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96. Isolated Bidirectional Micro Inverter With Proportional Resonant Controller For Renewable Energy System

Rajesh and R.Madavan

Design of Protocol Based V2V Emergency DC Fast Charging

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Abstract.

It has been quite some time Electric Vehicles (EV) started plying on the roads and are replacing fossil fuel vehicles. Charging infrastructure is already in place at many cities and highways for hassle free charging. Two types of chargers are deployed. AC and DC chargers, AC Charger utilizes the ON-Board charger of the EV and takes 6 to 8 hours for full charge whereas DC Fast Chargers (DCFC) charges the vehicle within a short period of 20 to 60 minutes. Most AC chargers are installed in apartments, parking lots, offices and malls and are mainly used for topping up. A well implemented charging infrastructure will have a DC charger at every 5 kms within city and a charger on every 25 km on highways. Therefore there is a rare possibility of EV battery draining completely. But such a facility is yet to be implemented at many places which create a range fear within EV users. This paper proposes a vehicle to vehicle fast charging (V2V) on such an occasion. An EV charger consists of a power converter and a communication section that communicates with the EV using a standard charge protocol. At present there are three protocols followed internationally for fast charging: CCS of European Union, CHAdeMO of Japan and GB/T of China. Fast charging requires to access fast charging port. Power can neither be drawn nor supplied to the port without proper protocol. There is no standard protocol devised for this purpose at present. We propose to use the standard available charge protocol (G2V) and vehicle to grid (V2G) protocols for the V2V charging. Here we have used CHAdeMO for demonstration. The vehicle could be fast charged from another vehicle during an emergency.

Keywords. Electric Vehicles, ON-Board charger, DC Fast Chargers, vehicle fast charging, CHAdeMO

1. INTRODUCTION

Increasing population of Electric Vehicles has placed a high demand for the charging infrastructure and related services. During a breakdown of an EV due to discharge of the battery, the vehicle has to be either charged from a mobile EV charger or has to be pulled to the nearest charging station/ workshop by a rescue vehicle. It consumes a lot of time if this happens on a highway before the vehicle could reach the nearest charge station. It will be of great relief and anxiety free travel, if there is a hand held Emergency Vehicle to Vehicle (V2V) fast charger. The broke down vehicle can be charged from a passing vehicle using this V2V charger within a matter of minutes. Fast Charging requires establishing charging with few digital interfaces between charger and vehicle and a serial communication interface through CAN bus using charge Protocol specific to that vehicle. Once communication is established, the charge current has to follow the continuous command from the vehicle through the CAN bus. Presently there are three standard charge protocols are followed internationally. CHAdeMO protocol by Japan is the forerunner, followed by GB/T of China and CCS of European Union. CHAdeMO has devised other protocols to utilize the charged battery of the EV, such as Vehicle to Home (V2H), Vehicle to Building (V2B), Vehicle to Grid (V2G), Vehicle to Load (V2L) grouped under V2X. All these protocols can be used to draw power from the battery pack. CCS too has V2G protocol to discharge the charged EV to grid. This can be used to export power to the grid during peak demand period and make a earning out of it. It is proposed to use the either V2G or V2H protocols for drawing power from a charged vehicle, say donor vehicle (DV) to charge the drained vehicle, say receptor vehicle (RV) using the charge protocol G2V.

Wireless charging is proposed [1] for V2V charging. Different coil designs are compared and different resonant options are analyzed. Power Capacity calculation and Energy cost calculation with EV as a source is provided. This calls for additional modules to be built within the vehicle for charging, communicating and supervisory control. Wireless charging has its own disadvantages like capacity limitation, distance of transmission and alignment. Bidirectional converter is proposed [2]. Its topology and operation in different modes are discussed which is additional to the On-Board charger present in the vehicle.

Several V2V charging strategies are proposed in [3]. One is Conventional way of exporting (V2G) and importing power (G2V) with the grid as an intermediate platform, utilizing the Bi-directional ON-Board charger (BDOBC) of the vehicle. The second one is eliminating this intermediate platform and charging the vehicle directly. Many EV's are presently equipped with Uni-directional chargers. Hence this strategy can be utilized only with few vehicles that are equipped with BDOBCs. For V2G capability, BDOBCs should have current source capability, while for V2H or V2B it should have voltage source capability at the AC end. Third one is bypassing the DC/AC of the donor and AC/DC of the receptor ON-Board charger (OBC), and connecting the DC sections directly. This case is plausible if only there is a double conversion. Additionally a provision for taking DC out is required and should have an additional outlet. This is also risky as the DC may not come with short circuit protection. The fourth one is an Off-Board DC V2V, which has a better feasibility and can be fast too. V2V charging is proposed [4] using a control algorithm incorporated in the BDOBC and a communication network between EV's to be established by a MQTT protocol over TCP/IP. A MQTT client mobile application is used for monitoring and control. Wireless Power Transfer (WPT) based V2V charging is proposed [5]. This requires additional hardware on all the vehicles. Communication methodology is
ambiguous. It discusses more on the angular offset of the WPT coils.

Various topologies suitable for V2G and V2H are discussed in length and are compared [6]. Communication standards used for such applications are also discussed. Factors like driving range distribution, optimal charge capacity for public charging infrastructure, charging methodology to minimize battery degradation were studied and analyzed for CHAdeMO quick charging station [7]. Power output capability and its duration when used in V2H mode were analyzed with PEV and PHEV based on the residential energy data collected [8]. Opportunities for V2H, V2G and V2V technologies were studied and challenges associated with it were analyzed [9]. Framework for operations under these technologies, modeling of household electrical appliances, study of power electronic devices and battery technologies are also carried out.Multiple protocols like Chademo, CCS Combo are analyzed in implementation of dynamic DC charging [10] and SAE J1772 based V2X AC charging where EV is charged through intermittent renewable energy source.

2. PROPOSED METHODOLOGY

DC charging through the Fast Charging port is proposed for V2V emergency charging. Donor vehicle shall use any of the V2X protocol to borrow energy from Chademo based vehicles and V2G protocol from CCS. On the receptor side G2V charge protocol is used for DC fast charging from the DV. An external charger shall be used for this purpose. The charger consists of a Power Module with two fast charge connectors and a controller as shown in Figure 2.1 for interfacing and communicating between the vehicles and two sets of high voltage relays one at the input and other at the output. One connector shall be connected to the input relay and the other to the output relay. The fast charge connectors shall be of Chademo or CCS depending on the protocol followed by the vehicle. Chademo connector has power, digital interface and CAN communication connections, while CCS has power, PWM control pilot interface, proximity and Power Line Communication (PLC) over the control pilot. The controller needs to have necessary digital and communication interfaces.

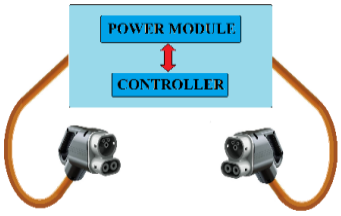

Figure 2.1. Proposed V2V Emergency DC Fast Charger

3. POWER MODULE

The charger is intended to charge similar type of vehicles that have similar battery voltages and capacity. Cars in India use low voltage of 72V while all other countries use 350V Battery. Generally Car battery capacity ranges from 20 to 50 kWH (50-120AH). So the output current requirement varies from 50A for 20kWH to 120A for 50kWH to support 1C charging. Here let us select an output current of 80A to suit most of the applications and at the same time keep the converter size minimum. A buck converter is best suited for this application. Isolation is not warranted as it is between two battery packs. Being a medium voltage application either an IGBT or a MOSFET can be selected. With MOSFET, high switching frequency can be achieved without increasing the losses greatly thereby reducing the inductor requirement. The main disadvantage is many devices are to be paralleled. Whereas a single device can be selected if IGBT is used, but the switching frequency has to be low enough to contain the losses associated with it thus increasing the inductor size. TABLE I specifies the brief input and output requirements of the converter. Detailed design is provided for all the power components.

TABLE I. Design parameters

V_{in}	300 – 399 V (351.5V Nominal)
V_o	300 – 399V
I_o	80A
P_o	32 KW
f_{sw}	30 kHz

3.1. Inductor Design

Inductor value is calculated based on the minimum duty cycle and the ripple current and is designed using an amorphous core. Let us assume 10% ripple, i.e., 8A and the peak to peak ripple current

ΔIL = 16A.

Minimum duty cycle

$$\delta_{T\min} = \frac{V_{o\min}}{V_{i\max}} = \frac{300}{399} = 0.75 \tag{3.1}$$

Inductance

$$L \geq \frac{V_{o\min}(1-\delta_{T\min})}{\Delta I_L f_{sw}}$$

$$\geq \frac{300(1-0.75)}{16\times 30e^3} \geq 156.25\mu H \tag{3.2}$$

$$E = \frac{1}{2}LI^2 = \frac{1}{2} \times 156 \times 10^{-6} \times 80^2 = 0.499J \tag{3.3}$$

Let us select FS-520026-2 FluxSan Fe-Si Alloy Powder core from Micrometals. The core is selected based on the required geometry and the energy storage needs. The dimension and magnetic data are given in TABLE II. Figure 3.1 provides the Energy handling capability, Figure 3.2 gives core loss information and Figure 3.3 provides the Inductance factor AL.

TABLE II. Core parameters

OD	132.54 mm	ID	78.59 mm	HT	20.32 mm
L_e	32.429 cm	A_e	5.35 cm^2	V_e	173 cm^3
SA	515 cm^2	μ_i	26	A_L	54 nH±8%

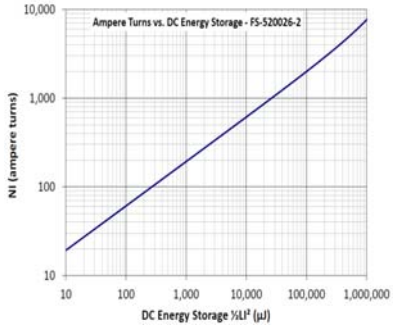

Figure 3.2. Energy vs Amp-Turns

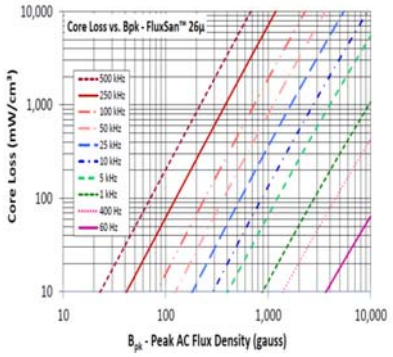

Figure 3.2. Energy vs Amp-Turns Flux Density vs Core Loss

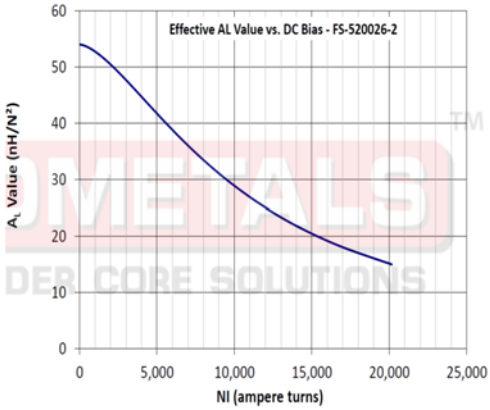

Figure 3.3. Amp Turns vs AL

Number of turns

$$N = \sqrt{\frac{L}{A_L}} = \sqrt{\frac{156 \times 10^{-6}}{42 \times 10^{-9}}} = 61T \tag{3.4}$$

Operating flux density

$$B_{ac} = \frac{L\left(\frac{\Delta I}{2}\right)\times 10^{-4}}{A_e N}$$
$$= \frac{156\times 10^{-6}\times 8\times 10^{4}}{5.35\times 61} = 0.038\,Tesla \quad (3.5)$$

From Figure 3.1 core loss is around 50mW/cm3 for 30 kHz at 0.038Tesla.
Therefore core loss = 50mW/cm3 x 173cm3 = 8.65W.
Let us choose 8 SWG copper wire 2 numbers in parallel.
Current density = 81.5/(2x12.97)=3.14A/mm2
Wire resistance =0.764mΩ/m x 8.479m = 6.478mΩ
Cu Loss =81.52 x 6.478 x 10-3 = 43W
Total loss = 51.678W
Temperature rise

$$\Delta T = \left(\frac{P}{SA}\right)^{0.833}$$
$$= \left(\frac{51.678\times 10^{3}}{515}\right)^{0.833} = 46.47^{o}C \quad (3.6)$$

Where P is power loss in mW and SA is the total surface area in cm3.

3.2. Device Selection

Let us select FCH023N65S3 MOSFET from ON Semiconductor. It is rated for 75A at 650V and has an RDS(ON) of 23mΩ. Let us use 7 nos in parallel to maintain low loss and operate under safe limits.

Conduction loss

$$P_{Trc}\ @\ 25^{o}C = I_o^2 R_{DS(ON)}\delta_{T\min}$$
$$= 80^{2}\times\left(\frac{0.023}{7}\right)\times 0.75 = 15.77W \quad (3.7)$$

$$P_{Trc}\ @\ 100^{o}C = 15.77W\times 1.75 = 27.6W \quad (3.8)$$

Switching loss

$$P_{Trs} = \frac{1}{2}VI(t_r + t_f) f_{SW}$$
$$= \frac{1}{2}\times 400\times 80\times(55+29)\times 10^{-9}\times 30\times 10^{3}$$
$$= 40.32W \quad (3.9)$$

Total device loss = PTrc + PTrs = 67.92W

Junction to Case thermal resistance RθJC =0.21oC/W per device and RθCS =0.24oC/W per device.
Therefore for 7 devices in parallel RθJC =0.03oC/W and RθCS =0.0343oC/W.

$$T_J = P\left(R_{\theta JC} + R_{\theta CS} + R_{\theta SA}\right) + T_A \quad (3.10)$$

Heat sink thermal resistance

$$R_{\theta SA} \le \frac{T_J - T_A}{P} - R_{\theta JC} - R_{\theta CS}$$
$$\le \frac{125-50}{67.92} - 0.03 - 0.0343 \le 1.039 \quad (3.11)$$

3.3 Diode Selection

Let us choose DSEI 6006A diode from IXYS, 3 in parallel. The diode is rated for 60A at 600V and has a reverse recovery time of 35ns.

Conduction loss

$$P_{Dc} = IV_f(1-\delta_{T\min}) = 80\times1.3\times0.25 = 26W \quad (3.12)$$

Switching loss

$$P_{Ds} = Q_{rr}V_R f_{SW} = 2.5\times10^{-6}\times300\times30\times10^3 = 22.5W \quad (3.13)$$

Total diode loss = PDc + PDs = 48.5W

Junction to Case thermal resistance RθJC =0.75oC/W per device and RθCS =0.25oC/W per device. Therefore for 3 devices in parallel RθJC =0.25oC/W and RθCS =0.0833oC/W.

$$T_J = P(R_{\theta JC} + R_{\theta CS} + R_{\theta SA}) + T_A \quad (3.14)$$

$$R_{\theta SA} \le \frac{T_J - T_A}{P} - R_{\theta JC} - R_{\theta CS} \le \frac{125-50}{48.5} - 0.25 - 0.0833 \le 1.213 \quad (3.15)$$

3.4 Efficiency Estimation

Inductor loss	= 51.678W
MOSFET loss	= 67.92W
Diode Loss	= 48.5W
Other losses	= 20W
Total loss	= 188.09W
Output power	= 400 x 80 = 32000W
Input power	= 32000W + 188.09W=32188.09W
Efficiency η	= 99.415%

4. COMBINED CHARGING SYSTEM(CCS) PROTOCOL

Combined Charging System (CCS) is a globally supported standard for communication and charging of battery-powered electric vehicles. Two different types of connectors are under use, Combo1 with Type I AC charging for US and Combo 2 with Type II AC charging for Europe based on J1772/IEC62196-3 standards as can be seen in Figure 4.1.

Figure.4.2 shows connection details. Verification of the status is carried out by a PWM signal generated by the CP and further communication is through a TCP/IP based 7 layer OSI model High Level Communication (HLC) as shown in Figure.4.3

Figure 4.1.Combo 2 Plug and Socket

DC+ DC Power
DC- Output
CP – Control Pilot
PP – Proximity Pilot
PE – Power Earth
Lx – AC Phase x (1,2,3)
N – Neutral articles.

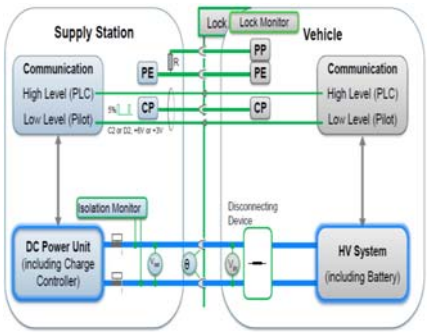

Figure 4.2.CCS Charging Architecture

The link is established by Power Line Communication (PLC) using HomePlug Green Phy physical layer. The charge process sequence starts with 5% PWM signal at 1 kHz to trigger the HLC. The amplitude of the PWM is modified by the EV which is an indication of the status such as

a. Vehicle not connected – State A (12V)
b. Vehicle connected but not ready to charge – State B (9V)
c. Vehicle connected and ready to charge – State C (6V)
d. Ventilation required – State D (3V)
e. Fault – State E (0V)
f. Electric Vehicle Supply Equipment (EVSE) not available – State F (-12V)

Once it attains State C, EV proceeds to establish HLC. This being a high-frequency signal, there is a possibility that it might skip the limits of private electrical network resulting into a cross talk. To ensure only physically connected EV and EVSE join a common AVLN, Signal level Attenuation Characterization (SLAC) protocol is used. EV sends sounding packets as broadcasts to all the charging stations on the same electrical network. SLAC measures the attenuation between two PLCs. PLC modules that exhibit the lowest attenuation to each other is physically connected. Once it is ensured EVCC uses SECC Discovery protocol to obtain the IP address and port number of SECC. Then TCP/IPv6 is setup. The communication sequence starts with the following Application Layer messages.

a. SupportedAppProtocolReq/Res

Request and response of the protocol compatibility.Either DIN Spec 70121 or ISO 15118.

b. SessionSetupReq/Res

Establishes communication session and exchanges client-server IDs.

c. ServiceDiscoveryReq/Res

Selects a Service. Charging, Discharging the EV are all some of the services offered by the EVSE.

d. ServicePaymentSelectionReq/Res

Selects the payment method

e. ContractAuthenticationReq/Res

Verifying Contract Authentication

f. ChargeParameterDiscoveryReq/Res

Verifies the compatibility of charging parameters

g. CableCheckReq/Res

For insulation verification

h. PreChargeReq/Res

Initial charging

i. PowerDeliveryReq/Res

For pre-charging

j. CurrentDemandReq/Res

Charge current request

k. PowerDeliveryReq/Res

For charging

l. WeldingDetectionReq/Res

Checks for welding of contactors

m. SessionStopReq/Resnames

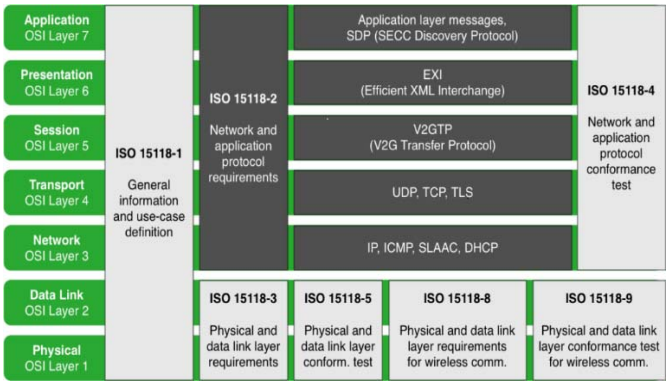

Figure 4.3.OSI Layer Model and Standards for HLC

At the end of the session the 5% PWM signal is switched off to terminate the process. All the application layer messages are defined using XML and has a specific time out values. These messages are converted into binary data by Efficient XML Interchange (EXI) codec employing the XSD file.Chademo Protocol.

Chademo unlike CCS communicates through a CAN bus and have few digital interface as can be seen in Fig.8. The control ground to the charger is obtained from the EV side On-board auxiliary battery. The extension of ground is sensed to perform the

Connection check. The charging sequence is shown in Figure 4.4. Switching ON ‘d1’ sends start-of-charge signal by extending 12V and EV recognizes it by ‘f’ on. It responds by sending the battery parameters through the CAN bus. The compatibility is verified by the charger and it transmits the charger parameters. EV does the compatibility check and start permission is given by turning on ‘k’ which is sensed at ‘j’ by the charger. Connector lock is activated and insulation check is carried out. Charging ready signal is generated by activating ‘d2’ and EV recognizes it through ‘g’ and closes the EV contactor. The EV side contactor coil is powered by the charger side auxiliary power source. The EV gives current request based on the battery condition and the charger follows by supplying the requested current. The charging continues till the stop condition is reached.

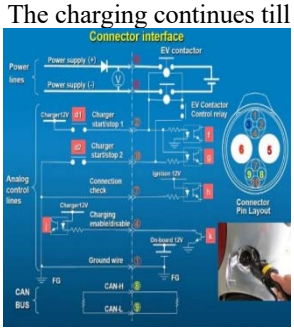

Figure 4.4. Chademo Charging Sequence

Once the battery is fully charged or the stop condition is reached, EV reduces the current request to zero. EV turns off the contactor once the charging current drops to zero and activates stop command by turning off ‘k’. In turn the charger terminates the session by de-activating ‘d1’ and ‘d2’. Finally the lock is released.

The data is transmitted at the rate of 500 bps. There are 5 data frames associated with the main charging process. Three are from the EV and two are from the EVSE. An example of the data frames during a charging process is given below in Table III. The first three data frames in yellow represents the EV data and the other two in green represents EVSE. Both the message IDs and data are in Hex format. DLC is the data length.

TABLE III. Data frames during charging

ID	DLC	D0	D1	D2	D3	D4	D5	D6	D7
100	8	0	0	0	0	A9	1	FA	0
101	8	0	FF	3C	0	0	0	0	0
102	8	1	A4	1	50	0	1	5B	0
108	8	1	8F	1	50	2C	1	0	0
109	8	1	45	1	80	0	5	FF	2D

5. HARDWARE

A practical working model is built employing Chademo protocol. Circuit schematic of the Buck Converter used for charging is shown in Figure 5.1. Q1 has seven numbers of discrete MOSFETs (FCH023N65S3) with individual gate resistors for turn-on and turn-off. D9 is the freewheeling diode and it has three numbers of DSEI 6006A connected in parallel. Inductor L1 is wound on FS-520026-2 torroidalFluxSan Fe-Si alloy powder core. The power circuit and its driver are assembled on a PCB. Discrete Mosfet based driver is used considering the drive requirement. A hall effect CT CT1 is used to measure and control the charge current. C6 and C7 constitute the output filter capacitor while C4 is the input filter capacitor. C7 is a Poly propylene capacitor that has low ESR and ESL to attenuate high frequency ripple and switching noises. Input and output voltages are measured using resistor chains. Two temperature sensors U1 and U2 are used to measure the device temperature and are utilized in monitoring and de-rating control. A controller using Microchip’s dsPIC33FJ64GS606 is used for both the charge control and RV side communication. MCP2532 is used as CAN transceiver. For DV additional controller is used. Both the controllers exchange data through UART

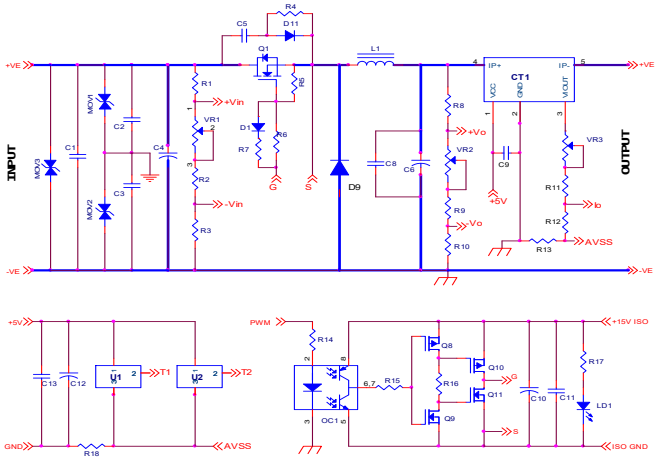

Figure 5.1. Circuit Schematic

6. RESULTS AND CONCLUSION

Due to difficulty in getting the vehicles for testing, the charger is tested on a resistive load for 80A at 350V. The measured efficiency is 99% and is close to the estimated value. The digital interface is simulated using switches and the vehicle CAN messages are transmitted from a CAN analyzer and the protocol is verified.

At this rate of charging a car with 20 kWh battery pack whose range is 100 km can charge to 30% of its capacity in around 13 minutes, which is sufficient to cover 30 kms. This charge is more than sufficient to reach the next charging station. Vehicles with higher capacity have more range. Therefore it is sufficient to charge it to a lower capacity to reach the same distance. So the charging time will remain almost constant irrespective of the vehicles battery capacity assuming similar efficiency. Assuming a distance of 25 km between two charging station, the distance to travel the nearest one is only 12 km. charging time of around 13 minutes is highly convenient for the acceptor and is quite.

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Detection of Non-Technical Losses(NTL) in Electric Distribution Network by Applying Machine Learning

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Abstract.

This article discusses Non-Technical Loss (NTL) in power utilities and how to deal with it. Benefits of electric power utilities have changed as a result of non-technical loss. At the same time, due to widespread distribution, dishonest users and regular consumers have many similar consumption tendencies. Electricity theft, unauthorised connections, faulty metering, and billing issues are examples of non-technical losses. The NTL detection method's accuracy has to be improved urgently. Non-Technical Loss is identified using a classification scheme and data mining tools. Implement an intelligent computational technique to detect non-technical losses and choose the characteristic that is most closely related using information from a database of customer profiles. This work developed a machine learning-based non-technical loss detecting method. The performance of the suggested model is confirmed by the experimental results. These results unequivocally demonstrate that the proposed detection model outperforms other current methods in terms of accuracy, precision, recall, F1 score, and AUC score.

Keywords. Random Forest, Decision Tree, SVM, Data Mining, Non-Technical Loss

1. INTRODUCTION

Power networks are essential to the prosperity of any nation. Unfortunately, non-technical losses have a negative impact on these networks (NTL). Any utility faces a serious problem with NTL. Although it is estimated that these losses cost energy suppliers throughout the globe billions of dollars annually, eliminating NTL might increase revenue, profit, and grid dependability. As a result, the government is enthusiastic about NTL spending. The demand for electrical energy is rising as a result of urbanisation and rising living standards. The transition to

electricity is being made using finite fossil fuels. The two categories of losses that happen throughout the production, transmission, and distribution of energy are technical and non-technical. Technical losses are brought on by internal resistance in the transformer, generator, and transmission lines. These losses range from 9 to 2 percent in Golden and Min[1] systems to 2 to 6 percent in inefficient systems, accounting for around 1-2 percent of the overall efficient energy distribution in Western Europe. According to Antmann[3], non-technical losses include power theft, problems with metre reading, record-keeping, accounting, and infrastructure failure or damage.

Theft of power might fall under one of the following categories: •A metre that is malfunctioning or damaged.

•Staying away from metering apparatus.

•A supply source that is unmetered.

•Measurement mistakes brought on by human and technological factors.

• Illegal actions, such tampering with metres.

The authors of references [14,15] claim that these losses cause around $1 billion in financial losses globally. This page was created because, when compared to technical losses, these losses account up a significant portion of overall losses.

To address the aforementioned difficulty using artificial intelligence, a great deal of effort has gone into implementing machine learning and deep learning techniques. Classification and clustering methods have been used to categorise existing machine learning techniques [5,6–8]. While human feature extraction is still required for existing machine learning detection methods, this suggests that they are unable to handle high-dimensional data such as standard deviation (SD), maximum, and lowest consumption statistics. To extract 2D attributes from smart metre data, manual feature extraction is a laborious and ineffective process. However, the bagging and random feature selection advantages of two machine learning methods are combined in the random forest (RF) classifier. As a result, there are several challenges associated with utilising machine learning to discover non-technical losses, such as class imbalance, data quality, technique comparison, feature design, and selection.

The structure of this document is as follows: In section 2, related works of literature were referenced. The results, as well as future study directions, are presented in Section 3.

2. RELATED WORK

In this part, we've covered the many NTL causes, the economic impact of NTL, the percentage of NTL in various nations, and the key works of literature on identifying non-technical losses.

In order to identify electricity and gas NTL, Coma-Puig et al. (2016) [3] utilised a range of machine learning strategies. They found that a single gradient boosted machine (GBM) outperformed any ensemble or classifier. Naive Bayes (NB), AdaBoost (AB), KNN, DT, NN, SVM, RF, and GBM were among the methods used.

Using data from a Chinese electrical firm, Zheng et alstudy .'s on deep convolutional neural networks in 2017 [18] (CNN). SVM, Random Forest (RF), Logistic Regression, and TSR are used to compare the results of deep convolutional neural networks (Three Sigma Rule). The classifiers listed before were outperformed by Deep CNN.

The 5K Brazilian Industrial Customer data collection is used by Ramos et al. (2013) [6]; each customer profile has 10 parameters, such as the maximum demand, demand billed, installed power, and so on. SVM, NN, and K-Nearest Neighbors (KNN) test accuracy is 0.9628, 0.9448, and 0.9620, respectively.

M. Hasan and colleagues (2019) [7] Long Short-Term Memory (LSTM) and Convolutional Neural Networks (CNN) were used for classification. The issue of class disparity is also addressed using the SMOTE approach. The simulation, which used a 10,000 customer data set, produced an 89 percent test accuracy. The remaining layers carried out the LSTM operation, whereas the first four hidden layers, each with 20 features, carried out the convolutional operation.

3. PROPOSED METHODOLOGY

The suggested method for NTL detection in the electric distribution organisation is explained in this section. We then discussed the necessity for specific performance assessment criteria for NTL detection. This proposed technique must be carried out in many stages. The next subsections provide a detailed description of these tactics.

Figure 1 depicts the suggested task's flow. The model is fed the information on the consumer's consumption metrics that was obtained from the service provider. The information is sorted using customer categories and meteorological data. Data cleansing, missing value imputation, and data transformation are done via feature engineering, which is also used for data pre-processing.

The division code and SDO code, among other attributes in the collected data set, are useless. These inconsequential attributes will be removed from the dataset. The k fold cross-validation strategy is used to train and test the model on the pre-processed dataset. There is an issue with data imbalance since there are many less defaulters in the data set than there are regular customers. The performance of the suggested model might be hampered by the data imbalance issue. To balance the data, we used the Megatrend Diffusion Function (MTDF) method.

Four machine learning classifiers are used in the proposed model. Several performance assessment measures acquired from test results offer a sufficient foundation for discovering various traits that identify the best classifiers to detect NTL [23].

A. Data Collection and Analysis

Without a dataset, NTL cannot be reliably detected. As a result, an actual dataset is obtained from a Tuticorin, Tamilnadu, India-based power distribution company. Statistics on consumer consumption from July 2019 to December 2020 are included in the data set. In all, there are 48754 records of monthly consumption. Utilizing customer groupings and weather kinds, the data is reviewed..

B. Data Pre-processing

There are 72 characteristics in the raw data that was received via the distribution tool. However, some of the parts have been shown to be worthless. For instance, all consumers have the same feature division code, SDO code, and load unit. As a result, certain functionalities may not be accessible. Other aspects that are employed for unique identification include "serial number" and "account id." Therefore, only one of them may be used to establish identification. Replace the null value in this step with the proper feature value. There were 19 criteria in all that were used by the suggested method.

Many characteristics in the obtained data contain some incorrect values during data pre-processing; these are known as outliers. In this study, the outliers are corrected using Equations 1 and 2.

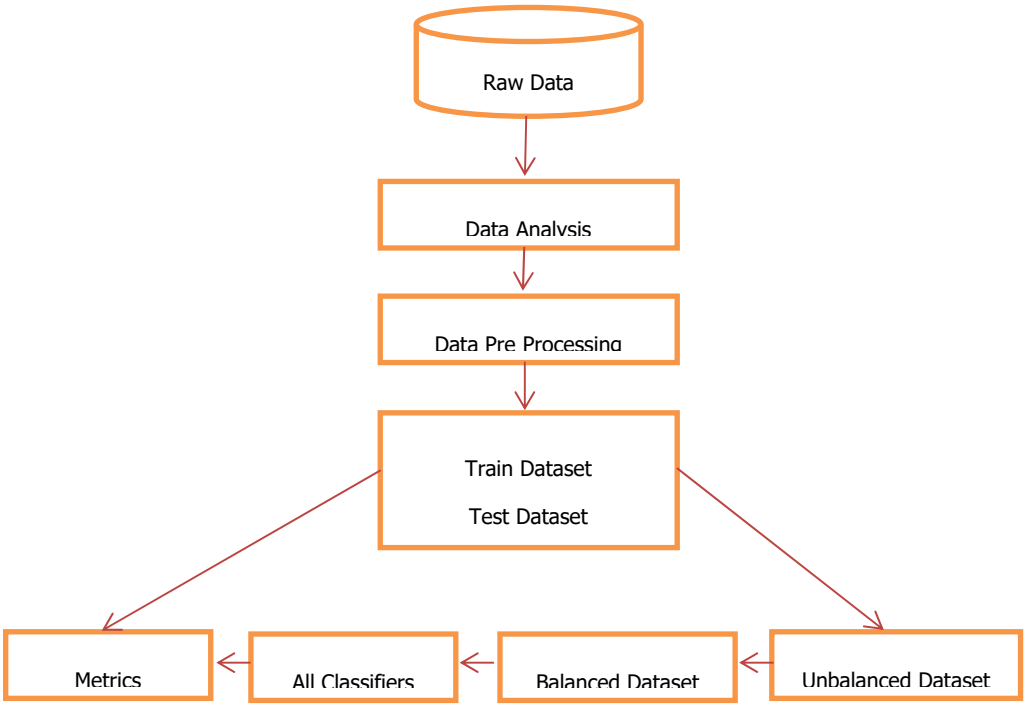

Figure 1. Flowchart of NTL detection

$$F(z) = \frac{x-\mu}{\sigma} \quad \text{----------(1)}$$

The Z score, x, and mean values are the Z score, current feature value, standard deviation, and mean value, respectively. Upper(Z) and lower(Z) are determined as threshold values based on the kind of feature and standard deviation once the Z score has been established. In the end, Eq (2) is used to find and eliminate outliers.

$$f(x) = \begin{cases} x, & upper(Z) >= x >= lower(Z) \\ mean(x), & else \end{cases} \quad \text{---------- (2)}$$

The raw data acquired has several features with a broad range of values. As a result, normalisation is required before training and testing data can be used. Using Eq. (3), the current feature value, Vx, is normalised, where min(Vx) and max(Vx) are the current feature's lowest and highest values, respectively.

$$F(Vx) = \frac{Vx - \min(Vx)}{\max(Vx) - \min(Vx)} \quad \text{---------(3)}$$

C. Feature Selection

The raw data that was retrieved has 72 characteristics, although not all of them are required. As a result, relevant attributes from the master data are chosen right away. A feature's utility is determined by its prediction error; if the prediction error varies when the feature's value changes, the feature is helpful; if not, it is not. The 19 main attributes that were chosen as a consequence of this technique.

In addition to these characteristics, other metrics based on metre data, such as creditworthiness, are produced here (CWT). This function ranges from 1 to 5, depending on the customers' ignorance of or tardiness in paying the bill, the healthy consumer flag, the overload, the metre read comment, and the aberrant load consumption rate. This feature categorises customers into two groups: normal and aberrant. Five distinct CWT types are used in the proposed study, and their calculations are as follows:

$$Overload = MDI - Load \quad \text{----------(4)}$$

The raw data that was retrieved has 72 characteristics, although not all of them are required. As a result, relevant attributes from the master data are chosen right away. A feature's utility is determined by its prediction error; if the prediction error varies when the feature's value changes, the feature is helpful; if not, it is not. This approach led to the identification of 19 essential traits.

In addition to these characteristics, other metrics based on metre data, such as creditworthiness, are produced here (CWT). This function ranges from 1 to 5, depending on the customers' ignorance of or tardiness in paying the bill, the healthy consumer flag, the overload, the metre read comment, and the aberrant load consumption rate. This feature categorises customers into two groups: normal and aberrant. The five distinct forms of CWT employed in the proposed study are computed as follows:

$$CWT2 = \begin{cases} 1, & HCF = yes \\ 5, & else \end{cases} \quad \text{-------- (5)}$$

$$CWT3 = \begin{cases} 5, & MRR = CDF \\ 1, & else \end{cases} \quad \text{-------- (6)}$$

CWT3 is determined by the metre read remark (MRR) status; if the MRR status is Ceiling Defective (CDF), CWT3 is 5, otherwise 1. Based on the cost of late payments, CWT4 (LPSC). By normalising it between 1 and 5, the LPSC value is transformed into a CWT4 value. Utilizing the load consumption rate, CWT5 is determined. These five CWTs may be used to categorise consumers in a number of ways.

D. Generation of train and test datasets

The train and test datasets are built using the k fold cross-validation method. The train dataset is used to train the recommended model's parameters, and the test data set is used to evaluate it. Data balancing is accomplished using the Megatrend Diffusion Function (MTDF) methodology.

E. Classification

Four classifiers were used for NTL detection, training, testing, and application. Using normalised data, these four classifiers—logistic regression, random forest, decision tree, and SVM—are trained and assessed.

IV. EXPERIMENTAL RESULTS AND ANALYSIS

The suggested model is written in Python 3.6 and operates on an Intel Core i3 processor running at 3.4 GHz with 4.0 GB of RAM. Using Sci-kit Learn, the logistic regression, decision tree, SVM, and RF are all coded [16].

A. Performance Metrics

A discrete two-class classification problem is discovered for NTL. Each customer is thus placed into either the abnormal or normal category. Confusion matrices are produced during classifier validation. For NTL detection, four confusion matrices are used: a true positive matrix (TP), a false negative matrix (FN), a false positive matrix (FP), and a true negative matrix (TN) (TN). The number of customers who are properly categorised as normal, wrongly classified as abnormal, truthfully classified as normal, and correctly classified as abnormal is what these matrices are characterised as. The precision with which a classifier predicts the TP and TN values is another crucial assessment factor. Utilize Eq. (7) to evaluate accuracy; it is as follows..

$$\text{Accuracy} = \frac{\text{True Positive + True Negative}}{\text{True positive +True Negative + False Positive + False Negative}} \quad \text{---------(7)}$$

The proposed model's performance metrics are measured using some additional crucial evaluation metrics, as given in Eqns. (8) to (12).

$$\text{True Positive Rate(TPR)} = \frac{TP}{TP + FN} \quad (8)$$

$$\text{True Negative (TNR)} = \frac{TN}{TN + FP} \quad (9)$$

$$\text{False Negative Rate(FNR)} = \frac{FN}{TP + FN} \quad (10)$$

$$\text{False Positive Rate(FPR)} = \frac{FP}{TN + FP} \quad (11)$$

$$\text{Positive Predictive Value(PPV)} = \frac{TP}{TP + FP} \quad (12)$$

The total number of power theft users that the classifier system successfully identified is determined using the recall or true positive rate (TPR). It becomes simpler to identify NTL as the TPR value rises.

The accuracy, recall, and F1 score for the classifiers for linear regression, support vector machines (SVM), decision trees (DT), and random forests (RF) are shown in Tables 2 through 5. A comparison of several classifiers based on accuracy, recall, and F1 score is shown in Table 6. Figure 2 shows its efficacy in contrast. The decision tree's accuracy, recall, and F1 score are 0.97, 0.97, and 0.97, respectively. With values of 0.98, 0.98, and 0.98 for recall, accuracy, and F1 score, respectively, Random Forest exceeds previous studies. Table 1 displays this difference. The accuracy, recall, and F1 score for both groups (normal and defaulter customers) are almost comparable, as shown in Tables 2–5, proving that the suggested model solves the issue of data imbalance.

Table 1. Classificationscoreof Different Classifiers

	Normal consumer	Defaulter consumer	Average/Total
Logistic Regression			
Precision	0.76	0.76	0.76
Recall	0.76	0.74	0.76
F1 Score	0.74	0.74	0.75
Decision Tree			
Precision	0.98	0.98	0.98
Recall	0.98	0.98	0.98
F1 Score	0.98	0.98	0.98
Support Vector Machine			

Precision	0.91	0.84	0.87
Recall	0.83	0.92	0.88
F1 Score	0.87	0.88	0.88
Random Forest(RF)			
Precision	0.98	0.98	0.99
Recall	0.97	0.98	0.97
F1 Score	0.99	0.99	0.99
Classification Score of LR, SVM, DT, and RF			
Logistic Regression	0.76	0.76	0.75
SVM	0.87	0.88	0.88
Random Forest	0.99	0.97	0.99
Decision Tree	0.98	0.98	0.98

A high harmonic mean score indicates the value of accuracy and memory. For the Decision Tree and Random Forest, the harmonic means of this suggested model are 97% and 98 percent, respectively.

This parameter's range is from +1 to -1. If the dominance value is close to +1, the classifier is accurate in the positive class. Additionally, the negative classifier seems to be accurate with a dominance score that is close to 1. The arithmetic mean and dominance of this suggested model are 98 percent and 0.006, respectively, as shown in Table 2.

Table 2: Parameter for LR, SVM, DT and Random Forest

Parameters	Linear Regression	Support Vector Machine	Decision Tree	Random Forest
Accuracy in %	0.76	0.87	0.98	0.99
Mean(Arithmetic)	0.76	0.86	0.98	0.99
Mean(Hormonic)	0.76	0.86	0.98	0.99
FNR	0.238	0.201	0.038	0.024
TNR	0.841	0.954	0.987	0.989
FPR	0.325	0.096	0.042	0.031
TPR	0.76	0.88	0.98	0.99
Domi	0.018	-0.041	0.002	0.008
AUC Score	0.845	0.894	0.98	0.99
MCC	0.54	0.896	0.96	0.97

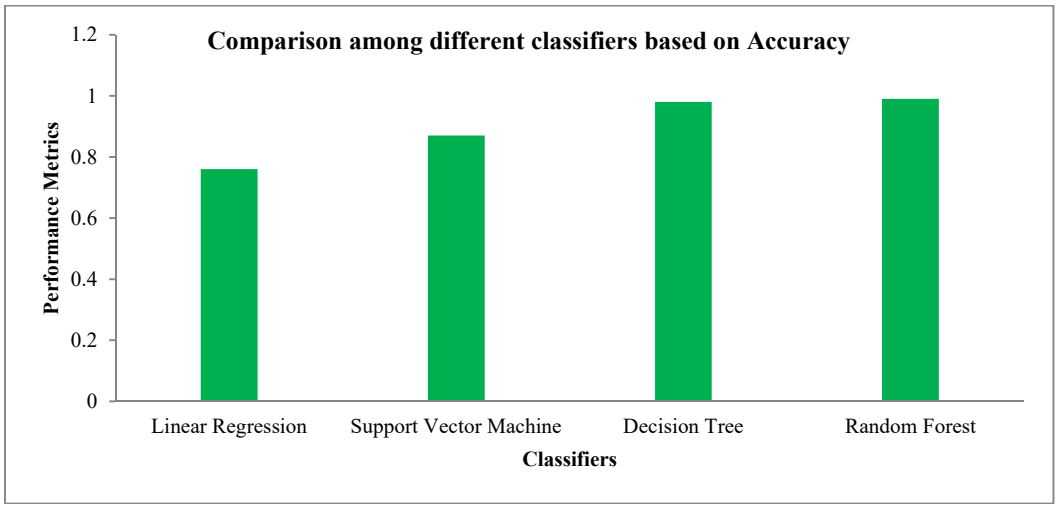

Fig.2 Comparison among different classifiers based on Accuracy

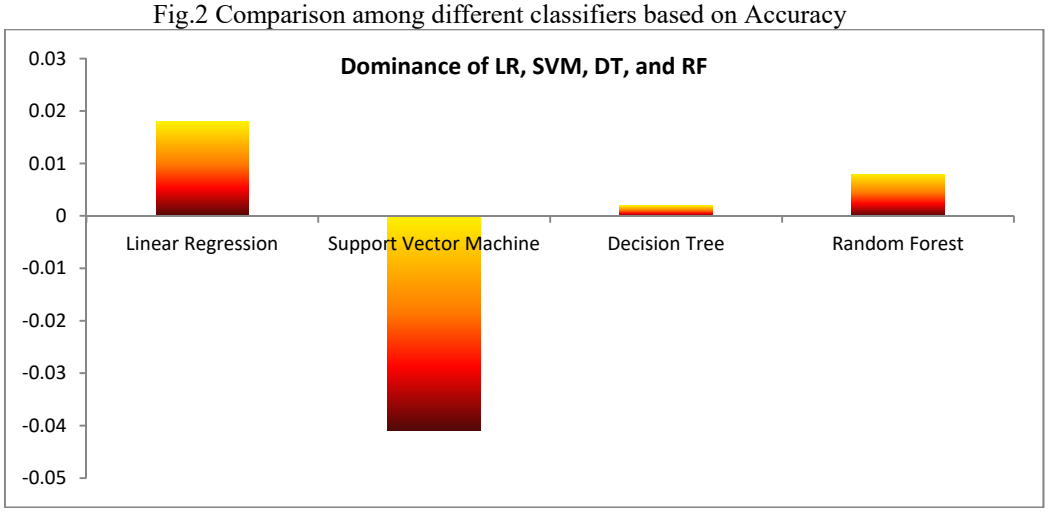

Fig 3. Dominance of LR, SVM, DT, and RF

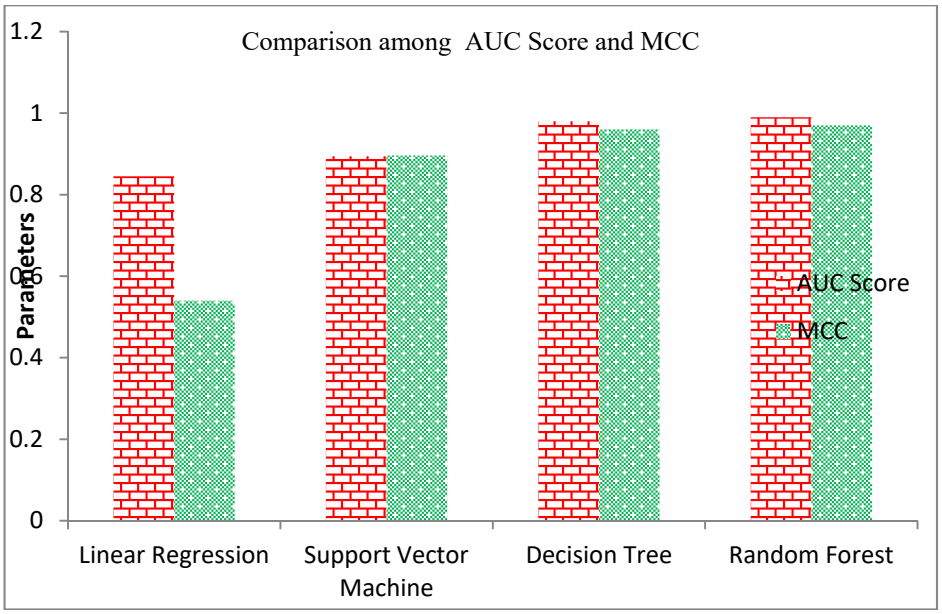

Fig 4. Comparison among AUC Score and MCC

Table 3 contrasts LR, SVM, DT, and random forest based on accuracy, arithmetic mean, harmonic mean, TPR, FPR, TNR, FNR, dominance, and AUC score. A comparison of classifiers utilising dominance metrics is shown in Figure 3. Figure 4 compares classifiers based on the TPR, TNR, and harmonic mean. The ROC curves for these three different classifiers are shown in Figure 5. The three terms are (LR, SVM, and RF). SVM, LR, and Figure 5 illustrates how Random Forest performs better than the opposition. The performance of the proposed model has been compared with that of earlier research, as shown in Table 5. Table 5 demonstrates that the new model performs better than earlier studies in terms of accuracy, recall, precision, and AUC score.

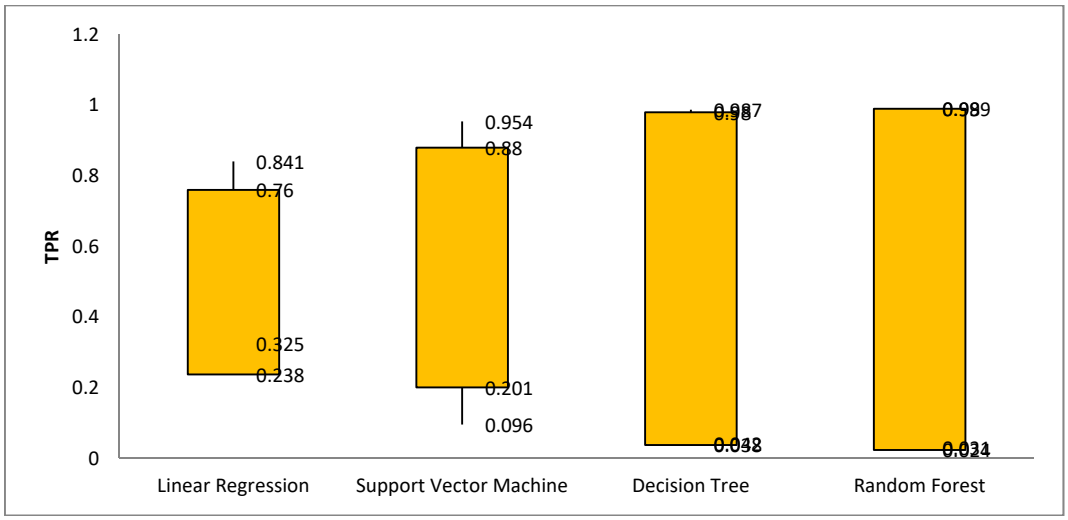

Figure 5. Stock diagram for LR, DT, and RF

Table 3. Comparisonbetweentheproposedschemeandexistedworks

Reference	Model	Accuracy	Recall	Precision	AUC
11	SVM(Gauss)	0.86	0.77	-	-
13	SVM+Fuzzy	-	0.72	-	-
14	SVM-FIS	0.72	-	-	-
15	FuzzyClassification	0.745	-	-	-
17	SVM	0.60	0.53	-	-
18	FuzzyLogic	0.55	-	-	-
19	CNN,LSTM	0.89	0.87	0.90	-
21	FuzzyClustering	-	-	-	0.741
22	Wideand Deep CNN	0.9404	-	-	-
23	DTcoupledSVM	0.925	-	-	-
25	(SVM,OPF, C4,5 tree)	0.862	0.64	0.544	-
26	CNN,LSTM	0.966	-	-	-
Our Proposed	LogisticRegression	0.75	0.75	0.75	0.749
	SVM	0.854	0.86	0.86	0.854
	DecisionTree	0.97	0.97	0.97	0.968
	RandomForest	0.98	0.98	0.98	0.98

This approach will provide the service provider a major edge in terms of identifying NTL. It will improve their capacity to detect NTLs while also saving them money, which is another important concern.

5. CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

A machine learning-based mechanism for recognising NTL is proposed in this study. This study made use of a data set from a distribution company in Tuticorin, Tamil Nadu, India. Theproposedworkconsiderstheveriouschallengingissues,includingclassimbalance,dataquality,comparisonofdifferentmethods,featuredescription,andselection. The suggested model outperforms other existing studies in terms of accuracy, precision, recall, F1 score, and AUCscore, according to the comparison study. ThisworkwilldrasticallygiveaheavybenefittotheserviceprovidertodetectNTL. ItwillimprovetheirabilitiesforNTLdetectionandtheenormoussavingsofrevenuelosseswhichisalsoa seriousconcern. This investigation made clear how difficult it is to get a complete data collection from a distribution organisation. So,thereisaneedforpubliclyavailablearealdataset,whichcanbehelpinginthisareaofstudy.

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COVID PATIENT DATA ANALYSIS SYSTEM USING SVM ALGORITHM IN MACHINE LEARNING

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Abstract.

COVID-19, is also called as 2019-nCoV, is just to know a pandemic but an endemic illness that has killed over 651,247 people over the world.COVID-19 seems to have no specified treatment at this time, hence it is unavoidable to live with the disorder and its effects. This fact has put enormous demand on the world's in sufficient health care systems, especially in developing countries. Even though there is no efficient, medically tested anti - viral agents' tactic or a certified vaccine to destroy the COVID-19 disease. The consequences of this epidemic, particularly the lockdown tactics, are multifaceted. There are non-clinical methods such as algorithms, data science, machine learning based, and other machine intelligence that may reduce the excessive toll on not only restricted healthcare systems as well as the economy. The spread of the COVID-19 virus is now posing a significant threat to worldwide healthcare. As an effect, the proposed model based on support vector machine learning algorithms offer a talented solution to this challenge that may be accurately predict the infectivity of the disease and identify earlier the affected people.

Keywords: COVID- Corona virus Disease, SVM-Support Vector Machine, NB-Naive Bayes, k-nn - k –Nearest Neighbors, CAD-Coronary Artery Disease

1. INTRODUCTION

The outbreak of developing coronal virus diseases 2019(COVID-19), initiated by SARS-CoV-2019, continue to pose a grim and imminent threat to global health. The endemic began in the democracy of China's Hubei province in beginning Dec 2019

and since then has increase across the world. As from October 2020, there were more than 39,500,000 reported cases of the infection in more over 180 nations, with the total number of persons afflicted likely much higher. COVID-19 has claimed the lives of about 1,110,000 people. Increased demand for hospital beds and crucial shortages of medical equipment, as well as the infection of several healthcare workers, continue to be issues for medical systems in the world. As a result, physicians' able to produce timely clinical choices and efficiently utilize healthcare resources has grown. A study of alternative involvement tactics[5] towards restrict the extend of the virus in the city is ended utilising such a set-up and the robust outbreak simulation stage.

2. LITERATURE REVIEW

Romney B Duffey [2] created the technologies of classification and data mining are excellent for classifying data. They have been used in medicine to make diagnosis and analysis so that decisions can be made. On the Wisconsin Breast Cancer (original) datasets, a comparison of results is undertaken between k Nearest Neighbor (k-NN), Naive Bayes classifier (NB)), SVMs (SVM) and Logistic Regression are examples of machine learning methods. The major goal is to classify data according to the accuracy, sharpness, sensitivity, and specificity of the each algorithm in terms of efficiency and efficacy. By looking at their results of the experiment, The SVM algorithm does have uppermost precision (97.13%) as well as the simple error rate. The Issue of Covid-19 is discussed in paper [2]. In this study, the recovery time after infectious disease outbreaks is predicted. By attempting to impose preventive measures such as medical services, isolation, took a step back, and so on, and in particular by adjusting the virus increase control by lowering illness rates when this is effective, the rate of infection declines after reaching a maximum, following what is recognized as the Worldwide Healing bend. When the transmission rate slows down, a phenomenon known as 'flattening the curve,' the danger of communicable diseases decreases. Once the rate reaches a high, successful countermeasures should cause the rate to fall.

PetarRadanliev [3] proposed removal techniques of scientific papers data as from Web of Science Collection was used to gather Covid-19 data, immunity information, and vaccination. The results are then compared against data from all Covid-19 explore areas shared, and each record is examined separately. According to a historical review of scientific information records on virus, pandemics, and death, Chinese colleges have not yet historically been leaders in these fields. We found a few bunch with allusions to exercising, irritation, smoke, fatness, and a variety of other topics.

Jooyeon Park [4] proposed with the advancement of transportation technologies, the worldwide transmission of illnesses continue to speed up. This paper uses GIS to investigate the relationship among transportation and infection, as well as statistical analysis of highway transportation and domestic flights. By employing logic in the SEIR imitation, the local infection could be forecasted when outbreaks occur, allowing for timely responses to disease risks. It may be determined through simulation that places with a huge population also have had the most illness. In conclusion, places with big inflows rather than flows have a high number of infected people, while infectivity is relatively low in some areas with poor transportation.

Vasilis Z. Marmarelis [6] proposed SIR is a framework that separates a population into "Susceptible," "Infectious," and "Recovered/ Removed" fractions and specifies their dynamic interrelationships using first-order differential equations. Estimated parameters result in a progressive decrease in infectivity rate, albeit the most recent wave is likely to be the greatest. The effects of various mitigation strategies can be quantified by analyzing data from particular states or countries.

Petropoulos and Spyros Makridakis [7] divised by predicting necessitates a large amount of past data. There is no such thing as a sure bet when it comes to the future. The forecast will be influenced by the data's dependability and the variables being anticipated. Predictions in medicine are rarely wrong, but their ambiguity is a severe problem. Estimating the future of pandemic and spate is difficult due to the large numeral of instances to be studied. For a basic time series, the prediction of confirmed COVID-19 instances is used. Algorithms from the simple exponential family are used to create the forecasts. Among several forecasting techniques, this provides good forecast accuracy, especially for short series. Exponential smoothing models feature patterns that are either multiplicative or additive.

Hiba Asri, Hajar Mousannif [8] created classifier and data gathering technologies are excellent ways to classify data. They are used for the medical field to make diagnoses and analyses in order to make judgments. The major goal is to classify data according to the efficiency and efficacy of each algorithm on the basis of precision, as well as precision, sensitivity, and specificity. By observing the trial findings, SVM provides the highest efficiency (97.13 percent) with the lowest error rate.

Shaobo He. Yuexi Peng [10] proposed for common data and various manage techniques like as quarantine, peripheral input, and sickbay, COVID-19 is studied using the SEIR epidemic model. Optimization algorithm (PSO) method is used to estimate the parameters using data from Hubei province. New limitation, such as seasonally and stochastic disease, are used in this model. The system's dynamics are influenced by the parameters, and the effects vary depending on the parameter.

3. PROPOSED METHODOLOGY

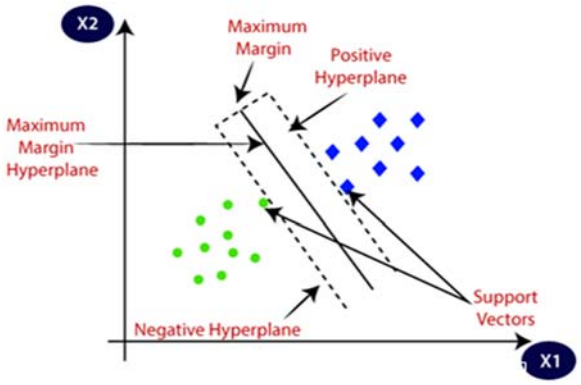

Fig 1 Support vector machine

The purpose of our project is to enables user to correctly predicted COVID-19 illness diagnoses in the proposed system. Age, gender, fever observation, travel history, and clinical data such as cough strength and lung infection incidence were also evaluated. We used our data to test a variety of machine learning techniques and found that the SVM model had the higher precision (>85%) in detecting and picking variables that correctly reflect COVID-19 condition in people of all ages. Support Vector Machines divide data into two groups to categorize it using an N-dimensional hyper plane. In SVM, the predicting variable is considered a feature, and the modified feature is called a converted attribute. Fig 1 describes mapping the data and on the Hyper plane, based on this divisible of data takes place. After a COVID diagnosis, doctors provide recommendations and prescribe medication to patients. The Take Entire is a fully - featured patient treatment system that collects all pertinent patient information. It's utilized to create new users who can interact with the interface. [9] To review the efficiency of varying time series in huge datasets, machine learning (ML)[11-12] approaches are applied. For a large data set, the assumptions are formed by separating the data into many time series. Also provided was a method for retrieve judgment from the improved SVM. The performance of proposed approach was then evaluated by comparing the behaviour[14-15] of the data sets with that of other algorithms. Finally, improved SVM was utilised to estimate the life expectation of lung cancer patients after surgery.

3.1. Architecture Proposed System

Fig 2 describes the architecture of the system in that the first phase is data cleansing. The dataset had a few null values in a few columns, which were handled by removing the rows matching to those columns because these values couldn't be substituted with

anything else relevant. The second phase is feature selection Because the dataset had several columns, this step involved picking the most important ones to employ for learning algorithm. The data was randomly partitioned into training data and real data in the third stage. The percentage of test data used for testing and validation in the current study ranged from 15% to 40%. The fourth step is to train the model, the best parameters for a given classification method were chosen and utilised to train a model. Step five is to evaluate the prototype that was implemented to the testing of data, and the model's accuracy was assessed by analysing the confusion matrix that was generated. The model was assessed in the sixth stage by purposes of calculating error metrics. Model prediction was matched to sample data in step seven, and the projected value was validated.

Fig 2 System Architecture

4. ADVANTAGES

- SVM can provide an a prior probability of disease, which can then be used to designate patients for angiogram. Other patients will save money and time as a result of this. They are also free of the angiography's negative effects.
- It could lead to earlier discovery and, as a result of lower mortality rate.
- Using SVM, latent patterns in the data collected can be extracted. This could lead to the development of new approaches for early diagnosis of ailments such as coronary artery disease.
- This is a novel method that builds on current research to derive quick and precise diagnostics.
- The method significantly out performs other published research in this area due to its superior accuracy.

5. RESULTS AND EXPERIMENTS

Fig 3 Home Page

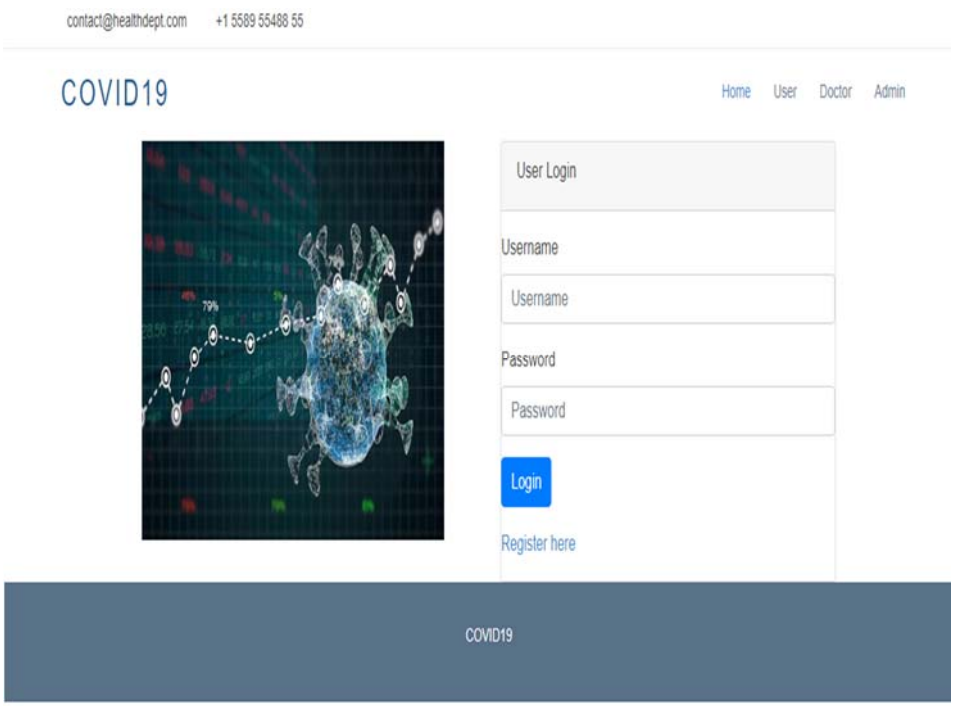

Fig 4 User Login

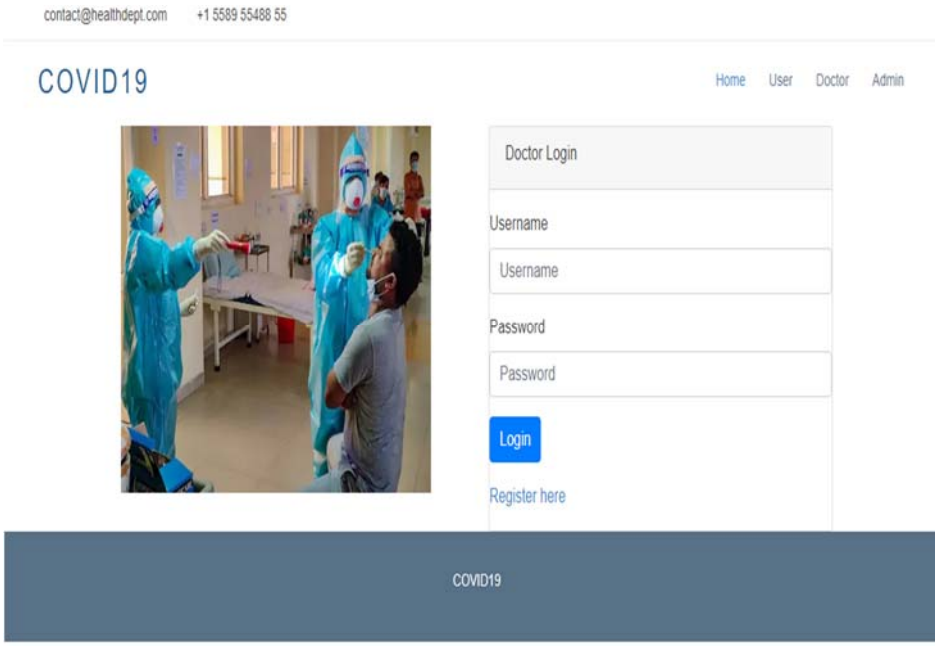

Fig 5 Doctors Login

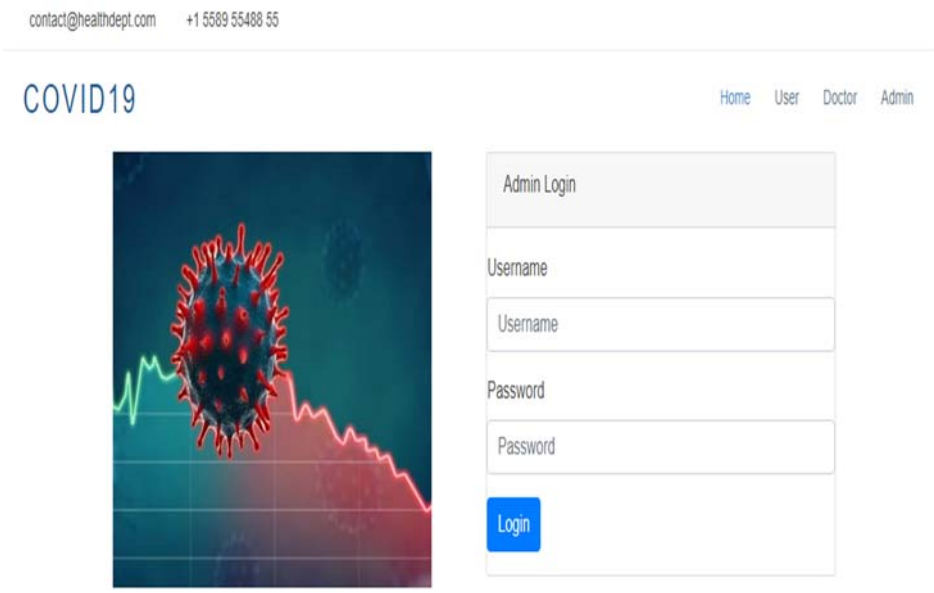

Fig 6 Admin Login

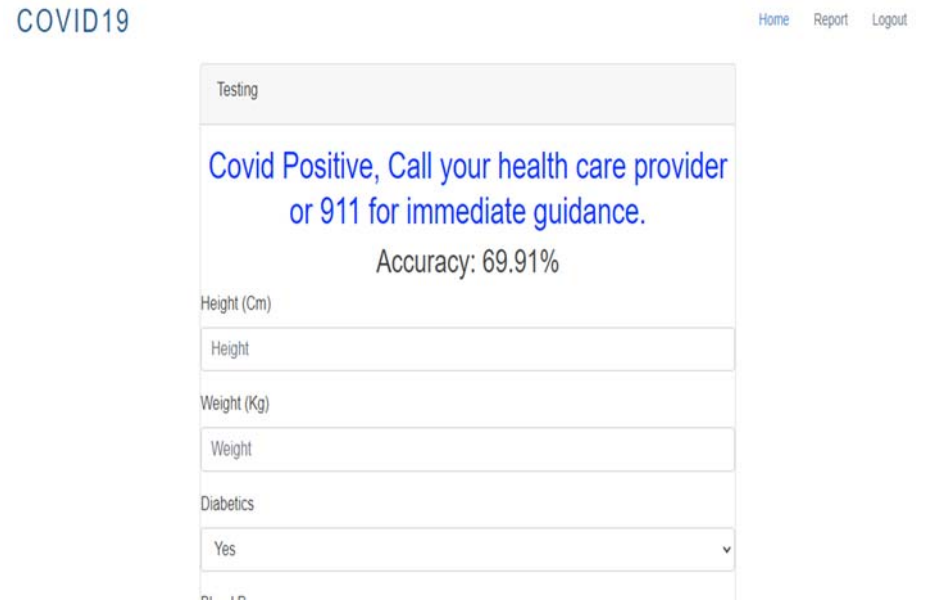

Fig 7 COVID Test

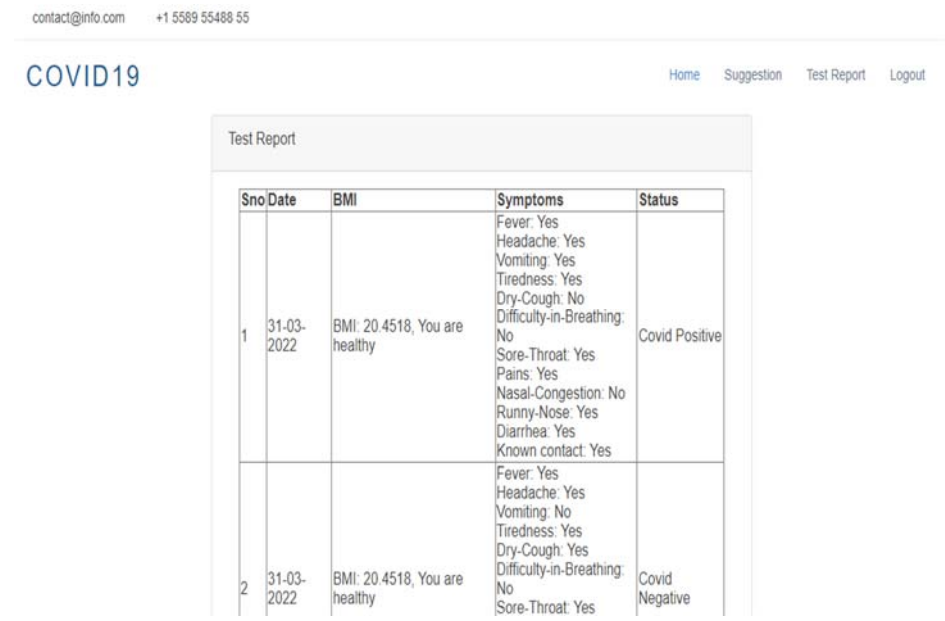

Fig 8 Test Report

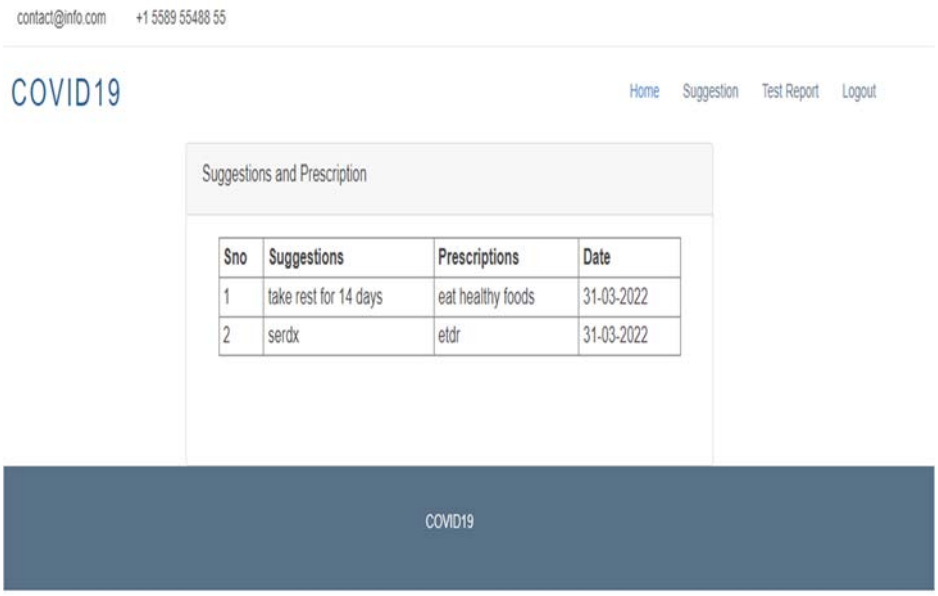

Fig 9 Suggestion and Prescriptions

Fig 3, is the home page where the patient doctor and admin have their login page and the registration page. Fig 4,5,6 are the login pages where the patients, doctors and admin can login with their username and the password or giving new user they can register and login. Fig 7 is the COVID test page in that the doctor tests the patients by giving the parameters given in that page and submits it after submitting the prediction of COVID disease is done. Fig 8 is the test reports of the patients and Fig 9 is suggestion and prescriptions given by the doctors are able to view in the user login.

6. CONCLUSION AND FUTURE ENHANCEMENT

Global health is currently being threatened by the outbreak of a COVID-19 pandemic. The develop of ways to detect infected people as soon as feasible is critical to stop this from happening. Given the lag in symptom manifestation, this may be problematic; nevertheless, machine in the event of a pandemic, training methods offer a viable solution that can be adopted rapidly and cheaply. The classification methods to look at information criterion and analyze performance using machine learning techniques on variety of clinical choices of sick people with COVID-19 diseases in a data set from India. The doctors' can improve ability to recognize patients early on by forecasting the probability of COVID-19 infection using predictive clinical signs. Several of the classifiers, on the other hand, did not produce reliable findings, perhaps because, despite their unquestionable exactitude, they produce done-sided answers for these datasets. Imaging new features were not used in this investigation to maximize speed and convenience. Imaging features can be compared to laboratories and pro features in future studies to see how effective they are at predicting outcomes.

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An Improved Novel Lipschitz Optimization Algorithm with FBBIC Converter for Photovoltaic System Under Partial Shaded Condition

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Abstract—

This paper presents a maximum power point tracking (MPPT) and a global maximum power point tracking (GMPPT) control strategy for solar systems, both of which use maximum power point tracking (MPPT). The method was developed using a Lipchitz optimization approach and applied on the Full-Bridge Boost Isolated Converter (FBBIC). It takes into account the fact that the outside environment can change quickly. In the Lipchitz Optimization Method (LOM) algorithm, a tangent trigonometric nonlinear function is used as a convergence factor. Soft switch technology for photovoltaic (PV) system FBBIC converters is also made possible by the use of phase-shift and active-clamp circuits. For a final stage, the proposed LOA algorithm was used to investigate and compare the performance of photovoltaic (PV) systems under static and dynamic partial shadowing conditions (PSCs) with other commonly used algorithms such as perturb and observe (P&O), particle swarm optimization (PSO), and others. The proposed control mechanism is shown to be successful and stable, especially when it comes to monitoring speed under PSCs, as demonstrated in this paper. Using simulations, it has been demonstrated that the Lipchitz Optimization Method (LOM) method with the FBBIC topology outperforms other algorithms in the majority of cases.

Keywords—Photavoltaic, LOM, FBBIC, MPPT, Partial Shading

I. INTRODUCTION

Photovoltaic energy systems have grown in popularity over the last few decades, owing to the fact that they are renewable and beneficial to the environment. The amount of energy produced by a photovoltaic array is dependent on the amount of photons that it is sensitive to, how hot it is, and how much voltage it has available. A DC/DC boost converter FBBIC combined with an active clamp converter can be used to adjust the voltage of a PV system in order to get the maximum amount of power from it. Dealing with the maximum and global peak of a Photovoltaic array's P-V curve under varying irradiation conditions is critical for the PV array to monitor the global maximum power point rather than the local maximum power point (GMPPT) (LMPPT). The development of global and local maximum power point tracking (MPPT) algorithms to improve the output efficiency of PV systems that work with PSCs has been the subject of numerous ideas and advances.

To figure out how to track and extract the most power out of a solar panel when the amount of light changes, perturbation, observation, and the incremental conductance approach are frequently used in conjunction with one another. When photovoltaic panels are exposed to sunlight in real time, traditional algorithms such as P&O may not be able to track the output of şolar PV arrays due to the nature of the data. A number of high-precision mppt algorithms have been developed and released as a result of this failure in order to track the global maximum power point tracking technique under a variety of lighting circumstances.

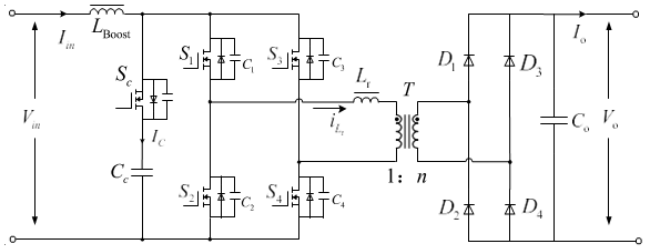

Fig.1 FBBIC with active Clamp Converter

When compared to the usual fuzzy MPPT algorithm, the recommended MPPT strategy in [9], which incorporated the robust fuzzy logic control approach and the fractional-order method, enhanced tracking accuracy in weather fluctuations. The most often researched strategies to extract maximum power under uniform irradiance conditions are

perturbation and observation (P&O) and incremental conductance (IC) among the various MPPT methods established thus far. Standard MPPT algorithms, on the other hand, may fail to follow the PV array's output GMPP when it is exposed to PSCs. As a result, several novel MPPT algorithms have been released that can properly track the GMPP of a PV array under PSCs. When compared to the usual fuzzy MPPT algorithm, the recommended MPPT technique, which integrated sophisticated control approaches such as resilient fuzzy control and the fractional-order control method, enhanced tracking accuracy in weather fluctuations. This change will improve algorithm convergence and reduce tracking time. Because the random numbers have been removed, the technique cannot be guaranteed to follow the GMPP in different PSCs. In a solar system with partial shading, a new algorithm was introduced. The key benefit is that once the GMPP is discovered, the steady-state oscillation is reduced.

A global optimization technique based on the Lipschitz constant and function was introduced in 2017 and has shown promise in conventional benchmarks for global optimization. Lipchitz optimization (LOM) is a technique that optimizes global parameters using the Lipschitz constant and function. Specifically, it has been demonstrated that the LOM technique, which takes advantage of the function's global smoothness, achieves faster convergence rates on globally smooth problems than previously known methods that simply take advantage of the function's local smoothness, and that it is faster than any random research optimization strategies. A global value is assigned to a function for which the Lipschitz constant is known.

These algorithms, despite their high efficiency and performance, have a number of basic problems that must be addressed. The process of adjusting several parameters of various optimization methods, such as the PSO algorithm, is time-consuming. The method may diverge if one or more parameters are entered incorrectly. Both the amount of biological particles present and the starting values of these particles influence track. The approaches necessitate the movement of random numbers from the LMPP to the GMPP; however, this greatly slows down the tracking speed. To summarize, the overall performance of the algorithms listed below is subpar in comparison to other algorithms. The LOM MPPT approach, as well as how to maximize the output power of a PV system while calculating the Lipchitz constant, are discussed in detail. Evolutionary algorithms are often used in the MPPT region of PV arrays and are of particular interest to academics because of their ability to deal with nonlinear difficulties in a straightforward manner. The new LOM MPPT technique is compared to two well-known, high-performance evolutionary algorithms: the modified PSO (M-PSO) algorithm and the modified firefly optimization. Simulations and experiments are used to compare the two techniques (M-firefly). The LOM MPPT approach, as well as how to maximize the output power of a PV system while calculating the Lipchitz constant, are discussed in detail. Evolutionary algorithms are often used in the MPPT region of PV arrays and are of particular interest to academics because of their ability to deal with nonlinear difficulties in a straightforward manner. The new LOM MPPT technique is compared to two well-known, high-performance evolutionary algorithms: the modified PSO (M-PSO) algorithm and the modified firefly optimization. Simulations and experiments are used to compare the two techniques (M-firefly). The remaining sections are laid out in the following manner. Section II discusses the characteristics of a LOM Optimization Algorithm and how it might be used. The operating premise of the LOM MPPT algorithm, which has been proposed, is also explained. The topological structure of the FBBIC Converter is depicted in Section III. The novel method is then tested and compared to two current popular MPPT algorithms, which are developed through simulations and testing. The results of the computational analysis are reported in Section III. The conclusion of the document brings the paper to a close. System Simulation is a term used to describe the process of simulating a system. In 201, Premkumar and sowmya [10] published an efficient global optimization methodology based on the Lipschitz constant that can produce faster rates of convergence on globally smooth problems than previously known methods that rely solely on the function's local smoothness. It works well and has been proved to be faster than a pure random search approach in theory.

If a Lipchitz function f (x), x X, fulfils the Lipchitz condition f (xi)-fmin(x0) k xi-x0 for all xi X, the call k is the Lipchitz constant. The Lipchitz constant k is the function's maximum possible slope, and x0 is the x value that minimizes the function's value. The Lipchitz condition k can be used to calculate the function's upper bound during optimization. There are two upper bound curves at each point x since the Lipchitz criterion includes absolute value symbols. For all possible x values, the LOM global optimization method seeks the maximum value of an unknown function f (x).

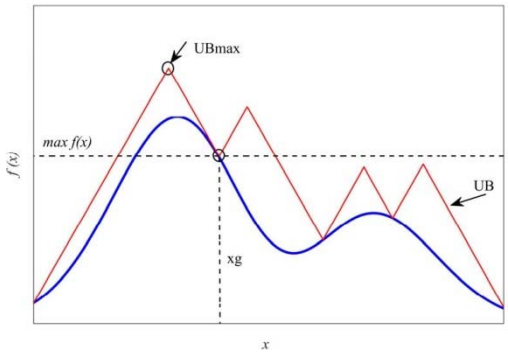

Fig.2 LOM algorithm – an introduction

3) For each iteration, update the best evaluation value max f (x) that has been obtained so far, and then search for a new x until the number of iteration times n equals the maximum number of iterations.

The greatest value max f (x) and the corresponding variable g, which represents the ideal value of the function being evaluated, should be printed out when each iteration is completed.

A. Local Optimum Mapping-Based MPPT Algorithm (also known as MPPT-LOM)

The maximum power point tracking (MPPT) of a PV system is, at its heart, a problem of global optimization. The LOM algorithm is a novel and effective method of tracking the GMPP of a PV system by use of global optimization. It is proposed in this paper that the LOM be used to implement an MTTP algorithm. As part of this investigation, a PV system with an FBBIC converter is used to test the LOM-based MPPT approach. These converters are capable of tracking the MPP of a PV array at all times, regardless of how much sunlight strikes the array, how hot it is, or how much load is attached. A resistive load is utilised to absorb the power that is transferred from the PV system to the boost converter for the sake of this inquiry, rather than an actual inverter, which would be more appropriate. This helps to make the experimental setup as minimal as possible. The maximum power point (MPP) of the PV system can be determined by monitoring the duty cycle of the switch that controls the boost converter.

Algorithm:

LOM (N, K, X)

1. Inputs: Lipschitz total iteration times N, constant K and input space X.
2. During Initialization : find the function value, upper bound at x_{min} curves and max f(x)
3. Iterations:

While$n<N$

Selectarandom$x$inthespace$X$.

Ifupperbound(x)> max f (x) ThenCalculate f(x)andupdatemax$f$(x).

Calculatetheupperboundcurvesatthepoint$x$.

Endif

EndWhile

4. Output:max$f$(x).

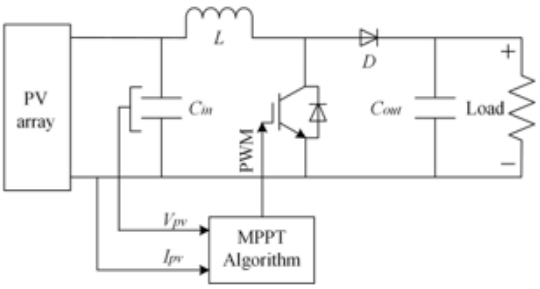

Fig.3 MPPT based PV System

III.THE TOPOLOGY STRUCTURE OF THE FBBIC CONVERTER

For this study's MPPT and DC booster management of PV arrays, the FBBIC converter design is used due to the demand for a high-power, high-ratio converter by the PVDC boost collecting system. Illustration of the topological structure can be found in Figure 1. In Figure 1, L represents the boost inductor, S1–S4 represents the full-bridge circuit, Cs1–Cs4 represents the junction capacitance of the switches, Lr represents the transformer's equivalent leakage inductance, and C0 represents the output capacitor. The timing scheme and critical waveforms of the converter are illustrated in Figure 2. Using the leakage inductance of the transformer as a source of power, Sc and Cc form an active-clamp circuit that can be used to control the peak voltage at both ends of switches generated by the leakage inductance of the transformer, achieve zero-voltage switching (ZVS), and minimise switching loss. There is a 180-degree phase difference between the driving pulses S1, S4, and S2, S3 and between the driving pulses S1, S4. In normal functioning, the duty cycle range is between 0 and 100%. (0.5,1). Upon turning off all four switches S1-S4, the energy stored in the inductor L Boost is trapped inside the loop, resulting in a huge peak voltage at both ends of the switch circuit.

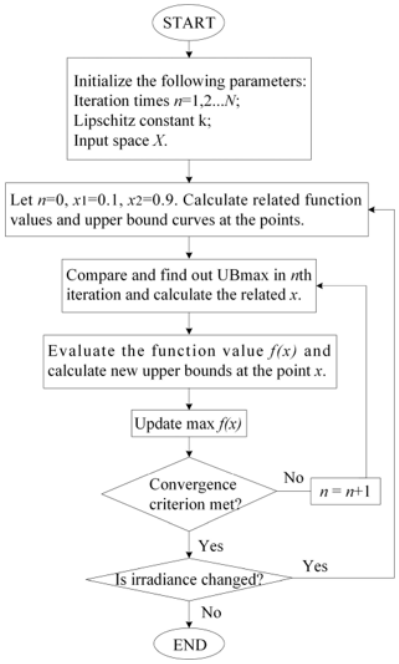

Fig.4 LOM Flowchart

In the initial phase (t1), all four switches, S1-S4, are turned on, putting the circuit into boost mode. Furthermore, the inductor current grows linearly with a slope equal to Vin/LBoost as the inductor current increases. The output voltage is provided by the capacitor C0.

Disconnect the S2, S3 switches on Stage 2 (t1-t2) from the rest of the stage (t1-t2). The active clamp switch Sc is still deactivated at the time of writing. The clamp capacitor Cc receives a portion of the inductor current from the body diode of the Sc. It is possible to minimise the peak voltage in the presence of leaky inductance.

In the presence of the active clamp switch Sc's body diode and due to its conduction, the voltage at both ends of the switch S is about zero at the second time step. The S is triggered by pressing the ZVS key on the keyboard. After that, the clamp capacitor and the stored energy of the inductor current are connected to the load. The leakage current of the transformer has now surpassed the leakage current of the input inductor.

The active clamp switch Sc is disengaged at the end of stage four (t4-t5). Because the transformer leakage current exceeds the input inductor current, the excess current flows to the junction capacitances of S2 and S3, as well as to the junction capacitance charge, as shown in the diagram. When the leakage current of the transformer equals the current of the input inductor, the body diodes S2, S3 are activated to provide protection.

The body diode is triggered in the fifth stage (t5-t6) in order to generate ZVS for the switches S2, S3, and S4. Because all of the switches S1-S4 are turned on at the same time, the circuit will operate in Boost mode for the time being.
It is after t6 that the circuit begins the second phase of its cycle, which corresponds to Stages 1 through 5.

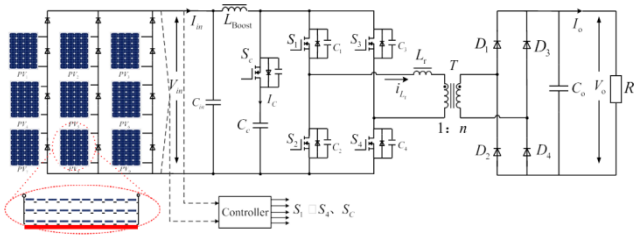

Fig.5 Proposed Converter with PV as Input

IV RESULTS

The model of the LOM-based FBBIC converter for an updated solar system is partially shadowed conditions and was done using the MATLAB 2019B software.
The output power of the converter with and without the LOM algorithm is clearly depicted in Figure 6, which is easy to understand. With or without the LOM method, there are huge variations in output power as well as abrupt rising and falling edges in output power when partial shading is in effect.

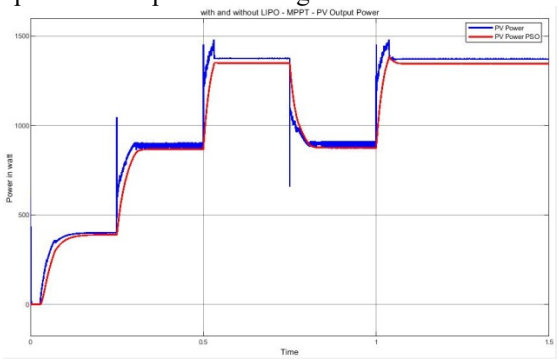

Fig.6 with and without LOM

In fig.7 depicts the irradiance variation in a photovoltaic system for simulating results in partial shadowed conditions by adjusting the irradiance.

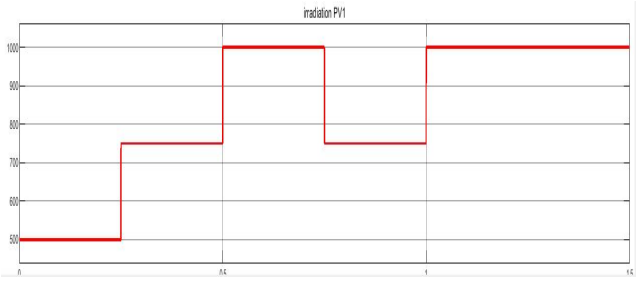

Fig.7 Irradiance

In fig.8 displays the output voltage and current of the FBBIC converter. The output voltage fluctuates in response to changes in irradiance. The current will fluctuate somewhat in response to changes in irradiance.

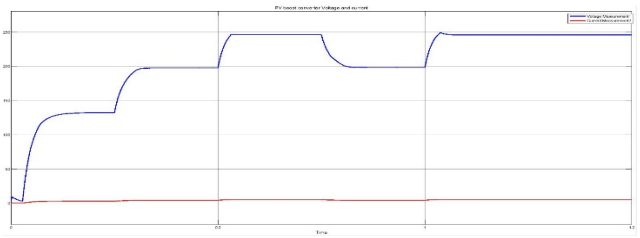

Fig.8 FBBIC Converter Voltage and Current

Fig.9 shows the photovoltaic panel voltage vs photovoltaic power

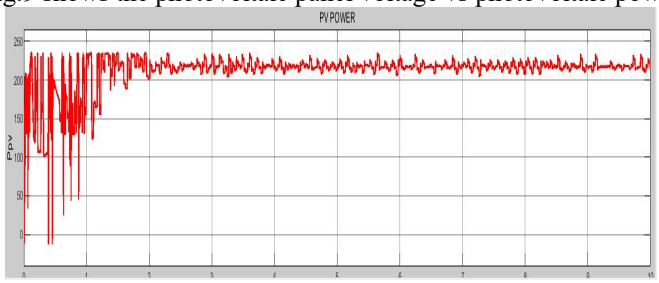

Fig.9 PV Voltage Vs PV Power

It displays the output current and voltage of the FBBIC converter. The output voltage fluctuates in response to changes in irradiance. The current will fluctuate somewhat in response to changes in irradiance.

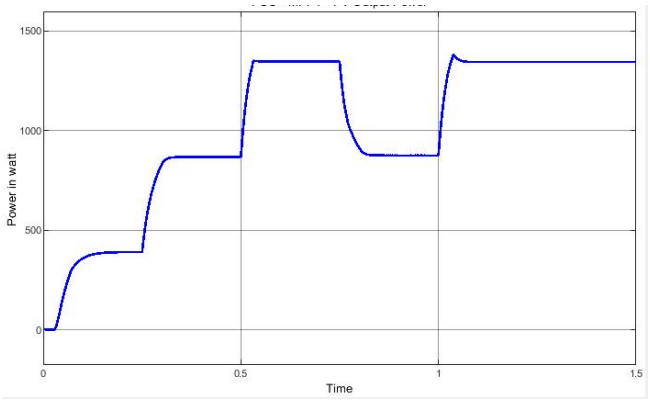

Fig.10 MPPT PV Output Power

In comparison to traditional and other algorithms, the simulation results reveal that the LOM-based MPPT algorithm has a greater efficiency and tracking speed. Under partial shading, the suggested LOM-based MPPT algorithm performs exceptionally well.

V CONCLUSION

This study presents a new LOM MPPT algorithm that performs exceptionally well under partial shadowed situations. The operational principle of the proposed LOM MPPT algorithm is provided, as well as the output characteristics of the PV array under partial shadowed situations. MATLAB was used to simulate the LOM MPPT method, which was implemented in the FBBIC converter. The Lipschitz constant is a crucial parameter in the LOM MPPT algorithm, and the paper explains how to calculate it. The proposed method has good dynamic performance and can monitor the GMPP under a variety of partial shaded conditions. The M-PSO and M-firefly algorithms were chosen for comparison and performance testing through simulations and experiments.

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Enhanced Energy Efficient Clustering Protocol - PSO

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ABSTRACT:

Numerous ways have been proposed in the past for dealing with node energy issues, focusing on developing effective energy management systems. Sensor clustering is a common strategy for dealing with network energy restrictions. EEECP-PSO, short for improved energy-efficient clustering protocol, is a new idea for enhancing network longevity while also enhancing overall system performance. The proposed methodology uses particle swarm optimization to choose the cluster head and relay nodes. The most ideal node for the cluster head is selected using a fitness function based on particle swarm optimization that takes into consideration the energy ratio (initial and residual energy) of nodes, the distance between nodes and the cluster head, and the node degree. According to the proposed method, relay nodes for the multi-hop data transmission to the base station are designated using fitness values derived from cluster head residual energy and distance from base station characteristics. Furthermore, EEECP-PSO is appropriate for networks with a long life span since it minimises node energy consumption by increasing clustering structure. The EEECP-PSO beats the present technique in terms of performance assessment outcomes, according to the evaluation.

Keywords: Wireless Sensor Network, Clustering Protocol, EEECP - PSO, PSO algorithm, Residual Energy, Multi-Hop

I INTRODUCTION:

More and more industries are benefitting from the Internet of Things (IoT). When it comes to industrial control, environmental monitoring, military surveillance, and intelligent transportation systems (ITS), wireless sensor networks (WSNs) have shown to be a useful tool.[1] In a two-tier WSN, sensor nodes are divided into numerous clusters. Each cluster has a cluster leader, who serves as a point of contact for all members of the cluster (CH). All sensor nodes collect local data and transmit it to the relevant CH. CHS then collects and normalises its own local data for transmission either directly or through other CHS to the base station (BS). The capabilities of a WSN cluster. Clustering sensor nodes has the following advantages:

Data may be aggregated at the cluster head, enabling duplicate and uncorrelated data to be eliminated, which saves sensor node resources.

It is easier to manage routing since only CHs are responsible for maintaining the local route configuration of other CHs. This results in less routing information being required, which increases the scalability of the network.

When sensors only interact with their CHs, there is no need for the exchange of duplicate messages.

The Wireless Sensor Network has seen a major advancement, however there are several current technologies that need to be changed, such as the fact that the sensor's battery life is solely dependent on that battery. Because of environmental limits, it is difficult to replace these batteries. A key difficulty in wireless sensor networks (WSNs) is to prolong the network's lifespan. It also has an effect on later network operations such as data aggregation and route discovery, where it prepares the network for operation [2] because of the WSN's insufficient clustering structure. The FCM method performs poorly on data sets having clusters of varying sizes or densities, and it is susceptible to noise and outliers, according to earlier studies. We came up with EEECP-PSO as a solution to these issues since it can handle cost functions with several local minima while avoiding the overlapping and mutation calculations of the PSO method. For its search space, this algorithm can switch between global and local searches with ease.

II RELATED WORK:

The lifespan of a network may be increased to some extent by using various routing techniques. According to a typical aggregate, the employment of essentialness harvesting methods reduces the energy consumption of one sensor node [3]. Solar-powered sensor nodes may be powered using a variety of routing algorithms, including sLEACH, A-sLEACH, IS-LEACH, modified s-LEACH, and more. Real-time data based on sunlight is missing from the LEACH [4, 5], advanced LEACH [6, 7], and IS-LEACH [8]. Since sunlight-based voltage and current accounting for sun-based power are taken into account in updated Sun Aware LEACH [7], real-time sun-oriented data is taken into account in this version. When it comes to the environment, the weather conditions prediction site is there to keep us updated. UV-list data may be found in the weather forecast, as well. Using these hourly UV indexes, the author computed the sun-oriented power in the LEACH method [8]. A wind energy-based wLEACH has been proposed to take use of various harvesting sources [9]. A wind turbine's output is determined by the current wind speed and direction. Using hybrid collecting sources like solar and wind energy, the network's lifespan may be prolonged. The HEH-LEACH sensor nodes are powered by both solar and wind energy, depending on their availability, in [10]. With this, the network's lifespan is extended while using less energy. Using balanced and static clusters, random node deployment concerns may be overcome.

TACAA [11] uses a modified FCM algorithm to re-arrange the degrees of belonging of the nodes. Using the number of rounds as a criteria is a waste of time. A new Energy Efficient Centroid Ground Routing Protocol (EECRP) [15] for WSN-supported IoT has been suggested by Shen and colleagues. When determining the centroid's location, EECRP takes into consideration the nodes' residual energy in particular. GEEC, LEACH, and LEACH-C were shown to have lower values than EECRP. EECRP is also suitable for networks that need a long period of time and whose base station (BS) is located inside the network.

OCM–FCM [12] was suggested to enhance the cluster organisation. A mathematical approach for determining the number of clusters is given based on the examination of node energy consumption models. Clusters are formed using an improved version of the FCM method. Unbalanced energy consumption by nodes might have a negative impact on a network's lifespan if sensors are randomly deployed, as is the case with FCM. A modified mathematical approach based on an evaluation of the energy consumption model for multi-hop communications and overlapping clusters is used to determine the appropriate number of clusters. A modified fuzzy C-means method (MFC) [13] was used to create balanced clusters. CH selection and rotation algorithm (CHSRA) is proposed as a combination of the back-off time mechanism for CH selection and a novel rotation mechanism for CH rotation across cluster members. Incorporating cluster overlap and multi-hop communication into a modified mathematical model for determining the optimal number of clusters. Balanced clusters may be formed by using an improved version of the fuzzy C-means method (M-FCM), which is the result of merging the FCM algorithm with a centralised mechanism. In a new algorithm known as the CH selection and rotation model, energy overhead from the CH selection process is reduced by new integration of the back-off timing mechanism for CH selection and the rotation mechanism (CHSRA), Setting a new goal function for the back-off mechanism and a new dynamic threshold for balancing the distance between CHs in the network and the life expectancy of chosen CHs in the cluster The lifespan of a network may be increased to some extent by using various routing techniques. According to a typical aggregate, the employment of essentialness harvesting methods reduces the energy consumption of one sensor node [3]. Solar-powered sensor nodes may be powered using a variety of routing algorithms, including sLEACH, A-sLEACH, IS-LEACH, modified s-LEACH, and more. Real-time data based on sunlight is missing from the LEACH [4, 5], advanced LEACH [6, 7], and IS-LEACH [8]. Since sunlight-based voltage and current accounting for sun-based power are taken into account in updated Sun Aware LEACH [7], real-time sun-oriented data is taken into account in this version. When it comes to the environment, the weather conditions prediction site is there to keep us updated. UV-list data may be found in the weather forecast, as well. Using these hourly UV indexes, the author computed the sun-oriented power in the LEACH method [8]. A wind energy-based wLEACH has been proposed to take use of various harvesting sources [9]. A wind turbine's output is determined by the current wind speed and direction. Using hybrid collecting sources like solar and wind energy, the network's lifespan may be prolonged. The HEH-LEACH sensor nodes are powered by both solar and wind energy, depending on their availability, in [10]. With this, the network's lifespan is extended while using less energy. Using balanced and static clusters, random node deployment concerns may be overcome.

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III PROPOSED METHODOLOGY:

Minimum transmission is preferred over direct transmission as shown in Table 1.

Direct Transmission	Minimum Transmission
The amount of energy used can be modeled by this formula: $Eamp = k(3d1 + d2)^2$	The amount of energy used: $Eamp=k(3d1^2 + d2^2)$

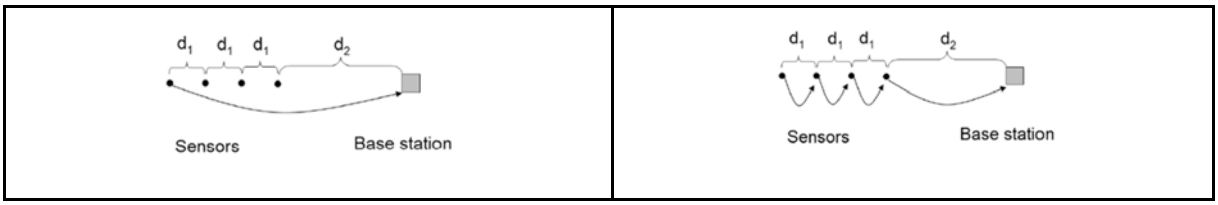

Table 1: Direct vs Minimum Transmission

A. CH SELECTION:

- Using the PSO method, the CH and relay nodes in this network are chosen.
- When the cluster head is chosen, this is what it looks like:
- using the fitness feature based on PSO
- The distance between the cluster head and the nodes
-
- An improved energy-efficient clustering protocol particle swarm optimization (EEECP-PSO) is presented to increase network life and performance.
- The proposed protocol uses the particle swarm optimization approach to identify the network's cluster head and relay nodes.
- Nodes' energy ratios (initial and residual) are taken into account as well as the distance between nodes and the cluster head in order to determine which node is best suited to be the cluster head. Node degree is also taken into consideration.
- This paper proposes an Enhanced Energy-efficient Clustering Protocol (EEECP-PSO) for WSN-based IoT devices in order to overcome the aforementioned issues.
- The energy consumption of the CHs is more evenly distributed, resulting in a longer network lifespan. For routing and clustering, a fitness function and an efficient particle encoding system were developed separately.

B. PSO ALGORITHM:

- Using the PSO method, the CH and relay nodes in this network are chosen.
- When the cluster head is chosen, this is what it looks like:
- using the fitness feature based on PSO
- The distance between the cluster head and the nodes
- An improved energy-efficient clustering protocol particle swarm optimization (EEECP-PSO) is presented to increase network life and performance.
- The proposed protocol uses the particle swarm optimization approach to identify the network's cluster head and relay nodes.
- Nodes' energy ratios (initial and residual) are taken into account as well as the distance between nodes and the cluster head in order to determine which node is best suited to be the cluster head. Node degree is also taken into consideration.
- This paper proposes an Enhanced Energy-efficient Clustering Protocol (EEECP-PSO) for WSN-based IoT devices in order to overcome the aforementioned issues.
- The energy consumption of the CHs is more evenly distributed, resulting in a longer network lifespan. For routing and clustering, a fitness function and an efficient particle encoding system were developed separately.

$$V_{i,d}(t) = w \times V_{i,d}(t-1) + c_1 \times r_1 \times (Xpbest_{i,d} - X_{i,d}(t-1)) + c_2 \times r_2 \times (Xgbest_d - X_{i,d}(t-1)) \; ; \qquad X_{i,d}(t) = X_{i,d}(t-1) + V_{i,d}(t)$$

where w is the inertial weight, c1 and c2 are two non-negative constants called acceleration factor and r1 and r2 are two different uniformly distributed random numbers in the range [0,1].

- The update process is iteratively repeated until either an acceptable Gbest is achieved or a fixed number of iterations tmax is reached.
- The various steps of a PSO are depicted in the flowchart.

C. ALGORITHM:

Proposed algorithm of the system is written down.

For each particle
    Initialize particle with feasible random number
End
Do
    For each particle
        Calculate the fitness value
        If the fitness value is better than the best fitness value (**pbest**) in history
        Set current value as the new **pbest**
    End
Choose the particle with the best fitness value of all the particles as the **gbest**
    For each particle
        Calculate particle velocity according to velocity update equation
Update particle position according to position update equation
End
While maximum iterations or minimum error criteria is not attained

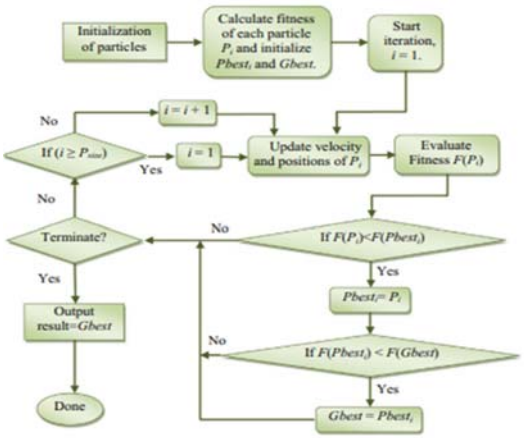

Fig 1: Flowchart of EEECP-PSO

The flowchart of the proposed algorithm is displayed in Fig 1. It showcases the execution of the PSO (Particle Swarm Optimization) algorithm for the proposed EEECP-PSOprotocol.

IV RESULTS AND DISCUSSION:

MATLAB implementation of the suggested protocol is shown in this section. Using a WSN with randomly placed nodes in a 100mX100m simulated region, the suggested protocol works. 150mX50m is the size of the base station's footprint beyond the network's coverage region.

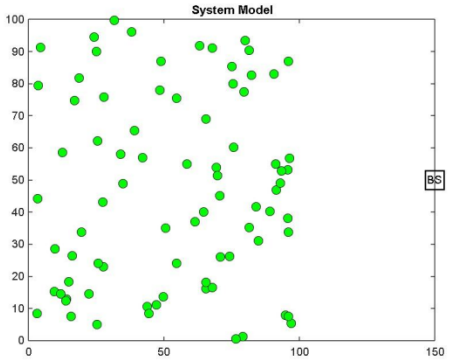

Fig 2: System model

On a WSN with 80 randomly distributed nodes in a 100X100m simulated region, the suggested protocol works well. The base station is 150X50m away from the network.

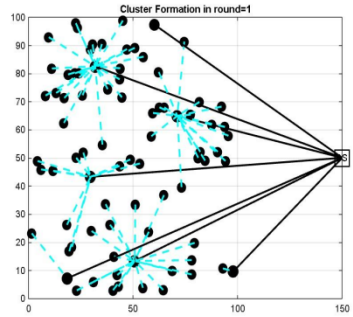

Fig 3: Cluster formation in Round 1

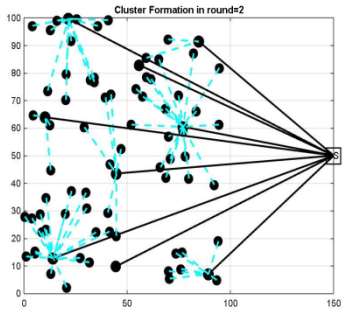

Fig 4: Cluster formation in Round 2

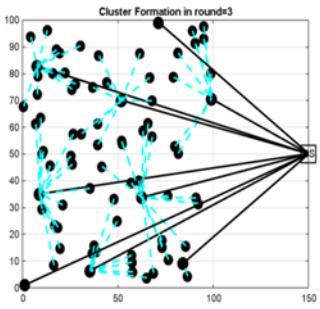

Fig 5: Cluster formation in Round 3

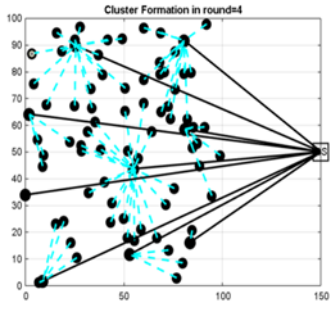

Fig 6: Cluster formation in Round 4

Nodes are randomly oriented, cluster heads form, linkages to the base station (BS) are shown in Figures 3, 4, 5, and 6, respectively, for Rounds 1, 2, 3, and 4. .

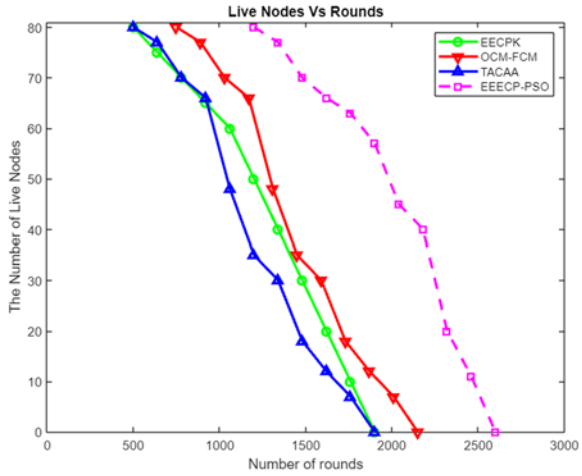

Fig 7: Live Nodes vs Rounds

PROTOCOL	FND	LND
EECPK	500	1900
TACAA	520	1950
OCM-FCM	750	2150
EEECP-PSO	1200	2600

Table 2: Comparison of different protocols on the basis of FND and LND

For 3000 rounds, the line graph in Fig 7 compares the current protocols (EECP-PSO) with the proposed protocol (EECP-PSO) in terms of the number of live nodes. With the suggested protocol, nodes will be active for a longer period of time than with other alternatives. The first node to die (FND) and the last node to die (LND) are two of the most important metrics used to evaluate the network's lifespan (LND). Table 2 compares the LND and FND of several methods in light of this situation. EECPK[14], TACAA, OCM-FCM, and EEECP-PSO protocols are compared in this study. The FND of EECPK, TACAA, and OCM-FCM happens sooner than our suggested protocol, and as a result, their performance is worse than that of EEECP-PSO in comparison. OCM-LND FCM's is superior to those of EECPK and TACAA. In comparison to OCM-FCM, LND happens during the 2600th round in the proposed protocol.

Fig. 8 shows the energy usage for the protocols (EEECP-PSO, TACAA, OCM-FCM, and EECPK) while choosing the channel head with the least, average, and maximum accuracy. In comparison to the current protocols, the EEECP-PSO consumes 0.9 joules of energy with maximum precision and 0.42 joules with least accuracy (TACAA, OCM-FCM, EECPK). Figure 9 shows the residual energy in the network after 2000 cycles. For the protocol EEECP-PSO, a proposed PSO algorithm surpassed the FCM method in terms of energy consumption efficiency.

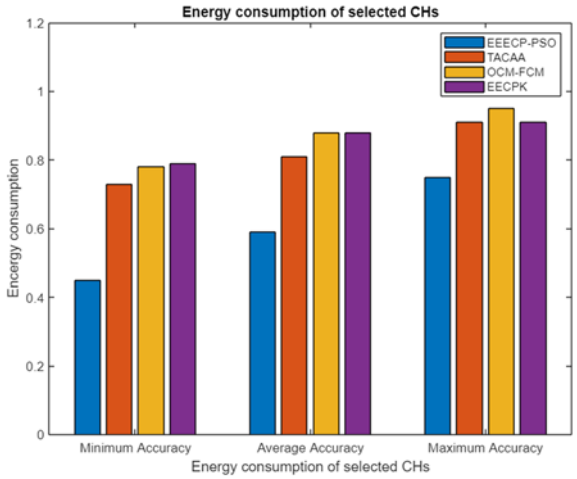

Fig 8: Energy consumption of selected channel heads

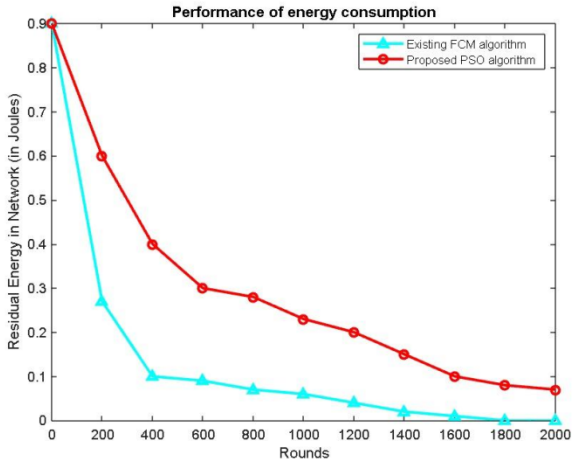

Fig 9: Performance of energy consumption

V CONCLUSION:

Since WSNs are used in many aspects of everyday life, our proposed protocol will be a vital addition to the IoT world. If you use the PSO algorithm with overlapping clusters, you may look at the network's energy usage to figure out how many clusters to use depending on how far they are from the central hub. For WSN-based IoT networks with clustering structure difficulties that detract from protocol performance, we propose an improved energy-efficient clustering protocol (EEECP-PSO). Nodes' energy consumption is reduced and balanced thanks to the recommended technique's optimization of the clustering structure. EEECP-PSO is thus suggested in networks with a longer expected lifetime. Overall, the EEECP-PSO outperforms the current protocols.

VI FUTURE SCOPE:

In the future, it may be possible to construct multihop routing among the CH nodes to increase energy efficiency and inter-cluster connectivity for relaying information to BS. Data aggregation may be used to increase the efficiency of data collection. A mix of FCM and PSO algorithms may also be used to boost the network's efficiency with this protocol.

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Prediction of Heavy Metal Content Present in Soil

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Abstract
Heading concerns that are spotted at the right time may save time and money in the long run. The gadget picks up vibrations in order to avoid the real association. Using a non-contact motion selector, researchers were able to get vibration data for use in monitoring joint health. Using a Hilbert modification, the sign has been determined more accurately. It was decided to utilise Principal Component Analysis to reduce the number of data types and then apply Sequential Floating Forward Selection to arrange the chosen highlights according to their importance in order to get the most accurate list of features. The distinct load faults based on these selected highlights are determined using Artificial Neural Networks (ANN) and Support Vector Machines (SVM). SVM and ANN have been extensively studied for their utility. Vibration data collected under comparable conditions and signal data generated from an industrially made, no-contact detector show a significant difference. It seems that the established NCS's matching accuracy with the multiple detectors mentioned in the study was effective. Automated identification of device defects might be used to aid in the early detection of unwanted and impulsive foundation closures due to the direction of travel.

Keywords. SVM, ANN, Bearings, Comparison graph.

1. INTRODUCTION

1.1. *Bearing*
A direction is a component of a machine that decreases grating by directing materials to travel in a certain direction. It's possible that the bearing's structure is unique, for instance, allow unrestricted in one direction development anticipation or the movable part of complimentary turn in the vicinity of correct portal; alternatively it may preventing mobility restricting the desired points of common powers that bear on moving the components. By reducing erosion, most heads perform at their best. After sorting by kind of movement, it is necessary to keep the gears from being destroyed by overuse by alphabetizing them.

Rotational orientation is used to hold poles and rods within a metal substructure, and hub and outspread loads are transferred from the pile's wellspring to the structure that supports them. The simple gear is the simplest form of gear, consisting of a pillar spinning in aperture. To avoid grating, grease is utilised. Metal ball and roller bearings may benefit from the use of moving components like as Tracks or spheres having a round division are examples of this situated in the middle of the gear assembly's contests or journals. With a wide number of gear configurations available, the program's needs may be met.

One of the most common types of device components, known as a bearing, is a mechanism that allows one part to move another. It's the least complicated to cut or mould mechanical elements into segments that vary in command level in contrast to the outside of the vehicle. Isolated devices put into a machine part are known as different orientations.

1.2 *CNN*
As an example of how grating might be reduced, consider the use of a machine component called a "direction." Perhaps the bearing structure is unique enough to allow for unrestricted development in one direction or to allow the movable part of complimentary turn to be moved near the correct portal; alternatively, it may prevent mobility by limiting the desired points of common powers that bear on moving components. Erosion is reduced in most heads, allowing for the finest possible flow. Motions must be limited in order to avoid damaging gears and other components. The categories are organised alphabetically based on the kind of movements that are authorised.

Rotational orientation is used to hold poles and rods within a metal substructure, and hub and outspread loads are transferred from the pile's wellspring to the structure that supports them.. This is the simplest kind of gear, and it's made up of only one pillar that spins in an aperture. Grease is applied on the grate to avoid it. Metal ball and roller bearings' sliding contact may be reduced by using moving components like as This may be seen in the centre of the gear assembly's contests or journals in the form of a track or sphere with a round division. There is a wide choice of gear arrangements to suit the program's needs for the maximum level of solidity.

"Bearing" is a noun derived from the verb "to bear," and it refers to an element of a mechanism that allows one part to convey another. Cutting or shaping mechanical elements into segments, with different degrees of command in

relation to the structure, figure, bumpiness, and area of the outside is the simplest heading. Different orientations refer to the placement of separate devices in a machine component.

1.3. *SVM*

In order to recognise patterns and identify relapses, support-vector machines utilise knowledge computations to describe AI. Using the factual knowledge structures or hypotheses proposed by Vladimir Vapnik and colleagues at AT&T Bell Laboratories in 1974 and Vapnik and Chervonenkis (1974) in 1974, SVMs were developed at AT&T Bell Laboratories. Non-probabilistic straight predictor: An SVM is creating a system that distributes new guided to one of two possibilities, and it becomes non-probabilistic. In order to enlarge the gap between the two groups, an SVM map generates suggestions for focusing on available space. It is expected that new models will be developed in this similar region and assigned a classification based on their placement within that space.

Additionally, SVMs may be able to use some clever trickery in order to construct a curved grouping, properly arranging their inputs to the rising portion sections.

Unlabeled data makes guided learning impossible, thus an unaided learning technique is required, including the hunting down of regular groups of data to assembly and the mapping of the most recent data to these structured groupings. This method is called unguided learning. Assist vector grouping calculation was created by Vladimir Vapnik and Hava Siegelmann using the value of assist vectors obtained in the vector devices computation. Currently, it is quite likely to be the most extensively utilised bunching approach.

2. RELARED WORK

Gee is built with the help of the Markov chain. The observed event is imbalanced in comparison to the state, yet there is a great deal of probability dispersion between them since the actual situation is more complex than the Markov chain model's representation; this kind is known as HMM. Markov anchors and generic irregular cycles are utilised to depict progress between states and the true linkages between conditions and observable components in this two-way random interaction. Preliminary calculations on the basis of the stowed away boundaries may be made using hereditary elements. With the flexible border change approach, it is possible to overcome the difficulty of the border learn analysis of stowed away Markov chains merging into ideal groups. Under different circumstances, the deficiency detection tests are carried out. HMM receives the blended space highlight set after aspect reduction. Efforts to eradicate the disease are broken down into search and combination speed components. Preliminary findings demonstrate that the proposed method's conclusion precision for typical, inner and exterior ring disappointment, and roller disappointment is accurate. While using PSO augmented HMM.

According to Adam Glowacz et al., The research shows bearing and rotor issue suggesting approaches for a one-stage acceptance engine. Acoustic indicators are used in the new methods. We looked at five different single-stage enlistment engines, each with its own unique set of issues: a sound engine, an engine with a broken rotor bar and a defective squirrel-confine ring, an engine with shorted helper winding and principle twisting, an engine with a shorted assistant twisting curl, and an engine with a defective bearing. The acoustic sign highlight extraction method SMOFS-22 was put to the test. It was used to extract the acoustic components of a signal. In order to organise the data, the NN (Nearest Neighbor) classifier was utilised. The recommended technique was quite successful in discovering the bearing and rotor defects in the single-stage enlistment engine. Shortfall conclusion in pivoting devices may be sought for using the approach described.

In this study, the author demonstrated how to identify bearing and rotor problems in the single-stage acceptance engine. Acoustic indicators were used in the proposed procedure. Engines with shorted helper winding and principal twisting loops, engines with shorted curls of assistant twisting, engines with a broken spindle shaft and faulty squirrel-confine round, and engines with a defective gear were examined by the designer. The SMOFS-22 was used to extract acoustic sign components. Arranging was done using the NN classification. Excellent outcomes were achieved using the method that was tried. Deficiency demonstrative view points were straightforward to get by. The bare minimum cost of the receiver and PC is around $300. Another $100–$300 is needed to buy a high-end voice recorder. The evaluation of acoustic signs is also fast and inconspicuous. Using acoustic signals, we are able to conduct symptomatic audits and repair procedures. Early detection of electrical and mechanical defects in pivoting machines may be aided by the suggested signal processing approaches. The acoustic indicators of recent techniques have the issue of being combined into one (for example reflections, waves covering). Warm, In the future, we'll look at how spinning gadgets affect noise levels in order to put our theories to the test. The functioning limits of engines will be breached, according to several claims. Industry and electric cars will benefit from the development, implementation, and use of more reliable shortfall indicator approaches.

According to Min Xia, Teng Li and Tongxin Shu et al. Today's hardware often disappoints because of problems with orientation. In order to save overall costs and avoid unnecessary personal time and even setbacks, it is essential to make an educated guess about which direction to go in order to determine the remaining usable life of an optimum

support system (RUL). Relying mainly on manual component extraction and determination based on human competence, RUL expectation approaches. Deep neural networks are used in this study to develop a new, automated, two-stage approach for estimating the RUL of orientation (DNNs). Auto Encoder-based DNN is used to characterise the data. To have a better sense of the direction in which the corruption is headed. Prepare the DNN to distinguish delegate highlights from the crude sign. Each stage of health has its own relapse model based on superficial neuronal structure. The most current RUL result is obtained by combining the relapse data from several models. A bearing debasement dataset with a wide range of operating conditions was able to meet the expectations of the proposed method.

Using DNN-based bearing RUL forecasting, this research created a two-stage forecasting process. In the main stage, the corruption encounter was split into several degrees of health. A DNN-based health stage classifier was built and introduced using a stacked auto encoder. Using the crude vibration indication of the tested course, a deep organisation was built without the need for laborious element extraction. The quantity of wellness stages was chosen by a framework search via the development of the arrangement discoveries. It was made possible for information to fit into each of the well-being levels when the stage's wellbeing classifier was created. At each level of debasement, a replica of a superficial neuronal structure was developed, and the RUL evaluation was able to be performed in the middle of the road. There was a smoothing activity at this point that focused on the probabilities that resulted from stage one's events as well as those that resulted from stage two's events. The debasement was put to the test under a variety of operational conditions to get the test approval. An sufficient RUL expectation execution might be achieved even with a very little quantity of accessible information, as shown by the findings of the study The suggested technique achieved more accurate expectations, especially in the latter stages of corruption, compared to using across the whole debasement process, there is only one model. Precision RUL predictions of orientation under various operating conditions may help with maintenance decision-making.

We've heard from Jin Chen, Guangming Dong and others. Condition checking and deficiency detecting frameworks should be built up to avoid unexpected breakage during activity because of the substantial role moving component orientation play in turning machines. The time, recurrence, and time–recurrence areas are often used to monitor the status of bearings or other equipment. The "scourge of dimensionality" may be avoided by using an NCA-based component extraction (FE) technique presented in this paper. In addition, a CHMM-based analysis of bearing or equipment failures is used to examine multi-channel data. Both the shortfall conclusion and the problem seriousness arrangement are supported by two contextual evaluations. The NCA-CHMM, as advised, is capable of removing unnecessary data, integrating information from several sources, and generating more accurate conclusions.

It's been common practise to use information from NCA and CHMM for shortfall analysis. Numerous records may be used to monitor the status of bearings or other equipment. The NCA-based FE approach is introduced in order to reduce the three-dimensional character of the initial components and concentrate useful information. In addition, a CHMM database may be constructed by each state using the pieces separated by NCA. These CHMMs are ready to be ordered for new testing. NCA-ability CHMM's to identify specific bearing issues was shown by the results of the first assessment. The early initial weakness in bearing is difficult to recognise and analyse in the future assessment. When it comes to understanding the solid, early problem, debased, and disappointed phases of orientation, the NCA-CHMM method does an excellent job. The suggested method outperforms current strategies in both of the analyses. The suggested NCA-CHMM technique is capable of integrating multichannel data and developing a more accurate conclusion following bearing or machine failure.

Rafael Pomorski Linessio, Kleiton de Morais Sousa, and others have all provided suggestions. An accelerometer is used to measure the movement of a fibre optic in three-part induction machines, as well as its installation, depiction, alignment, and assessment. It is common for optical sensors to employ fibre Bragg gratings (FBGs) in general, to measure the flow of an inertial mass. When the effect hammer was employed to estimate the sensor portrayal, it allowed vibrations to be verified as being normal in both delicate methods. Positive 747.5 Hz and positive 757.5 Hz sides of the x- and y-hubs were examined individually. An electromagnetic exciter was used to tune a guided vowel activation at various intervals. An SNR greater than 30 dB was observed for sensitive joints and an influence ability of 100 pm.g-1, based on 33% of the regular occurrence, toward each route. Testing was designed with the primary goal of investigating enlistment engines located in vibration monitoring, which may help prevent engine wear, increase productivity and reduce maintenance costs. The optical accelerometer values were compared to those from an active sensor during normal activity and with a screwed up rotor bar working at 75% and 100% stress. We were able to examine the recurrent parts and their modifications using optical sensor testing to look for both normal and hazardous activity. Gee is built with the help of the Markov chain. The observed event is imbalanced in comparison to the state, yet there is a great deal of probability dispersion between them since the actual situation is more complex than the Markov chain model's representation; this kind is known as HMM. Markov anchors and generic irregular cycles are utilised to depict progress between states and the true linkages between conditions and observable components in this

two-way random interaction. Preliminary calculations on the basis of the stowed away boundaries may be made using hereditary elements. With the flexible border change approach, it is possible to overcome the difficulty of the border learn analysis of stowed away Markov chains merging into ideal groups. Under different circumstances, the deficiency detection tests are carried out. HMM receives the blended space highlight set after aspect reduction. Efforts to eradicate the disease are broken down into search and combination speed components. Preliminary findings demonstrate that the proposed method's conclusion precision for typical, inner and exterior ring disappointment, and roller disappointment is accurate. While using PSO augmented HMM.

According to Adam Glowacz et al., The research shows bearing and rotor issue suggesting approaches for a one-stage acceptance engine. Acoustic indicators are used in the new methods. We looked at five different single-stage enlistment engines, each with its own unique set of issues: a sound engine, an engine with a broken rotor bar and a defective squirrel-confine ring, an engine with shorted helper winding and principle twisting, an engine with a shorted assistant twisting curl, and an engine with a defective bearing. The acoustic sign highlight extraction method SMOFS-22 was put to the test. It was used to extract the acoustic components of a signal. In order to organise the data, the NN (Nearest Neighbor) classifier was utilised. The recommended technique was quite successful in discovering the bearing and rotor defects in the single-stage enlistment engine. Shortfall conclusion in pivoting devices may be sought for using the approach described.

In this study, the author demonstrated how to identify bearing and rotor problems in the single-stage acceptance engine. Acoustic indicators were used in the proposed procedure. Engines with shorted helper winding and principal twisting loops, engines with shorted curls of assistant twisting, engines with a broken spindle shaft and faulty squirrel-confine round, and engines with a defective gear were examined by the designer. The SMOFS-22 was used to extract acoustic sign components. Arranging was done using the NN classification. Excellent outcomes were achieved using the method that was tried. Deficiency demonstrative view points were straightforward to get by. The bare minimum cost of the receiver and PC is around $300. Another $100–$300 is needed to buy a high-end voice recorder. The evaluation of acoustic signs is also fast and inconspicuous. Using acoustic signals, we are able to conduct symptomatic audits and repair procedures. Early detection of electrical and mechanical defects in pivoting machines may be aided by the suggested signal processing approaches. The acoustic indicators of recent techniques have the issue of being combined into one (for example reflections, waves covering). Warm, In the future, we'll look at how spinning gadgets affect noise levels in order to put our theories to the test. The functioning limits of engines will be breached, according to several claims. Industry and electric cars will benefit from the development, implementation, and use of more reliable shortfall indicator approaches.

According to Min Xia, Teng Li and Tongxin Shu et al. Today's hardware often disappoints because of problems with orientation. In order to save overall costs and avoid unnecessary personal time and even setbacks, it is essential to make an educated guess about which direction to go in order to determine the remaining usable life of an optimum support system (RUL). Relying mainly on manual component extraction and determination based on human competence, RUL expectation approaches. Deep neural networks are used in this study to develop a new, automated, two-stage approach for estimating the RUL of orientation (DNNs). Auto Encoder-based DNN is used to characterise the data. To have a better sense of the direction in which the corruption is headed. Prepare the DNN to distinguish delegate highlights from the crude sign. Each stage of health has its own relapse model based on superficial neuronal structure. The most current RUL result is obtained by combining the relapse data from several models. A bearing debasement dataset with a wide range of operating conditions was able to meet the expectations of the proposed method.

Using DNN-based bearing RUL forecasting, this research created a two-stage forecasting process. In the main stage, the corruption encounter was split into several degrees of health. A DNN-based health stage classifier was built and introduced using a stacked auto encoder. Using the crude vibration indication of the tested course, a deep organisation was built without the need for laborious element extraction. The quantity of wellness stages was chosen by a framework search via the development of the arrangement discoveries. It was made possible for information to fit into each of the well-being levels when the stage's wellbeing classifier was created. At each level of debasement, a replica of a superficial neuronal structure was developed, and the RUL evaluation was able to be performed in the middle of the road. There was a smoothing activity at this point that focused on the probabilities that resulted from stage one's events as well as those that resulted from stage two's events. The debasement was put to the test under a variety of operational conditions to get the test approval. An sufficient RUL expectation execution might be achieved even with a very little quantity of accessible information, as shown by the findings of the study The suggested technique achieved more accurate expectations, especially in the latter stages of corruption, compared to using across the whole debasement process, there is only one model. Precision RUL predictions of orientation under various operating conditions may help with maintenance decision-making.

We've heard from Jin Chen, Guangming Dong and others. Condition checking and deficiency detecting frameworks should be built up to avoid unexpected breakage during activity because of the substantial role moving component orientation play in turning machines. The time, recurrence, and time–recurrence areas are often used to monitor the status of bearings or other equipment. The "scourge of dimensionality" may be avoided by using an NCA-based component extraction (FE) technique presented in this paper. In addition, a CHMM-based analysis of bearing or equipment failures is used to examine multi-channel data. Both the shortfall conclusion and the problem seriousness arrangement are supported by two contextual evaluations. The NCA-CHMM, as advised, is capable of removing unnecessary data, integrating information from several sources, and generating more accurate conclusions.

It's been common practise to use information from NCA and CHMM for shortfall analysis. Numerous records may be used to monitor the status of bearings or other equipment. The NCA-based FE approach is introduced in order to reduce the three-dimensional character of the initial components and concentrate useful information. In addition, a CHMM database may be constructed by each state using the pieces separated by NCA. These CHMMs are ready to be ordered for new testing. NCA-ability CHMM's to identify specific bearing issues was shown by the results of the first assessment. The early initial weakness in bearing is difficult to recognise and analyse in the future assessment. When it comes to understanding the solid, early problem, debased, and disappointed phases of orientation, the NCA-CHMM method does an excellent job. The suggested method outperforms current strategies in both of the analyses. The suggested NCA-CHMM technique is capable of integrating multichannel data and developing a more accurate conclusion following bearing or machine failure.

Rafael Pomorski Linessio, Kleiton de Morais Sousa, and others have all provided suggestions. An accelerometer is used to measure the movement of a fibre optic in three-part induction machines, as well as its installation, depiction, alignment, and assessment. It is common for optical sensors to employ fibre Bragg gratings (FBGs) in general, to measure the flow of an inertial mass. When the effect hammer was employed to estimate the sensor portrayal, it allowed vibrations to be verified as being normal in both delicate methods. Positive 747.5 Hz and positive 757.5 Hz sides of the x- and y-hubs were examined individually. An electromagnetic exciter was used to tune a guided vowel activation at various intervals. An SNR greater than 30 dB was observed for sensitive joints and an influence ability of 100 pm.g-1, based on 33% of the regular occurrence, toward each route. Testing was designed with the primary goal of investigating enlistment engines located in vibration monitoring, which may help prevent engine wear, increase productivity and reduce maintenance costs. The optical accelerometer values were compared to those from an active sensor during normal activity and with a screwed up rotor bar working at 75% and 100% stress. We were able to examine the recurrent parts and their modifications using optical sensor testing to look for both normal and hazardous activity.

3. PROPOSED SYSTEM

Additionally, studies were carried out on a test system with a variety of gear situations in order to acquire noise information for testing the system. The signals are acquired in both contact and non-contact level and vertical tomahawks estimate tools at a testing repetition of 30 kHz and 12.8 kHz instances for various conditions, both of which use contact and non-contact estimate tools. The average value of measurable boundaries is obtained by performing each test many times. With the use of an Electrical Discharge Device, a wide variety of load-carrying issues, such as Inner Race, Outer Race, and Ball Defect, were developed. Various flaws ranging from 1600 to 2000 rpm in a sequence of rpm, as well as three stacking possibilities, were tested at three separate speeds. Some examples of no-heap weights are 4 kilogrammes and 8 kilogrammes. Calculations were made using the signal from a healthy bearing, which was employed as a yardstick.

Using a test system with a variety of load conditions, noise information was gathered for training and testing purposes. The x and y axis signals are acquired using touch and non-contact measurement devices at a predetermined rate in varied conditions. Each experiment is repeated five times to get the statistical mean. Diverse issues with the gearbox. Signatures were obtained at three-axle speeds ranging from 1600 to 2000 revolutions per minute in rpm increments for a variety of faults. It is possible to have no load or a weight of four kilogrammes or eight kilogrammes. Because the Healthy gears were used as a control, the signal produced under faulty conditions was compared to the Healthy gear and a response was obtained.

4. MODULES

4.1. Testing And Training

Precompiled data from both devices was used to construct a set of noise characteristics for joint problem diagnostics. The review made use of elements and measured bounds for each joint situation, rotor position, and weights applied.

4.2. Feature Extraction

The phrase "include an extraction" applies to the procedure of evaluating a small number of estimations in order to get the information held in the indication in terms of equipment health checking, the indicative errand. It's a question of how examples are shown and how examples are acknowledged, of which the fundamental progression is incorporating an extraction. Observations are being used to derive Average.

4.3. Fault Detection Using SVM And ANN

A cross-breed approach for determining a stream and filling a highlight that takes advantage of a new technique for calculating sequential forward drifting the hunt (SFFS). Sifting a technique evaluates the elements in order to predict the outcome and complement distinct highlights. Cross approval of the help is used to use the collection of rivals obtained by selecting a method With a client-defined order, SVM classifiers with ranging from various tasks, such as Linear, Square, Cubic, and Gaussian, were applied using isolated and selected features generated from both basic and enclosed data. The product's qualities were assessed to see if they were appropriate for the demand challenge. With a minimum of four classes, the SVM classifier was created by using 'one on one' approach. For each combination of highlights ordered by pertinence, exactness was processed. For the purpose of evaluating SVM classifiers, a five-overlay cross-approval plot was used.

Stowed the away layer four times calculation hubs was used in this study. For planning purposes, the appropriate BPNN's limits are recorded. The preparation would stop on the off chance that any of the conditions given in was experienced. The organization loads and predispositions were introduced haphazardly by the program. The important element network acquired from 316 crude information was partitioned into three classifications, for example 70% preparing data, 10% approval information and 20% of the data was used to evaluate the neural organization classifier's presentation. These sets were picked at irregular intervals, and after five cycles, the average value of the resultant lattice was computed.

5. EXPERIMENTAL SYSTEM

In this section, the results of SVM and ANN models used to address the problem of missing abstract concepts are shown. Figure 5.1 depicts the results of a series of tasks as a two-dimensional disarray network for the multi-class expectation, with a segment and a column for each class. Components on the 336-component grid each show how many times a projected category occurred before a genuine category occurred. With no accurate projection, the discoveries look like huge numerals along the fundamental slanting. First, the classifier produces a point-by-point precision by the class, as well as a disarray framework, and an assessment of the positive numeric expectation for the class's deficit. In order to identify the unique load-carrying restrictions for raw and contained data, ACC and NCS are employed to record the disarray grid. Six components with the highest description quality of 100% and close to 100% were selected for moving the component deformities, and the disarray network was utilised to show the combination of all vibration characteristics. According to Figure 5.1, the most often misclassified item was H, or the potentially defective item.

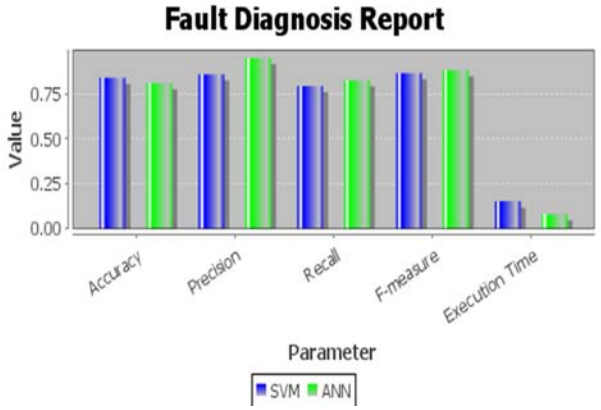

Figure 5.1. Comparison graph

6. CONCLUSION

Non-contact sound collecting has been created in this study to measure device disruptions. Finally, the qualities that were selected were analysed using ANN and SVM for implementation and scheduling purposes. Listed below are a few noteworthy accomplishments:

The movement outputs of the non-contact device are in line with sensor data gathered under comparable circumstances.
Even after accounting for all of the PCA's selected features throughout the same time period and ranking their relevance, the precision attained by crude and assembled before the signals acquired using SFFS calculation produced the most severe outcomes for a combination of components.
The accuracy attained using NCS data, border indicators, and ACC data acquired using SVM and ANN independently was 98.3 percent and 97.2 percent, respectively.
You may save money and prevent faults by using the proposed non-contact sensors, according to the results.

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PEOPLE COUNTING AND TRACKING USING MACHINE LEARNING

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ABSTRACT

The demand for people counting and tracking systems for surveillance applications is rapidly increasing, necessitating the development of more precise, efficient, and dependable systems. The major goal of this project is to create an accurate, long-lasting, and efficient system for counting and tracking people in public spaces. The main goal of this study is to create a system that can work in a variety of environments, including varying orientations, densities, and backdrops. AI calculations make a model in light of preparing information, which is a sample of data. The primary goal of this project is to keep track of and count people and determine the number of things. [11]This hybrid approach has the advantage of being able to count persons in a crowd with great precision utilizing a high definition camera. [13]. The HOG (Histogram of Oriented Gradients) technique is utilized to identify detecting, tracking, whereas the CNN algorithm is utilized to count objects and recognize faces [4], [5], [6]. This research is used to develop object tracking technologies that are less computationally intensive. In a single algorithm, the concepts of object detection and object tracking are combined.An ROIs based pedestrian detection system for single images [7].

Keywords: OpenCV, Detecting, People Counting, Tracking, Surveillance based spotting, Centroid Tracker, High Definition Camera, CNN, HOG algorithm.

1. INTRODUCTION

People counting and tracking are done using deep learning mechanisms, and thanks to advances in image processing algorithms and computer technology, the utilization of camcorders to track and count individuals has expanded significantly in recent years. There are a variety of techniques and technologies available to do this task, and due to its importance in a wide range of public space applications, commercial goods offer a variety of options. A Bayesian computer vision system for modeling human interactions is done by using these algorithms. [15] The functional distinctions between these goods can be visualised as a pyramid. In terms of functionality, systems that count the number of individuals are the most basic. A traffic flow detection system combining optical flow and shadow removal is done by the HOG and CNN algorithms. [9] Another option is to utilise video cameras to count persons entering or exiting a building through a door. Video cameras are commonly used as sensors in systems that track individuals. A method of counting the passing people by using the stereo images is implemented by using

the HOG and CNN algorithms. [16] It can be tracked while they are in the field of vision of the camera, resulting in a more accurate representation of their actions.

2. LITERATURE SURVEY

Title: Image Motion Analysis **Year:** 2020**Author:**NanangCahyadi**Abstract:**Individuals counting frameworks can give factual pattern data used to human conduct investigation. Instinctively individuals counting framework works in view of succession discovery. In any case, with dynamic exploration exercises in Artificial Intelligence in Computer Vision, there are numerous choices accessible for carrying out a group counting framework.

3. METHODOLOGIES

The methods used are profound sort, centroid tracker, CSRT, etc, which track the distinguished objects. The steps and methodologies followed are:

- Draw an ideal reference line on the information outline.
- Recognize individuals utilizing the item identification.
- Note the centroid on the recognized individual.
- Track the development of that obvious centroid.
- Compute the centroid development Count the quantity of individuals coming in or leaving a reference line.
- In light of the counting, increase the up or down counter.

4. RELATED WORK

Object tracking and counting were not first offered as machine learning approaches. The present system detects, tracks, and counts objects using a deep learning method in machine learning. The main goal of this project is object detection and determining whether there are any instances of things from defined categories (such as humans, vehicles, bicycles, dogs, or cats) in a picture and, if present, returning the spatial location and human behavior extent of each object instance.[10] The advantage of this hybrid technique is that it can count people even in a crowd with great accuracy utilizing a high definition camera. The HOG (Histogram of Oriented Gradients) technique is utilized to identify tracking, while the CNN algorithm is utilized to count objects and recognize faces. [1], [12]

5. PROPOSEDSYSTEM

The main purpose of this project is to tracking and counting of people and detect the number of the objects. The advantage of this half breed approach is that can apply exceptionally accuracy using high definition camera and count the people even in the crowd. HOG (Histogram of Oriented Gradients) algorithm is used for detecting, tracking and counting of objects such as body parts and face recognition. [14] This project is used for object tracking techniques without as a large part of the computational weight.

5.1 System Setup

An above camera connected via USB link will be mounted pointing downwards or marginally inclined.The camera's height has a direct impact on the likelihood of detection. The higher the camera stature, the broader the camera's field of vision and, as a result, the larger the monitoring area.

5.2 Camera choice

There are two kinds of cameras: fixed cameras and PTZ cameras. They can then be partitioned into two sorts: shading and non-shading. Notwithstanding, any type of camera might give information to a PC or control unit. A 25 business minimal expense camera was used for this venture. The nearest centering distance of the camera used is 4.8mm. It has a top notch sensor, high edge rate video playback, and a base responsiveness of 2.0V/Sec. It additionally upholds great AVI ,as well as picture stockpiling in BMP and JPG designs. Its result outline has a goal of 640x480, which is great for the recognizing framework.

5.3 Image Processing Library

The people counting system in this project is built utilizing Microsoft Visual Studio and theOpen Source Computer Vision Library for identifying social and behavioral sciences. [3] Because of technological advancements, OpenCV is sufficient to support the whole detection process.[2] There are several functions in OpenCV's default library that may be used to handle video feeds from various sources.

5.4 Object Detecting

We run our computationally more costly article tracker during the detection phase to determine if new items have entered our vision and to check in the event that we can find protests that were "lost" during the following stage. We construct or then again update an article tracker with the updated bounding box coordinates for each identified object. We only perform this step once every N frames since our item indicator is all the more computationally intensive.

5.5 Object Counting

We establish an object tracker for each of our identified objects to monitor the object as it travels across the edge. Our article tracker ought to be more efficient and quicker than the item identifier. We'll continue to follow until we reach the N-th frame, at which point we'll re-run our item indicator. The whole procedure is then repeated. We plan to use such a global positioning framework to improve our people and object counting.

6. IMPLEMENTATION

To execute our people counter. We'll utilize both OpenCV and dlib to assemble our people counter. For standard PC vision/picture handling capacities, we'll utilize OpenCV, and for individuals counting, we'll

utilize the profound learning object indicator. Then, at that point, we'll utilize dlib to carry out connection channels. We might have utilized OpenCV all things considered, yet the dlib object following execution. Initially the video sequences of the object is detected based on motion segmentation and the object is classified with Gaussian filter and then track the human and count the people as shown in the fig.6.1.

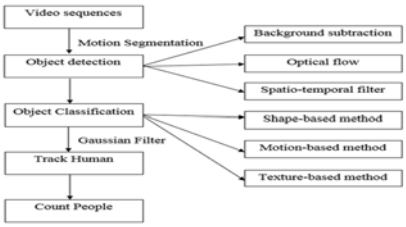
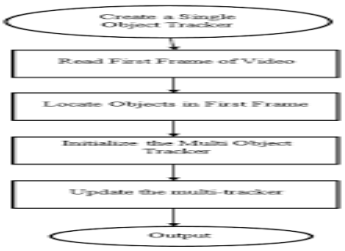


Fig 6.1 Flow chart of Tracking and Counting People

6.1 UseCaseDiagram

A use case diagram depicts a framework's dynamic way of behaving. The object is initially detected by the people counting and tracking system. By following the input dataset it tracks and counts the number of projects with high accuracy and determines whether the object is moving or static as shown in the fig.6.1.1. It is accomplished by employing a high-definition camera that focuses with pinpoint accuracy. The advantage of this hybrid approach is that it can count people even in a crowd with high accuracy using a high definition camera. [8], The HOG (Histogram of Oriented Gradients) algorithm is used for object tracking and the CNN algorithm for object counting and face recognition as shown in the fig.6.1.2. A single algorithm employs the concepts of objectdetection and object tracking



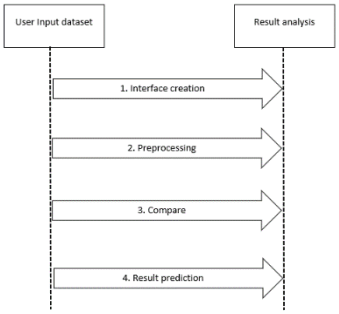


Fig.6.1.1 Sequence Diagram of people Counting and Tracking

Fig. 6.1.2 UML Diagram of People Counting and Tracking Result Analysis

7. RESULT AND DISCUSSION

It was successful in developing a counting system that could detect and count people. This project made use of a low-cost commercialised upward camera, open source programming, and a control unit like a CPU.

8. CONCLUSION

This research led in the creation of a counting system that can identify and count individuals. This project makes use of a low-cost commercialized overhead camera, open source programming, and a control device such as a CPU. The construction of the passerby counting framework might be based on the HOG and R-CNN algorithms, which are utilized in object detection and counting.

9. FUTURE SCOPE

In future, effective research is required to remove the complexities by shadows. Counting and tracking of people even in very much crowded area with high definition of image with very high accuracy can be implemented by using additional algorithms like Single Shot Detector (SSD), Faster RCNN, YOLO in future and it can be used to implement real time tracking and counting of people and objects.

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SOFT C USING MULTI OBJECTIVE METAHEURISTIC DRAGONFLY OPTIMIZATION FOR CLUSTER HEAD SELECTION IN WIRELESS SENSOR NETWORKS

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ABSTRACT

With development of low-power electronic devices, wireless communication capabilities are the leading areas in wireless sensor networks (WSNs).Many researchers carried out their research on cluster head selection in WSN. But the clustering accuracy was not improved and processing time was not reduced during cluster head selection. In order to overcome the existing problems, Soft CMultiobjectiveMetaheuristic Dragonfly Optimization (SCMMDO) Method is introduced. The main objective of this Method is to select the optimal cluster head for efficient data transmission in WSN.SCMMDOMethod performed two processes, namely clustering and optimization for data transmission in WSN. Simulation is carried out with different metrics such as energy consumption, clustering accuracy and processing time. The observed resultshows that the SCMMDOMethodeffectively increases theclustering accuracy and minimizes the energy consumption as well as processing time than the state-of-the art methods.

Keywords: electronic devices, wireless sensor networks, sensor nodes, Soft C clustering, multiobjective meta-heuristic dragonfly optimization, cluster head, source node

1. INTRODUCTION

Clustering is an essential one used for increasing the network lifetime in WSNs. It includes the grouping of sensor nodes into clusters and choosing the Cluster Head (CH) for all clusters. CH gathers the data from nodes and transmits aggregated data to the base station. A High-Quality Clustering Algorithm (HQCA) was introduced in [1] for forming the high-quality clusters. But the bandwidth utilization rate was not improved by HQCA. A Tunicate Swarm Butterfly Optimization Algorithm (TSBOA) was introduced in [11] for choosing the CH to perform data transmission between sensor nodes. But the clustering accuracy was not improved by TSBOA. For efficient cluster head selection in wireless sensor network, Diversity - Driven Multi-Parent Evolutionary Algorithm with Adaptive Non-Uniform Mutation was used [15]. The residual energy of sensor node and distance was optimized to reduce the fitness function. However, computational complexity was not reduced by designed algorithm. An innovative approach was introduced in [13] for selecting the cluster heads. The target of cluster head was based on the node distance and node energy. The cluster head selection minimized the energy utilization and increased the networklifetime through shortest path relay node concept. But the network lifetime was not improved by designed approach.

The Genetic Algorithm based Optimized Clustering (GAOC) protocol was created to allow for better CH selection by combining residual energy, distance, and node density. To address the Hot-Spot problem, multiple data sinks based GAOC (MS-GAOC) was introduced [6]. But the computational complexity was not reduced by GAOC protocol. Cluster Head Selection by Randomness with Data Recovery in WSN (CHSRDR) method was designed in [14] for choosing the cluster head within cluster for data recovery. CHSRDR considered the heterogeneity in power and preserved the cluster of vice-head on randomness inside the cluster. However, the computational overhead was not minimized by CHSRDR method. A new clustering algorithm was introduced in [18] for WSNs to minimize the energy consumption and increase the lifetime of WSNs. But, the processing time was not reduced by clustering algorithm. A genetic algorithm-based cluster head selection was introduced in [17] for centralized clustering algorithms with load balanced network. The designed algorithmidentifiedthe optimal cluster head and increased network lifetime. Though network lifetime was improved, the clustering accuracy was not improved by genetic algorithm. An energy efficient technique was introduced in [2] to reduce the attacks on improving cluster head selection mechanism. The honest nodes were determined to commend as cluster head during packets transmission phase. But the delay was not reduced by energy efficient technique. A hybrid Sparrow Search Algorithm with Differential Evolution algorithm was introduced in [12] to address the energy efficiency problem by cluster head selection in WSN. The designed algorithm employed high-level search efficiency with higher node lifetime. But, the processing time was not minimized by Hybrid Sparrow Search Algorithm.

2. RELATED WORKS

WSN are leading area of research for different applications. Firefly algorithm was introduced in [7] for increasing energy efficiency of network and node lifetime throughchoosing the optimal cluster head. Though the energy efficiency was improved, the delay was not minimized by Firefly algorithm. Firefly Algorithm (FA) and hesitant fuzzy was introduced in [16]with CH selection protocol. The designed protocol employed sensor node parameters to determine the score of each node for best CH selection. However, the energy efficiency was not improved by FA. Particle Swarm Optimization (PSO) approach was introduced in [10] for generating energy-aware clusters through optimal cluster head selection. PSO minimized optimal position cost for head nodes in cluster. But, the computational cost was not reduced by PSO approach. A multi-criteria decision-making method was introduced in [4] for choosing the CH based on residual energy, neighbors, distance below base station and transmission range for every node. But, the energy efficiency was not at required level by designed method.

For cluster head selection, the area double cluster head APTEEN routing protocol-based particle swarm optimization (DCA-PSO) was introduced [5]. DCA-PSO employed classification adaptive change inertia weight for optimization process. But, the optimal cluster head selection was not carried out by DCA-PSO.A centralised cluster head selection and distributed cluster formation scheme was introduced in [9] with fuzzy methods. The fuzzy was employed by sink to identify the cluster centerand associatedmember nodes. But, the clustering time was not reduced by designed scheme. A power-aware routing protocol was introduced in [3] for WSNdepending on threshold rate and fuzzy logic for increasing the energy efficiency. The cluster heads were chosen based on probability values of every node in WSN calculated from residual energy of every node. But, the clustering accuracy was not improved by power-aware routing protocol. A fuzzy-based energy-efficient cluster head selection algorithm was designed in [8] to increase the network lifetime. K-means algorithm was employed to form cluster and cluster head was selectioncarried out with fuzzy logic system

3. METHODLOGY

WSN is a self-configured wirelessnetwork to examine the environmental conditions. Clustering process is carried out to group the sensor nodes with similar characteristics. Each cluster comprises one cluster head for performing efficient data communication in WSN. The information is collected from the source node and transmitted to the base station through CH. But efficient clustering is not carried out by existing techniques for CH selection. Therefore, SCMMDO method is introduced for choosing optimal cluster head in WSN. The main objective ofSCMMDO method is to select the cluster head in wireless sensor networks. The brief description of SCMMDO is carried out in below sub-section.

3.1 Soft C using Sensor Node Clustering Clustering is the method of grouping the collection of similar objects into cluster. Soft c-is the process allocating data points based on probability score belong to cluster. During sensor node grouping, SCMMDO initializes the 'm' number of clusters '$Clu_1, Clu_2, Clu_3, \dots Clu_m$'and their cluster centroid '$cc_1, cc_2, cc_3, \dots cc_m$' in random manner. The soft c sensor node clustering process is carried out throughallocating the membership to every sensor node 'SN_i' corresponding to each cluster centroid based on distance between the centroid and sensor node. The sensor node 'SN_i' belongs to the cluster 'Clu_j' through membership function. The received signal strength of the sensor node is determined for performing efficient data transmission. The received signal strength (RSS) of sensor node is determined as follows, $RSS = 10 \log_{10}\left(\frac{Transmitted\ signal\ power}{Received\ signal\ power}\right)$(1)

From eqn.1, 'RSS'denotes the received signal strength. The signal strength is determined in decibel (dB). The bandwidth availability between cluster head is determineddepending on difference between the total bandwidth and consumed bandwidth. It is given as, eqn. 2

$$Bw_{avilability} = Bw_{total} - Bw_{consumedbandwidth} \quad (2)$$

' $Bw_{avlailability}$ 'represent the bandwidth availability.' Bw_{total} ' represent the total bandwidth.'$Bw_{consumedbandwidth}$'symbolizes consumed bandwidth. After that, the residual energy of sensor node is calculated. The residual energy of sensor node is defined as the difference of total energy and consumed energy of sensor node.

The residual energy of sensor node is formulated as, eqn. 3

$$Energy_{Residual} = Energy_{Total} - Energy_{Consumed} \quad (3)$$

the residual energy is determined. Based on these above mentioned parameters, membership function of sensor node is determined. It is obtained as,

$$Mf_{ij} = \sum_{n=1}^{m} \left(\frac{d_{ij}}{d_{ic}}\right)^{-\left(\frac{2-fu}{fu}\right)} \quad (4)$$

From eqn. 4, 'Mf_{ij}'symbolizes the 'd_{ij}' denotes theparameter value distance between 'i^t' sensor node and 'j^t' cluster centroid. 'd_{ic}' portrays the distance between 'i^t' sensor node and 'm^t' cluster. 'fu' denotes the fuzzifier. SCMMDO Methoddetermines the cluster centroid because mean of all sensor node weighted by membership degree belongs to the cluster. Consequently, the centroid for each cluster is determined as eqn. 5

$Cluster\ centroid = \frac{\sum_{SN_i \in cluster\ centroid} Mf_{ij}^{fu} SN_i}{\sum_{SN_i \in cluster\ centroid} Mf_{ij}}$(5)

'Mf_{ij}' is amembership degree. The distance between the sensor node and cluster centroid is computed as eqn. 6,

$d_{ij} = (\sum_{i=1}^{z}(|(SN_i - cluster\ centroid)|)^q)^{1/q}$(6)

'SN_i' represent the 'i^t'sensor node in wireless sensor network. 'z' symbolizes the number of sensor node. 'q' denotes the parameter. The minimal distance between thesensor node and cluster centroid is suitable to group sensor node to that cluster.

It describes the step by step process of soft c clustering in SCMMDO method. Initially, number of clusters is initialized. After that, received signal strength, residual energy and bandwidth availability is determined of every sensor node. Then, the membership function is calculated for every sensor node. The centroid value of every cluster is determined to perform node clustering. After that, the distance between the centroid and parameter value of the sensor node is determined for every cluster. Finally, the sensor node is grouped to the cluster with minimum distance in WSN.

3.2 Multiobjective Metaheuristic Dragonfly Optimization based Cluster Head Selection

The dragonfly optimization is the meta-heuristic method used to find better solution for optimization problem. In SCMMDO Method, Multiobjective denotes the dragonfly optimization algorithm that solves more than three objective problems such as received signal strength, residual energy and bandwidth availability. The movement of dragonflies and their search for food is their behaviour. Every cluster's dragonfly represents the number of sensor nodes. '$P = df_1, df_2, \dots df_p$' and their food source is considered as themultiobjective functions(i.e., received signal strength, residual energy and bandwidth availability). Multiobjective Metaheuristic Dragonfly Optimization in (MMDO) Methodfunctioned with the population based approach termed as the swarm. An optimization initializes the population of 'h' number of dragonfliesin the search space. It is formulated as,

$$P = df_1, df_2, \dots df_h(7)$$

Once initialization process was completed, the fitness value is determined for every dragonfly in current swarm population. Depending on the estimation, the fitness value is determined as, $FitnessFunction = (Energy_{Residual} Energy_{threshold} \&\& (RSS > RSS_{th})$(8)

From eqn. 8,'RSS'symbolizes the received signal strength.'RSS_{th}symbolizes the threshold for received signal strength. '$Bw_{availability}$'Symbolize the bandwidth availability.'$Bw_{threshold}$'symbolizes the threshold of bandwidth availability. Depending on the analysis, the fitness function is computed as given below in eqn. 9.

$FitnessFunction = argmax\{RSS, Bw_{availability}, Energy_{Residual}\}$(9)

'$argma$'represents the maximum function argument. In search space, four swarming behaviours of dragonflies are determined based on the fitness measure. To identify the global optimal solution among population, the four behaviours are separation, alignment, cohesiveness, and attraction towards food supply. Initially, the separation method is used to determine the dragonfly's current and nearby positions. It is given as,

$$\delta_1 = -\sum_{k=1}^{h}(P_{a(t)} - P_{b(t)})(10)$$

From eqn. 10, 'δ_1' denotes the separation of dragonflies, '$P_{a(t)}$'represents the dragonfly's current location. The position of nearby dragonflies is represented by $P_{b(t)}$. The letter 'h' stands for the number of nearby dragonflies in the search space. The second process is alignment, which refers to the speed with which dragonflies migrate towards their neighbours. It is formulated as,

$$\delta_2 = \frac{1}{h}\sum_{j=1}^{n}\tau_j(t)(11)$$

From eqn.11, 'δ_2' denotes the alignment. '$\tau_j(t)$'symbolize the speed of dragonflies in close proximity finally, the cohesion process is used to determine the dragonfly's tendency to fly to the centre of the neighborhood's mass.

$\delta_3 = \frac{1}{h}\sum_{k=1}^{h}[P_{b(t)} - P_{a(t)}](12)$

From eqn.12, 'δ_3'denotes the cohesion process of dragonfly. Finally, the dragonfly's attraction to the food source is governed by the current position of the food source and the dragonfly's position. It is given as eqn. 13

$$\delta_4 = |P_f - P_{a(t)}|(13)$$

'δ_4'Symbolizes the attraction towards the food source.'P_f'represent the position of food source. The current dragonfly's location is updated with their surroundings.

$$P_{a(t+1)} = P_{a(t)} + \nabla P_{a(t+1)}\ (14)$$

From eqn. 14, '$P_{a(t+1)}$'denotes the current position of the dragonfly'$P_{a(t)}$' is symbolized by the updated position of the dragonfly. '$\nabla P_{a(t+1)}$'symbolizes the step vector to identify themovement direction of dragonfly. It is given aseqn. 15

$$\nabla P_{a(t+1)} = \{we_1\delta_1 + we_2\delta_2 + we_3\delta_3 + \rho_f\delta_4\} + \theta * P_{(t)}$$

(15)

'we_1'denotes the weight of separation function. 'we_2' represent weight of alignment function. 'we_3' Symbolizes weight of cohesion.'ρ_f' represent the food vector. 'θ'Symbolize the inertia weight to control The position of the dragonfly at time 't' reflects the convergence behaviour of optimization$P_{(t)}$. The global best solution is determined based on the updated results. By this way, Every cluster's cluster head is chosen using the SCMMDO Method. The flowchart of dragonfly optimization is given in below diagram.

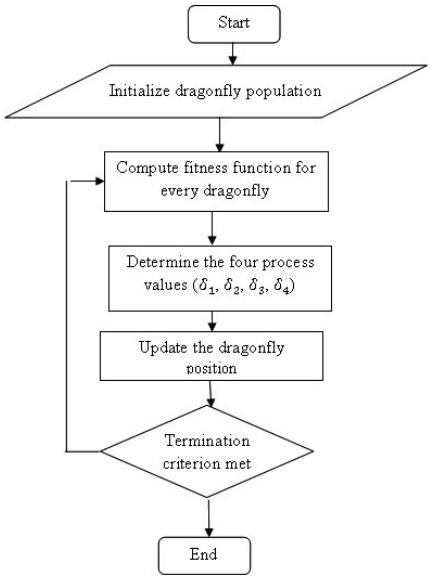

Figure 1 Flow diagram of Multiobjective Metaheuristic Dragonfly Optimization based Cluster Head Selection.

4.1 Impact of Energy Consumption

Energy consumption is defined as the amount of energy consumed to perform clustering process for efficient data transmission in WSN. It is formulated as eqn. 16.

$EC = N * Energy\ consumed\ by\ one\ sensor\ node$ (16), 'EC' represent the energy consumption of sensor node. 'N' symbolizes the number of sensor nodes.

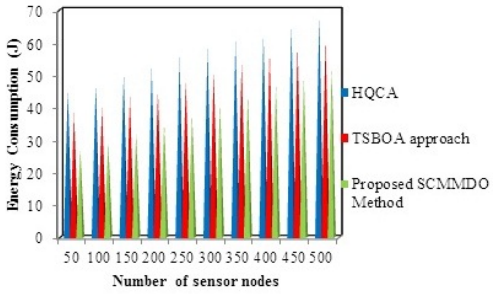

Figure 2 Measurement of Energy Consumption

Figure 2illustrates the simulation results of energy consumption of different number of sensor node varied from 50 to 500. From figure, the green color pyramid denotes the energy consumption of proposed SCMMDO Method whereas the blue color pyramid and red color pyramid denotes the energy consumption of existing HQCA and existing TSBOA. As described in the graphical results, the proposed SCMMDO Method reduces the energy consumption while transmitting the data packet through optimal cluster head selection. As described in the graphical results, the proposed SCMMDO Method reduces the energy consumption while transmitting the data packet through optimal cluster head selection.

5.2 Impact on Clustering Accuracy

Clustering accuracy is defined as the proportion of successfully grouped sensor nodes to the total number of sensor nodes. It is measured in terms of percentage (%). It is formulated as,

$$CA = \frac{Numberofsensornodesthatarecorrectlyclustered}{N} \quad (17)$$

From eqn. 17, 'CA' symbolizes the clustering accuracy. 'N' symbolizes the number of sensor nodes.

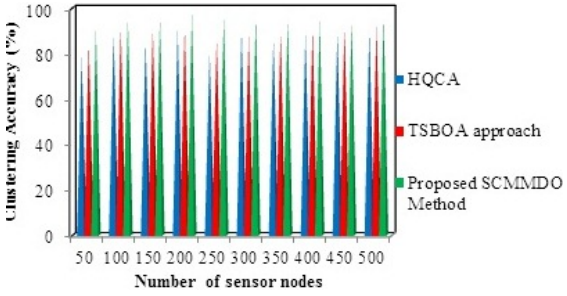

Figure 3 Measurement of Clustering Accuracy

Figure 3 illustrates the simulation results of clustering accuracy of different number of sensor node varied from 50 to 500. The green color pyramid denotes the clustering accuracy of proposed SCMMDO Method whereas the blue and red color pyramid denotes the clustering accuracy of existing HQCA and TSBOA. As

illustrated in results, the proposed SCMMDO Method increases the clustering accuracy while grouping the sensor nodes in WSN by using soft c-using residual energy, bandwidth, and received signal strength, the sensor node clustering procedure groups the sensor nodes to form the cluster. This helps to increase the clustering accuracy in WSN. Therefore, the clustering accuracy of proposed SCMMDO Method is increased by 10% and 6% when compared to existing HQCA [1] and existing TSBOA [2] respectively.

6. CONCLUSION

An efficient SCMMDO Method is developed for efficient data transmission through optimal cluster head selection with minimum processing time in WSN environment. The scattered sensor nodes are grouped into the diverse clusters using soft c clustering. The clustering based data transmission minimizes the energy consumption and increases clustering accuracy. After that, the cluster head ischosen by using multiobjective metaheuristic dragonfly optimizationfor every cluster and manages all sensor nodes within the cluster. This process reduces the processing time. Simulation of proposed SCMMDO methodis carried out with three different performance metrics such as energy consumption, clustering accuracy and processing time. The observed resultshows that the proposed SCMMDOMethodincreases theclustering accuracy by 8% and minimizes the energy consumption by 26% as well as processing timeby 28% than the existing HQCA [1] and existing TSBOA [2].

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Self-Appraisal Framework for Distance Estimation Monitors

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Abstract— For a variety of applications, including face detection, recognition, and identification, the development of a system for automated picture content recognition is a challenging issue. For example, face recognition is only one use of digital image processing. Automated face detection entails automatically detecting a person in a picture, and it's a challenging problem to solve With several algorithms, this procedure is possible. However, there are no methods for automatically identifying low-resolution faces in diverse application circumstances.. scenarios.. Using the computer vision technologies developed for this research, we can foretell whether or not the displays are in view. There may be problems if your monitors are too near or too far apart. As a result, eyes may have difficulty focusing (convergence issues) and be forced to sit in an inconvenient posture because of the lack of viewing distances. You may be forced to type with your arms extended if your chair is pushed away from the screen or your head is turned backwards. The distance between a display and the eye cannot be automatically measured, though. A face-recognition-based automated alarm system may now be developed in this project as a consequence. Distances range from 0.38 metres to 1.02 metres, which is about one foot to one foot (3.3 ft.). This is something that artificial intelligence can help with. A webcam may be used to take pictures of people's faces and tell the difference between the foreground and backdrop. Afterwards, image processing methods are used to identify and recognise individuals. Last but not least, you may use a webcam to measure the distance between your face and the monitor. Where a predefined limit value has been met, an alert is generated and sent to customers without the need of sensors. The process for creating the parent-child structure should also be improved so that an alert may be shown when a user visits an undesired website.

Index Terms—**Artificial intelligence, Deep learning, Distance monitoring, Face detection, Vision system**

I. INTRODUCTION

Most approaches to image processing think of a picture as a two-dimensional signal and process it like any other indication. Pictures are processed as three-tiered alerts with the use of a new dimension (the z-hub). While optical and fundamental image processing are also available, the most well-known kind of image processing is sophisticated picture management. All of these approaches were employed when creating this piece. Imaging is the term used to describe the action of capturing a photograph (making the principal picture in the primary area). The ability to manipulate images is essential in both computer-based illustrations and computer-based research and development. However, although cameras and other imaging technology are used to capture natural settings in most dynamic films, all images shown on laptops are created manually using actual models of items, locations, and lighting. Computer vision, on the other hand, may be thought of as an advanced kind of image processing in which an electronic device (computer) or software programme (algorithm) attempts to decode the biological content of a picture (or set of images) using these cues (e.g., movies or 3-D complete-frame magnetic resonance scans). Scientific visualisation (often large-scale, complex clinical/experimental data) is becoming more important, and this has a profound impact on modern scientific and technological endeavours. Computers are required for statistical analysis, complex computing, and data extraction of any kind. Given the breadth of the topics of image processing and facial recognition, my response may be divided into many sections, with a possible abortive conclusion. Computerized face recognition and image processing. Common tasks in image processing include making changes at the pixel level, such as mapping one image to another. When a computer is being creative and predictive, it is automatically extracting info from visuals. Face reputation refers to the process through which a person's likeness is linked to their identification in a database. It is common for a laptop's vision device's front-end subsystem to handle image processing duties. Histogram equalisation for assessment enhancement and a low-skip clear out, such as a Gaussian or bilinear clean out, may be used by a standard face recognition programme before the data is sent to the actual vision algorithms.

Facial recognition is a widely applicable computerised method for identifying human faces in photographs of very high resolution. Face discovery is the mental process through which people seek out and control their appearance in a visual setting. Face recognition may be seen as a specific instance of the broader problem of article localization. Article class discovery seeks to locate and quantify all exemplars of a certain class present in a given image. Everything here relies on a model. To calculate a person's face, computers focus on the direction in which their eyes are looking. Comparing a person's picture to one in a database is quite similar to image recognition. This picture is identical to the one in the database and

cannot be distinguished from it. Modifications to the face When the genetic algorithm has finished running, it is applied to every part of the face. This includes the brow, iris, nostrils, and corners of the mouth. By standardising every possible up-and-face, we can mitigate the effects of uneven lighting and the shirring effect of increased head size. comer's The eigen-faces are considered in order to gauge an individual's general happiness. All the promising young faces who place a premium on health are ultimately chosen for additional verification after many rounds of selection. Here, we check the presence of distinct face features and evaluate the facial harmony of each competitor.

II. RELATED WORK

Ruiz, Nataniel To wit: Eunji Chong,, et al. Evidence from [1] demonstrated that a multi-loss deep network can reliably and accurately predict head rotation from image intensities. We use cutting-edge landmark detection techniques to demonstrate that this kind of network can achieve better results than traditional landmark-to-pose approaches. This work investigates the relationship between the accuracy of landmark detection and the success of landmark-to-pose methods. We also demonstrate that our proposed method outperforms networks that regress head pose as a sub-goal in detecting landmarks, and that it is generally applicable across datasets. We demonstrate that landmark-to-pose is fragile in the presence of extremely low resolution and that our method is robust in these cases by appropriately augmenting the training data. Improvements in performance for the proposed method may be achieved through the use of synthetic data generation for extreme poses and research into more complex network architectures that might, for instance, account for the entire body's pose.

This is a paraphrase of Gregory P. Meyer, Shalini Gupta, Iuri Frosio, et al.

[2] efficiently registers facial surfaces despite large rotations and partial occlusions. Our algorithm's success can be attributed to its incorporation of several different factors, including the overlap term (Ec) in the cost function, the combined PSO and ICP algorithm, the dynamic adaptation of the face model's weights, and the adoption of a morphable face model. Although each of these ideas has been introduced separately in other research, our work contributes by combining them in a way that greatly improves the accuracy of 3D head pose estimation. We also provide the first quantitative analysis of how each of these factors affects head pose estimation accuracy. We expand upon Qian et alwork .'s by explaining how the combined PSO and ICP optimization for 3D surface registration works. To the best of our knowledge, our study is also the first to present a systematic survey and detailed comparison of the available state-of-the-art algorithms for 3D head position estimation using a unified benchmark dataset.

According to Zhiwen Cao, Zongcheng Chu, Dongfang, et al.

New vector-based annotation and metric MAEV were introduced in [3]. They are effective in addressing the discontinuity problems brought on by Euler angles. We obtain state-of-the-art performance on the job of head posture estimation by combining a novel vector representation with our TriNet. Then, demonstrate that, in the specific circumstances of profile views, MAE may not be reflective of real behaviour. To address these issues, we offer a novel annotation approach that makes use of three vectors to characterise head postures and a novel measurement known as Mean Absolute Error of Vectors (MAEV) to evaluate results. We also develop a neural network to forecast the three vectors under the limitations of orthogonality. When applied to the AFLW2000 and BIWI datasets, our suggested technique produces state-of-the-art results. Prediction errors for extreme posture angles may be greatly reduced with our vector-based annotation technique, as shown experimentally.

The authors Tsun-Yi Yang, Yi-Ting Chen, et al.,

Using the fine-grained spatial structures, a novel method was described in [4] for acquiring more relevant aggregated characteristics. Complementary model versions may be learned by establishing learnable and non-learnable scoring functions of the pixel-level features. An ensemble of these versions has been shown to outperform state-of-the-art approaches (both landmark-based and landmark-free ones) despite having a model size that is around 100 times less. In addition, its yaw angle estimate is even more precise than that of approaches using multi-modality data, such as the RGB-D or RGB-Time recurrent model. We demonstrate that learning meaningful intermediate features can lead to better regression results. Despite our focus on the pose estimation issue, we think this concept can be applied to other forms of regression.

In this regard, Guido Borghi et al.

The authors of [5] propose an efficient and accurate method for estimating the position of a person's head and shoulders, with a focus on car drivers but with broad applicability given the availability of depth images. The results obtained using the proposed framework are quite promising. This study proposes a rapid and reliable method for estimating the position of a person's head and shoulders, with a focus on automobile drivers but with broad applicability given the availability of depth photos. The provided system achieves state-of-the-art levels of performance, with an accuracy of over 73% on the new Pandora dataset and a low average error on the Biwi dataset. In this research, we present a comprehensive framework that unifies many cutting-edge facets of computer vision. Head and shoulder identification, localisation, and posture estimates on depth pictures are only some of the features included. Following, we provide an in-depth analysis of the current state of the art in each of the aforementioned areas of study, such as Domain Translation and its application to the Face-from-Depth component.

Citing Vincent Drouard, Silèye Ba, Georgios Evangelidis, et al...

Head posture is an essential visual signal in many situations, including social event analysis, human-robot interaction (HRI), and driver-assistance systems, to mention a few, and its framework was implemented in [6]. For instance, 3D head-pose information is a huge assistance in social event analysis for identifying interactions and extracting the visual centre of attention. Three angles are used to depict the stance, and they generally indicate the head's egocentric position. Challenges arise in its estimate when many persons are in a same picture and their faces each have a limited support area, often less than pixels. Even if the location of the face inside the picture is known, the posture angles must be extracted from data with poor resolution. Local feature identification, such as face landmarks, becomes difficult, therefore only global visual data may be used. Ruiz, Nataniel To wit: Eunji Chong,, et al. Evidence from [1] demonstrated that a multi-loss deep network can reliably and accurately predict head rotation from image intensities. We use cutting-edge landmark detection techniques to demonstrate that this kind of network can achieve better results than traditional landmark-to-pose approaches. This work investigates the relationship between the accuracy of landmark detection and the success of landmark-to-pose methods. We also demonstrate that our proposed method outperforms networks that regress head pose as a sub-goal in detecting landmarks, and that it is generally applicable across datasets. We demonstrate that landmark-to-pose is fragile in the presence of extremely low resolution and that our method is robust in these cases by appropriately augmenting the training data. Improvements in performance for the proposed method may be achieved through the use of synthetic data generation for extreme poses and research into more complex network architectures that might, for instance, account for the entire body's pose.

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N. R. Nataniel To wit: Eunji Chong, et al. With the help of a multi-loss deep network, [1] demonstrated that head rotation can be predicted directly, accurately, and robustly from image intensities. Using the state-of-the-art in landmark detection, we demonstrate that such a network outperforms landmark-to-pose methods. This paper examines the relationship between the accuracy of landmark detection and the results obtained using a landmark-to-pose method. We also demonstrate the method's generalizability across datasets and its superiority to networks that regress head pose as a sub-goal in landmark detection. We demonstrate that landmark-to-pose is vulnerable in the presence of very low resolution, and that our approach is robust in these cases by virtue of the fact that it does not rely on a single landmark to determine its pose. More research into more complex network architectures, which might account for full body pose, for example, and synthetic data generation for extreme poses, seem promising avenues for enhancing the performance of the proposed approach.

To paraphrase: Gregory P. Meyer, Shalini Gupta, Iuri Frosio, et al.

Extreme rotations and partial occlusions are no problem for [2], and the facial surfaces are accurately registered. Our algorithm's effectiveness is due to a number of factors, including the overlap term (Ec) in the cost function, the combination of the PSO and ICP algorithm, the dynamic adaptation of the face model's weights, and the adoption of a morphable face model. While these ideas have been introduced in isolation in other research, our contribution is to bring them together in a way that greatly improves the accuracy of 3D head pose estimation. To further improve the precision of head pose estimation, our work also provides a systematic quantitative evaluation of the contribution of these various factors. In addition to expanding on the work of Qian et al., we also shed light on the inner workings of the hybrid PSO/ICP optimization used in 3D surface registration. To the best of our knowledge, our work is also the first to provide a comprehensive review and in-depth comparison of the existing state-of-the-art techniques for 3D head pose estimation using a unified benchmark dataset.

It is true that Zhiwen Cao, Zongcheng Chu, Dongfang, et al,...

In [3], we see the introduction of the vector-based annotation and the metric MAEV. They are effective at fixing the gaps that arise due to Euler angles. State-of-the-art performance on the task of head pose estimation is achieved by combining our TriNet with a new vector representation. Next, demonstrate that, at least in the cases of profile views, MAE may not accurately portray the underlying behaviour. To address these issues, we propose a new annotation strategy that makes use of three vectors to characterise head poses and a new metric, Mean Absolute Error of Vectors (MAEV), to evaluate performance. In addition, we train a new neural network to make orthogonal predictions across the three vectors. Both the AFLW2000 and the BIWI datasets benefit from our proposed method, which produces state-of-the-art results. The experimental results demonstrate the effectiveness of our vector-based annotation approach in lowering prediction errors for extreme pose angles.

For example: Tsun-Yi Yang, Yi-Ting Chen, et al.

To better acquire meaningful aggregated features with the fine-grained spatial structures, [4] proposed a new method. By separating the pixel-level features into learnable and non-learnable scoring functions, we can train models that are mutually reinforcing. Despite having a model size that is roughly one-hundred times smaller than that of previous methods, experimental results show that the ensemble of these variants outperforms the state-of-the-art methods (both landmark-based and landmark-free ones). To top it all off, its yaw angle estimation is more precise than that of multi-modality approaches like the RGB-D or RGB-Time recurrent model. We demonstrate that by studying informative intermediate features, regression outcomes can be enhanced. Although we only show this working for the pose estimation problem, we think it could work for other regression issues as well.

Reference: Guido Borghi et al.

[5] proposes a fast and reliable method for estimating the position of a person's head and shoulders; while it is tailored toward car drivers, the method can be easily adapted for use with any application that has access to depth images. The results obtained using the presented framework are very promising. This paper proposes a fast and accurate method for estimating the position of a person's head and shoulders, with a focus on car drivers but with broad applicability given the availability of depth images. An accuracy of over 73% was achieved on the new Pandora dataset, and the average error on the Biwi dataset was significantly lower than previous state-of-the-art works. Multiple cutting-edge areas of computer vision are combined into a unified framework in this paper. The detection and localization of the head and shoulders on depth images, as well as the estimation of their poses, are among the features included. The current state of each mentioned topic is described below, including the Domain Translation research area associated with the Face-from-Depth module.

Researchers Vincent Drouard, Silèye Ba, Georgios Evangelidis, et al...

Head pose, a crucial visual cue in many scenarios including social event analysis, human-robot interaction (HRI), and driver-assistance systems, among others, was implemented in [6]. In social event analysis, for instance, 3D head-pose information is a huge help in figuring out how people are interacting with one another and extracting the visual centre of attention. Typically, three angles are used to express the pose and describe the subject's head in relation to the body. When there are multiple people in a picture, and their faces each have a relatively small support area (usually less than a pixel), it becomes difficult to make an accurate estimate. Pose angles must be extracted from low resolution data even if the location

of the face within the image is known. In this situation, it is difficult to detect local features, such as facial landmarks, and one must instead rely on global visual cues.

Stephane Lathuili, et.al,…[12] propose the coupling of a Gaussian mixture of linear inverse regressions with a ConvNet, we describe the methodological foundations and the associated algorithm to jointly train the deep network and the regression function, and we evaluate our model on the problem of head-pose estimation. From an experimental point of view, our contribution can be summarized as follows. First, we show that the proposed inverse regression model outperforms L2-based regression models used by most of the state-of-the-art computer vision methods, at least in the case of head-pose estimation. Second, our method works effectively on relatively small training datasets, without the need of incorporating additional data, as it is often proposed in the literature. Lastly, our proposal outperforms state-of- the-art methods in head-pose estimation testing on the most widely used head-pose dataset. To the best of our knowledge, we are the first to propose an inverse regression approach to train a deep network. As future work, we plan to test our method on other computer vision problems, like facial keypoint detection or full body pose estimation, and extend the type of distributions used in our mixtures, as for example t-distributions to make the model more robust to outliers.

Instead, you should depend on overarching visual clues.

Stephane Lathuili and colleagues...

To solve this problem, we propose in [12] to couple a Gaussian mixture of linear inverse regressions with a ConvNet, describe the methodological foundations and the associated algorithm to jointly train the deep network and the regression function, and then test the model on the head-pose estimation task. It is possible to describe our contribution from an experimental perspective as follows. First, we demonstrate that, at least for head-pose estimation, the proposed inverse regression model outperforms L2-based regression models employed by most state-of-the-art computer vision approaches. Second, unlike many other methods that have been presented in the literature, our approach is successful even with limited training datasets. Finally, using the most popular head-pose dataset, our solution achieves better results than state-of-the-art algorithms for estimating head poses. We believe our inverse regression method for deep network training is the first of its kind. Future work will include expanding the types of distributions utilised in our mixes, such as t-distributions to make the model more resilient to outliers, and testing our technique on additional computer vision issues, such as face keypoint identification or whole body posture estimation.

According to Marco Venturelli, Guido Borghi, et al.

Attention and behaviour analysis, saliency prediction, and other branches of computer vision may all benefit from the wealth of data provided by [13]. The area of automobiles is the primary subject of this study. Research shows that estimating a driver's head posture is an important part of monitoring their attention and conduct while behind the wheel. Driver attention studies are already highly sought for, and this need is only expected to grow with the advent of autonomous and semi-autonomous vehicles and their inevitable cohabitation with conventional vehicles. For legal and ethical reasons, human drivers must assume command of driving algorithms in these situations. The structure must be sturdy in all kinds of weather that might drastically alter the interior lighting (shining sun and clouds, in addition to sunrises, sunsets, nights etc.). It has been shown that depth cameras are more reliable under these conditions than traditional RGB or stereo sensors, and our technique aims to address two main issues of deep architectures in general, and CNNs in particular: the difficulty to solve regression problems, and the traditional heavy computational load that compromises real time performance for deep architectures. Our method for solving a regression challenge is based on a Convolutional Neural Network with a shallow deep architecture to maintain time performance.

This is a paraphrase, therefore Xiang Xu et al.

Head posture estimation and landmark identification were discussed in [14]. For this reason, we suggested a hierarchical learning approach for estimating head poses and aligning faces simultaneously, all while taking use of CNN's global and local properties. To begin, the identified facial area is used to train a convolutional neural network (CNN) to estimate the posture and locate the seven major landmarks. The most comparable reference shape is used as a starting point. The form and posture residuals are then predicted using the local CNN features learned using LNet. Face parameters including head posture and facial components are estimated using global CNN features, while the shape is refined using local CNN features, in a coarse-to-fine cascade. As far as we are aware, this is the first system to simultaneously handle head posture estimation and landmark identification tasks by using both global and local CNN features. Based on our trials, it is clear that our approach provides much better results than state-of-the-art methods for estimating head poses.

To wit: Katerine Diaz-Chito et al.

Using a feature set created from a restricted number of face keypoints, [15] presented a novel approach for estimating the coarse and fine head's yaw angle of a driver. The strategy integrates subspace approaches such as principal component analysis and fuzzy linear regression. Also, it has a built-in system that compares the pose label from FLD and PCA to determine the reliability of the produced hypothesis and eliminates any doubtful poses. The method's dependability has been evaluated in both a controlled scenario (CMU-PIE) and real-world driving conditions (our own database). According to the global average accuracy on the CMU-PIE dataset, the strategy is competitive with other top-tier approaches. In conclusion, we find that just three keypoints on the face (the two eyes' centres and the nose's tip) are required

to accurately and precisely extract ten geometric characteristics based on angles and Euclidean distances, allowing for estimate of both coarse and fine head poses. Since the tip of the nose and the eyes do not move, their degrees of freedom are likely linked to those of the face. Additional facial landmarks, such as the corners of the lips,

Existing Methodologies

Computers and laptops are ubiquitous in many fields nowadays. These help tremendously in facilitating the quick and simple completion of duties. There are a number of drawbacks to utilising these PCs, however. To the exclusion of desktop PCs, laptops (intended for portability) have become the standard. Be mindful of how much time you spend on the computer. Reason being: it's the root cause of many unpleasant symptoms, including pain in my spinal column and frequent headaches. When using a computer for long periods of time, the space between the screen and the keyboard is quite tiny, which may lead to eye strain from staring at the bright screen for too long. Common eye problems include redness, irritation, and blurred vision. Put LED backlighting and built-in displays into our current setups to help with our eyesight. There are a number of methods that have been developed by different research teams to identify people in photographs. In this study, we used a two-stage approach to identify faces. To begin, a filter is applied to the picture to emphasise regions where human skin is most likely present. This filter was developed using sensors, some quick arithmetic, and some rudimentary image processing software. The second step is to filter out the brightest and darkest areas of the map in the areas of skin that you've chosen. Evidence-based studies have shown a correlation between the removed features and the normal eye, eyebrow, nose, and mouth locations. When searching for faces in a picture, both the binary skin map and the original image are used. The technique requires the thresh to hold the skin in position in order to create openings in the brow, eyes, mouth, and nose. All other areas of skin will have little or no characteristics, and no holes will be created, save for the targeted facial features. Nonetheless, there is no sophisticated proximity sensor.

III. PROPOSED METHODOLOGY

Since the introduction of the personal computer and the subsequent understanding that it was the source of occupational health risks, several recommendations have been produced outlining the best viewing angles and distances. The allowed spacing is too tight, and the permitted angles are too acute. It's easy to forget about the well-established relationship between viewing angle and viewing distance. Intimate spaces are required for computer work. This project will allow us to provide a method for testing the accuracy of vision systems that utilise webcams to gauge distances. It's possible to take a picture of someone's face and identify their front and background features. There are several applications for face identification, a computer technique that recognises human faces in high-tech photographs. Face placement also refers to the cognitive process of storing a face in memory. Front-facing human face detection lies at the heart of the math behind the HAAR Cascade. If the database's external features are changed in any way, the matching approach will be rendered useless. To begin, we check every valley in the grayscale picture for possible eye spots. Then, the algorithm generates the various parts of the face that may be seen, such as the brows, iris, nostrils, and mouth corners. Each potential face is fine-tuned so that head movement doesn't cause a shirring effect and uneven lighting doesn't result in a lightning effect. The fitness of each candidate is determined by a projection onto the eigen-faces.

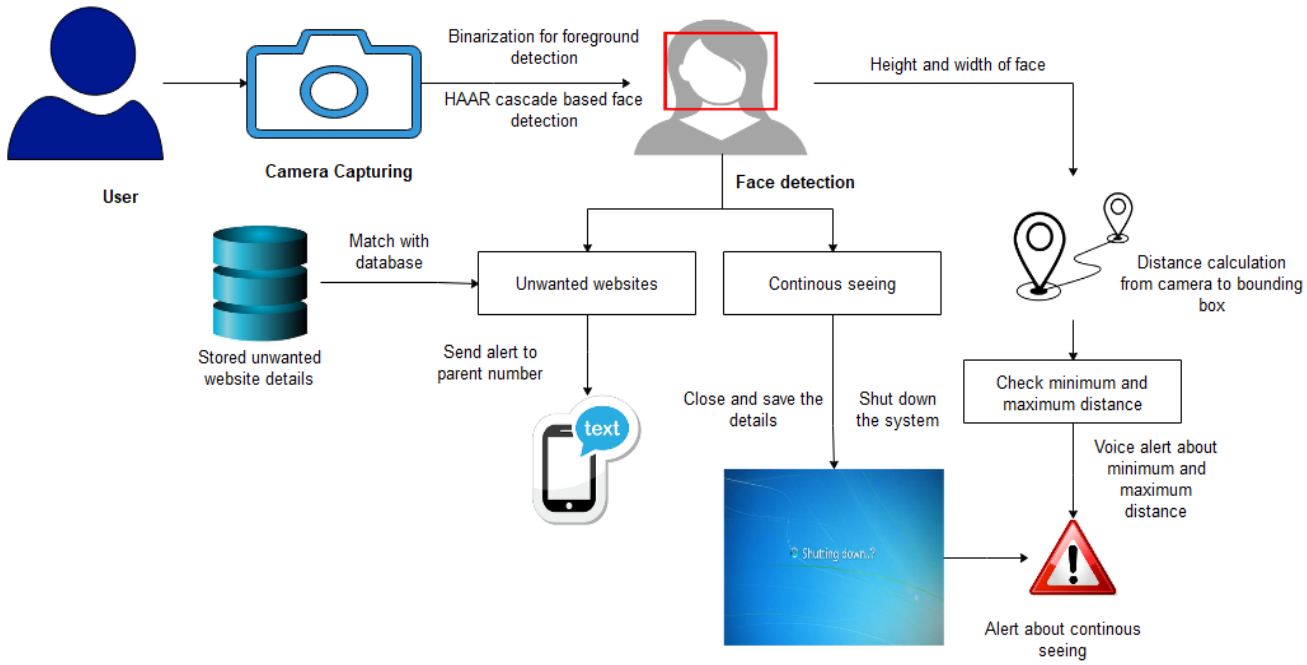

Fig 1: Proposed framework

HAAR Cascade algorithm

- The use of Haar Cascade classifiers for object detection is recommended. There are four distinct steps to the calculation:
- Defining the Hair's Characteristics
- The Art of Integral Imagery
- Utilizing both class-wide and within-class variations
- Cascading Classifiers: Putting Them to Use

Linear Discriminative Analysis

The LDA algorithm can recognise a wide variety of face characteristics. You may use it to pick out the various characteristics, and it comes with two linearity assumptions. The linearity of the face subspace and the existence of a linear separation of classes are taken as givens. The following is a description of the algorithm:

Calculate within-class scatter matrix Sw

$$S_w = \sum \sum (x_i^j - \mu_j)(x_i^j - \mu_j)^T$$

where

x_i^j : i[th] sample of class j C: Number of classes, N_j : Number of samples in class j

Calculate between class scatter matrix Sb

$$S_b = \sum (\mu_j - \mu)\,(\mu_j - \mu)^T$$

Where μ represents the mean of all classes. Calculate the eigenvectors of the projection matrix

$$W = eig(S_w^{-1} S_b)$$

Compare projection matrices of the test image and training images and the result is the training image closest to the test image

Convolutional neural network

Eye states are ranked using a Convolutional neural network method. Feed-forward neural networks, or CNNs, use a variety of convolutional, max-pooling, and totally-related layer configurations to achieve their goals. They do this by implementing a close-by affiliation strategy among neurons in neighbouring layers, so taking advantage of the geographically neighbourhood link. Similarly to how human visual cortex emulates the differentiation of confusing and clean cells by substituting convolutional layers with max pooling layers, the latter is composed of recurrent neural networks. A convolutional neural network (CNN) is a kind of deep learning network that uses many layers of convolution and maximum pooling to discover highly correlated mental representations.

V.EXPERIMENTAL RESULTS

The suggested job may be carried out as a self-vision framework for distance verification, using C#.NET as the front end and SQL SERVER as the back end. Using the provided method, we can successfully recognise individuals' faces. All the rising stars with a high health value are selected for subsequent testing when different stressors are applied. At this point, we evaluate the facial harmony of each potential face match and insist on the existence of specific facial ascribes. Moreover, the leaping box should be planned, and distance estimates should be determined with the use of web cameras. The next logical step is to expand the framework to include parental control, which would inform children of their constant exposure to and access to potentially harmful online content.

Next, sketch a leaping box on their faces. Here, we made use of datasets collected in real time. This system made use of facial recognition algorithms. After that, we may use precision metrics to evaluate the presentation. Here is a review of many measures of accuracy:

$$\text{Accuracy} = \frac{\text{TP+TN}}{\text{TP+TN+FP+FN}} * 100$$

The proposed calculation give further developed precision rate than the AI calculations.

CNN give significant level precision than the current AI calculations. The proposed framework gives diminish number misleading positive rate.

Screenshots of workflow

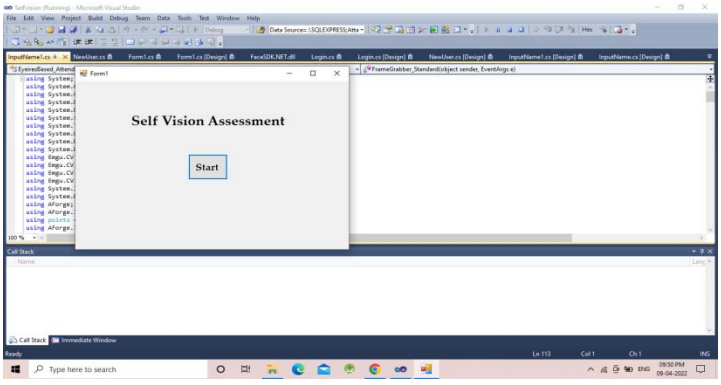

Figure 1. Once run the program, self-vision assessment application will open. Click the start button.

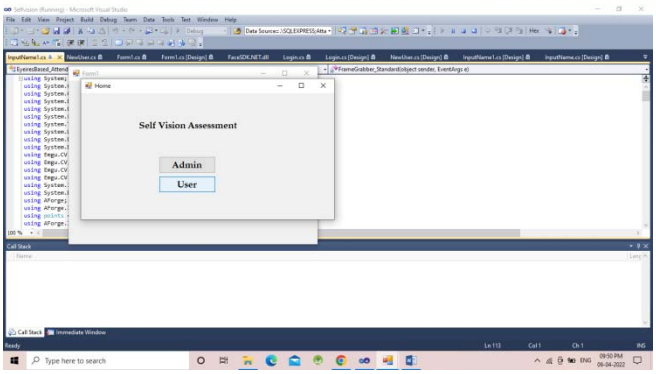

Figure 2. In the admin page, needed URL can be entered and saved. Then click the user. The following page will open.

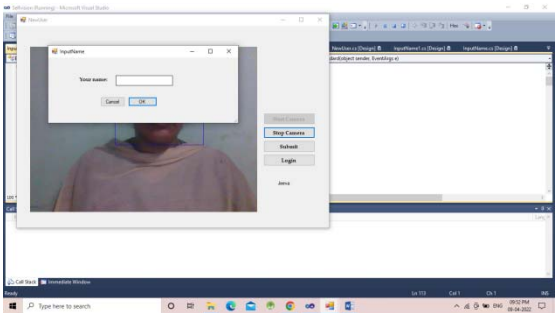

Figure 3. Once we start the camera, our image will be detected and processed.In the detected face, the square will appear and it change into blue color. Double click inside the blue square, the new pop up page will open. In that we have to enter the name and click OK. Stop the camera and submit it. The saved name will appear under login button. Then click login button, the following page will appear.

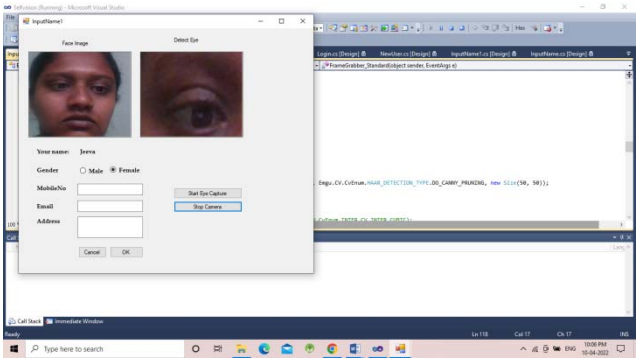

Figure 4. Then start capturing eye by clicking the start eye capture button. Once the eye is capture then stop the camera. Fill the details in the above given options. Then click OK, the record will be saved.

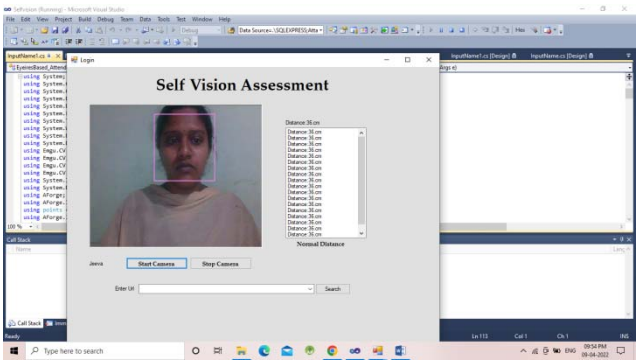

Figure 5. Then the distance between the screen and the person will be recorded and the distance is shown. If the distance is between 1.2 feet to 3.3 feet. It shows that 'Normal Distance'.

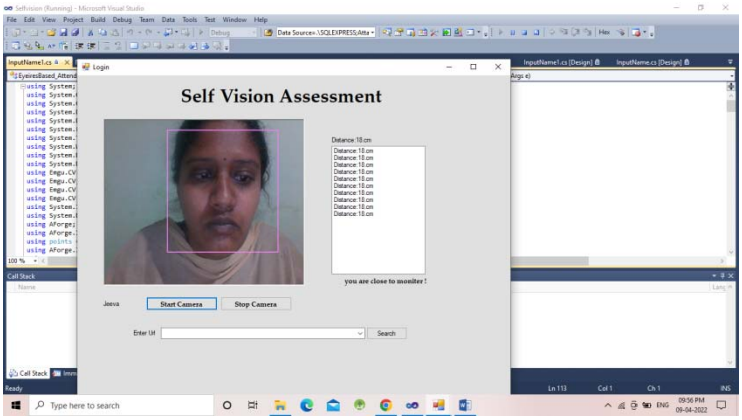

Figure 6. If the distance is less than 1.2 feet, then it alert 'you are close to monitor!', also the voice message will alert the students.

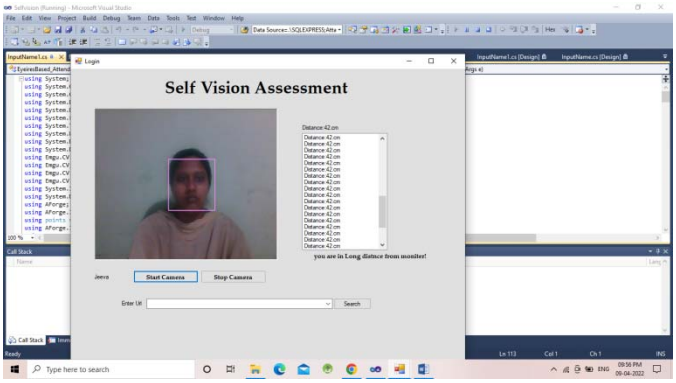

Figure 7. If the distance is greater than 3.3 feet, then it alert'you are in long distance from monitor!', also the voice message will alert the students.

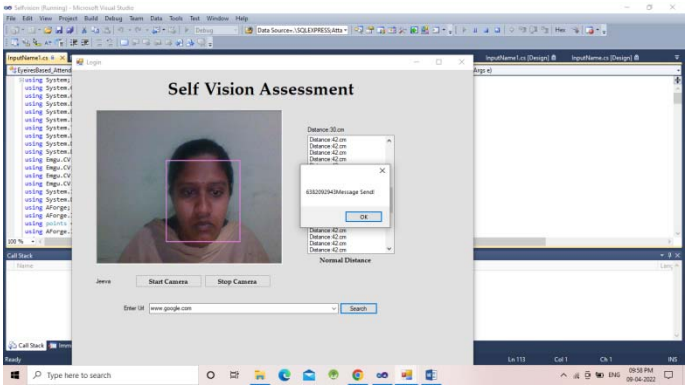

Figure 8. Enter the already saved URL and click it.

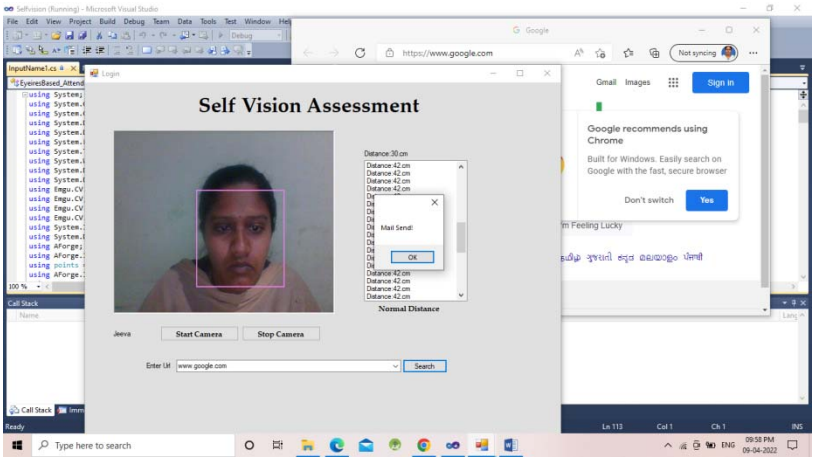

Figure 9. Here, the mail and messages will be sent to the parents E-mail ID and Phone number.

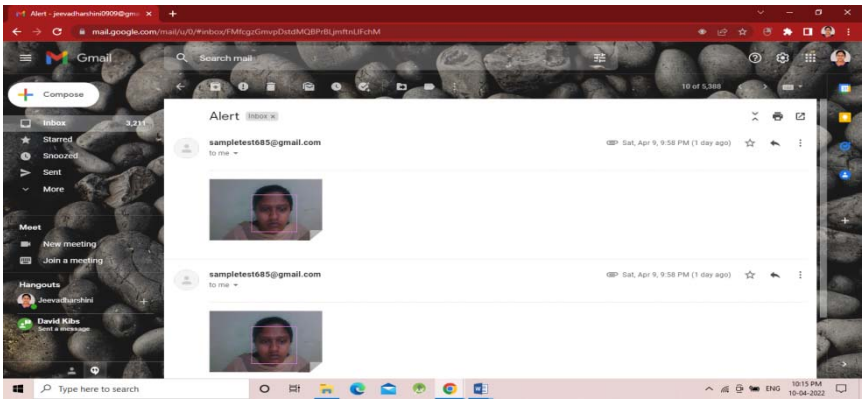

Figure 10. If the students is too close to the monitor or too far from the monitor, then the alert will be sent to the given parents E-mail ID.

Figure 11. If the students is too close to the monitor or too far from the monitor, then the alert will be sent to the given parents Phone number.

FUTURE ENHANCEMENT

In future we can extend the system to implement various face detection algorithms to improve the accuracy of the system and implement in different scenarios. We can also implemented in various types monitors

VI. CONCLUSION

When we look at close electronics, our eyes tilt inward towards the nostril, which is known as convergence. Because of convergence, the image of the devices may be projected onto each retina at the same position. If convergence isn't perfect, we see two separate images. Greater strain on the muscles that cause the eyes to focus inward indicates that the devices are closer. An additional component of the visual apparatus is a vergence resting factor (RPV). This is the distance at which the eyes are trained to converge even when there is nothing for them to focus on, and it is analogous to the accommodation resting point. It's also known as "darkish vergence," which sounds like a horror movie. There is no easy way to set a minimum viewing distance requirement. In this study, we propose developing a system that utilises photo processing methods to identify faces acquired by a digital camera at distances greater than the vergence resting point. Then, we offered photos of happy, smiling individuals superimposed with bounding boxes to make the song more relatable. Finally, define the proximity thresholds that will be used to ascertain whether a user is in close proximity to the device. Normal viewing circumstances and unfavourable online access were also determined for the person. Everyone, regardless of age, may use this technology for things like gaming, business, and more.

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Video Forgery Detection Using Features Extraction And Segmentation Techniques

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Abstract

The ability to edit digital videos is becoming increasingly straightforward as video editing tools progress. Determining the authenticity of videos has become a prominent problem in the area of information security. The purpose of video forensics is to uncover characteristics that distinguish authentic movies from forgeries. As a result, people can tell whether a video is genuine or not. A form of differentiating strategy based on video data that includes copy-move detection and inter-frame manipulation detection has become a hot topic in video forensics. Anyone may now publish, download, and distribute materials such as audio, photographs, and video over the internet thanks to the rise of viruses.Two examples of Multimedia software and tools are programmers that allow you to edit or alter media files are Video Editor and Adobe Photoshop. Furthermore, altering video sequences in such One of the most typical malicious video forging procedures is the insertion or deletion of objects within the frame. In this research, copy move assaults are identified using Detection of video counterfeiting using features taken from frames and compared to authentic footage, and for detection, the Scale Invariant Feature Transform (SIFT) has been improved. First, picture key points are obtained, and a multi-dimensional feature vector known as a SIFT descriptor is created for each key point. These crucial spots are then matched using distance as one of their properties. Despite the fact that this approach detects copy move attacks effectively. We can provide information on the total number of forged frames, as well as the types of forged frames. Create the application as a window-based application using image processing techniques as well.

Index Terms—Forgery of video, Features Extraction, Key points, Query frames, Reference frames, SIFT features

I. INTRODUCTION

Computer forensics (sometimes referred to as computer forensic science) is a subset of digital forensics that deals with evidence acquired from computers and digital storage media. Computer forensics is the forensic examination of digital media with the objective of detecting, conserving, retrieving, analyzing, and presenting facts and perspectives on the digital data. Although computer forensics is most commonly linked with the investigation of a wide range of computer crimes, it can also be used to investigate other types of crimes, it can also be employed in civil lawsuits for other objectives. Although data recovery techniques and concepts are employed, there are additional norms and practices in place to ensure that a legal audit trail is produced.The same concepts and approaches apply to computer forensics evidence as they do to other types of digital evidence. It has been employed in a number of high-profile cases and is slowly gaining acceptance as a trustworthy tool in both the American and European legal systems.

Passive and active recording devices are the most frequent digital video evidence types. A recording system that does not save information in its memory system is referred to as a "passive recording system." A method for active recording saves data by using its memory system. A hard disc drive (HDD), solid state drive (SSD), or volatile (flash) memory is the most common digital storage medium used in active recording systems. Digital video records are created in the following formats by video recorders:

Format for open source:A file format for storing digital data that is defined by a publicly disclosed specification that anyone may use and amend is known as an open-source format. A standards organization is normally in charge of keeping it up to date.

Format that is unique to the company:A proprietary format is a file format used by a firm, organization, or person to store and arrange data using a specific encoding method. This system is intended to be hidden by the company or organization, with only proprietary software or hardware provided by the company being able to decode and interpret the data saved. These formats are becoming more popular because they are a more secure and higher quality format when video evidence is obtained directly from the system that made it. These proprietary formats also include digital data such as Meta Data and Telemetry Data, which can aid in a video forensic investigation.

Format for use in a courtroom:A computer, projection device, or huge television can simply play a duplicate of the video clip in a court of law. Before being presented in court, this digital format should be tested on the computer it will be played on. This format is commonly provided by a flash drive, DVD, or Data Disc. Despite the fact that the watchable copy will be encoded in a standard video format (MP4, AVI, WMV), it may still be necessary to advance frames and smoothly play or decode the movie using a freeware player such as VLC or DVD playing software.A professional video forensic specialist uses scientific methodologies such as forensic video analysis and authenticated video recording to ascertain what happened at the time of the incident. Things are seen differently by the human eye and by CCTV cameras. Some of the video recordings we review in our lab have been tampered with, either deliberately or unintentionally, utilizing methods that compromise the evidence's integrity. As video forensic specialists, we are required to review and conduct several scientific tests in order to determine the nature of any anomalies in the video recording so that we may aid our client attorneys in understanding the anomalies.Because of the widespread availability of digital video and digital picture editing software, accurate multimedia content authentication has become problematic. Thanks to With today's modification techniques and the continuous advancement of multimedia technology, even a novice may quickly delete an object from a video sequence, add an object from another video source, or insert a graphical object. program designer. It's becoming increasingly difficult to

distinguish between a legitimate video and one that has been tampered with. Figure 1 depicts the basic layout forgery detection.

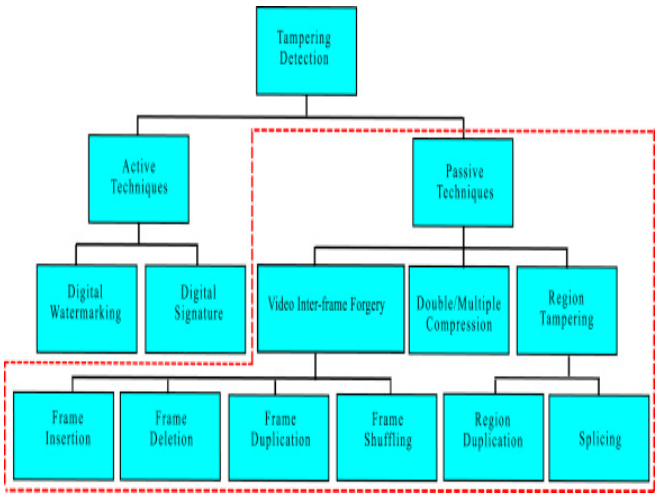

Fig 1: Tampering detection techniques

II. Related Work

MubbasharSaddique, et.al,…[1] This research focused on both recognizing and locating forged video segments (VSs). The texture of micro-patterns in tampered frames is changed during spatial domain video manipulation, which is a major evidence of fraud. To describe tampering traces in video frames, the texture descriptor Histogram of Oriented Gradients (HOG) was used. Gradient orientation is used in this descriptor and its derivatives, despite the fact that it is ineffective in describing local texture micro-patterns and modifications. HOG only provides shape information due to its gradient orientation, making it subject to noise and scale fluctuations. The Local Binary Pattern is another prominent texture descriptor being studied for image counterfeit detection (LBP). It's been utilized for a wide range of categorization tasks. Noise and tiny gray-level fluctuations are vulnerable to this description, which is resistant to monotonic illumination changes and contrast variation. Furthermore, edge strengths are not taken into account by LBP.

Mohammed aloraini, et.al,…[2] installed a surveillance video surveillance system that has become critical for social security and monitoring many organizations, and it is critical to verify the trustworthiness of these surveillance films. If these recorded films are misused, it could result in a slew of serious issues with public safety and legal evidence. That is, determining whether a recorded video is real or not, especially when it is utilized as key evidence in a court of law, is the fundamental challenge. Furthermore, with the emergence of powerful and simple-to-use media editing tools, an attacker might maliciously fabricate a video sequence by adding or deleting an object in a scene with little effort and no obvious traces.This fabricated film is frequently deceptive since it appears realistic and so credible. That is, media are occasionally duped into publishing faked movies as though they were authentic As a result, video footage should be scrutinized properly to ensure its validity and integrity, hence decreasing digital crimes. The topic of identifying object-based video counterfeiting is investigated in this research. Due to the possibility of varied speeds and illuminations in movies, Adding moving objects without leaving visual traces is tricky. We offer a method for detecting and estimating the movement of eliminated moving objects from a video scene captured by a static camera. Object-based video forgeries are examined in this work, and a method based on it is proposed.We also demonstrated that using spatial decomposition and sequential analysis, the suggested approach can estimate the movement of different sizes of removed objects and detect temporal changes that are practically imperceptible. Our method not only surpasses the other in terms of Precision, Recall, and F1 score, but it is also more resilient against compressed and lower definition films, according to the results. Because the sequential analysis stage is computationally expensive, we will focus our future research on enhancing the detection speed of the suggested technique.

Mengnan du, et.al,…[3]have been committed to detecting forgeries, their detection generalization capability remains an issue, and their performance reduces dramatically on previously unknown but comparable manipulations. To close this gap, we offer the Locality-aware Auto Encoder (LAE) in this research, which integrates In a single framework, fine-grained representation learning and locality enforcement are combined. We use pixel-wise mask to regularize local interpretation of LAE to encourage the model to learn intrinsic representation from the forgery region, rather than collecting artifacts in the training set and learning spurious correlations to achieve detection.We also offer an active learning system for identifying the most difficult candidates for labeling and reducing annotation efforts to ensure consistency in interpretations. The results of the experiments show that LAE can make decisions by focusing on the forgery sections. The results also reveal that LAE outperforms In terms of universality, state-of-the-arts on forgeries developed by various manipulation methodologies.Based on the foregoing discoveries, we provide the Locality-aware Auto Encoder (LAE) in this paper for improved forgery detection generalization. LAE considers both fine-grained representation learning and enforcing locality in a single framework for image forensics. Our method is based on an auto encoder that captures the distribution for the training images using reconstruction losses and latent space loss, resulting in fine-grained representation learning. To regularize the local interpretation, we add local interpretability to the auto encoder and use extra pixel-wise forgery ground

truth to defend against false correlations learnt by the auto encoder. As a result, the LAE is enforced in the forgery region to catch discriminatory representations.

Irene amerini, et.al,…[4] Deep learning techniques are increasing the technological sophistication of multimedia content creation and processing. Deep Fakes (DF) is a new phenomenon that allows people to easily create realistic videos in which their faces, or sometimes just their lips and eyes movements, are altered to likely simulate the presence of another subject in a given context or to make someone speak coherently with a different and, most likely, compromising speech.When this false information is used to intentionally injure a person, such as a public personality or a politician, or even an organization, such as a political party, the consequences are obvious. The impact of Deep Fakes can also be enhanced by social media's ability to distribute information swiftly and globally. According to this, the machine learning community has paid special attention to this phenomenon in two ways. This extended abstract provides a revolutionary technique for identifying real from deep fake-like films. In contrast to state-of-the-art algorithms that normally operate in a frame-based manner, we offer a sequence-based technique dedicated to analyzing possible dissimilarities in the temporal structure of a video.Specifically, optical flow fields were collected in order to take advantage of inter-frame correlations and feed them into CNN classifiers. The idea of using This work introduces and investigates optical flow field dissimilarities as a cue to discern between deep fake and legitimate videos. This is a rather inventive way of accounting for possible temporal inconsistencies in the sequence. Motion vectors were represented as 3-channel images in this first experiment, and then used as input for a neural network to overcome the challenge of using a pre-trained network.

Markoszampoglou, et.al,…[5] There is a pressing demand for tools to help professionals detect and prevent manipulated content. Multimedia forensics attempts to bridge this gap by developing techniques and tools that assist investigators in detecting traces of manipulation and extracting information about the history of a multimedia item. In recent years, research into automatic video verification has progressed tremendously; nonetheless, state-of-the-art systems are not yet mature enough for journalists without specialized training to utilize. Expert verification, or skilled specialists visually inspecting the film under several picture maps (or filters4) in order to find inconsistencies, is now the most common method used in real-world video forensics. We investigate the possibility of two unique filters developed for human visual assessment in the context of automatic verification in this article. The filter outputs are used to train a collection of deep learning visual classifiers to learn to discriminate between real and manipulated videos. We examine their viability in real-world scenarios using a dataset of well-known tampered and unhampered news-related videos from YouTubescenarios, in addition to proven experimental forensics datasets.

III. EXISTING METHODOLOGIES

Wang,W.[11] The cheap availability of video and image altering software has made it harder to authenticate multimedia information in recent years. Signal acquisition and processing thanks to the availability of has been more accessible to a wider range of people low-cost and easy-to-use digital multimedia equipment (such as digital cameras, mobile phones, digital recorders, and so on), as well as high-quality data processing tools and algorithms. As a result, a single image or video can be processed and changed by multiple people. Because the originality and integrity of digital content cannot be guaranteed, this fact has serious ramifications when it is used to support legal evidence.Important elements in the recorded scene might be buried or removed, and the genuine source of the multimedia material can be hidden. Furthermore, because there is no method to identify the original owner, detecting copyright infringements and validating the legal possession of multimedia data may be challenging. Illegal crimes are committed using digital movies and photos with fake material. As a result, the integrity of digital content must be validated. Analyzing the qualities of digital media can help with this. The current method separates the test video is divided into frames, with each frame divided into 12 non-overlapping sub-blocks. Each sub-block is translated into each frame the frequency domain using the discrete cosine transform (DCT). Each sub-average block's DCT value is Each frame is calculated, and a row vector containing averaged DCT values is obtained. For each frame, the generated row vectors are binarized. By computing a correlation matrix utilizing binary row vectors, the suggested technique creates a correlation image for the current test video. In the correlation image, brighter pixels represent similar frames.

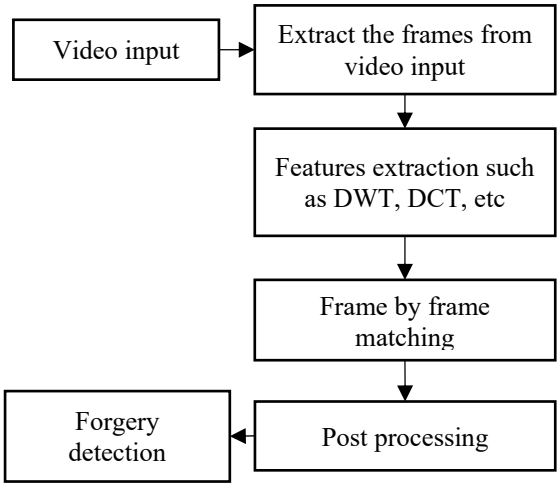

Fig 2: Existing approaches2 depicts the present framework

IV. PROPOSED METHODOLOGY

Shivakumar, B. L., [12] Our daily lives are now pervaded by digital video material as one of the most significant ways of communication in the digital era. People and society have benefited from advances generation, transmission, storage, and retrieval of video, as well as applications such as video sharing platforms and video conferencing. Images and videos on video sharing and social networking sites like YouTube, Facebook, Instagram, and others are emblematic of social, economic, and scientific development. Other applications, such as the entertainment industry, video surveillance, legal evidence, political videos, video courses, advertisements, and so on, show how revolutionary they are in today's world. Videos may be quickly made, stored, sent, and processed in digital format because to the widespread use of the Internet, as well as inexpensive and high-quality cameras, PCs, and user-friendly editing tools.Any inexperienced person can use these approaches to make unlawful changes to video content, compromising its integrity and authenticity. This option necessitates determining whether multimediaImage and Video Source Class Identification [13] content retrieved via The information on the internet, as part of a video surveillance system, or as received by a broadcaster is authentic. As a result, there is a dark side to videos, which is the misapplication or incorrect projection of information through videos, in addition to its amazing behavior. The purposeful modification or alteration of a digital video for the purpose of fabrication is known as digital video forgery. Video forgeries are the manipulation of a video in such a way that the content is perceptually altered.Video falsification can range from simple things like inserting advertising into sporting event broadcasts to more complicated things like digitally removing people from a video. The two categories of video forgeries are spatial forgeries and temporal forgeries. When collecting a video sequence, there is frequently a lot of redundancy between the successive frames. The MPEG video compression method takes advantage of this redundancy by anticipating particular frames in a video sequence and storing the difference between the expected and actual frames. This results in a more efficient compression strategy since the expected difference may be compressed at a faster rate than the entire frame Compression, on the other hand, has issues with this approach since any inaccuracy introduced by one frame propagates to all frames predicted from it. To prevent error propagation, the video sequence is divided into segments, each of which is referred to as a group of photographs (gop). To prevent decoding difficulties from spreading across the video sequence, frame prediction is performed inside each segment, but not across segments.Within each group of images, there are three types of frames: intra-frames (I-frames), predicted-frames (P-frames), and bidirectional-frames (B-frames). Each cycle begins with an I-frame and continues through P-frames and B-frames. Because no prediction is done when encoding I-frames, each one is encoded and decoded sequentially. During encoding, each I-frame is compressed using a loss algorithm similar to JPEG [14] compression.Motion estimation is used to encode P-frames in a predictive fashion. SIFT characteristics are retrieved from gray-level images and are generally insensitive to post-processing techniques. They're employed in a wide range of image processing applications, from medical to space-related. It is the most commonly researched algorithm, with a variety of modified variations.

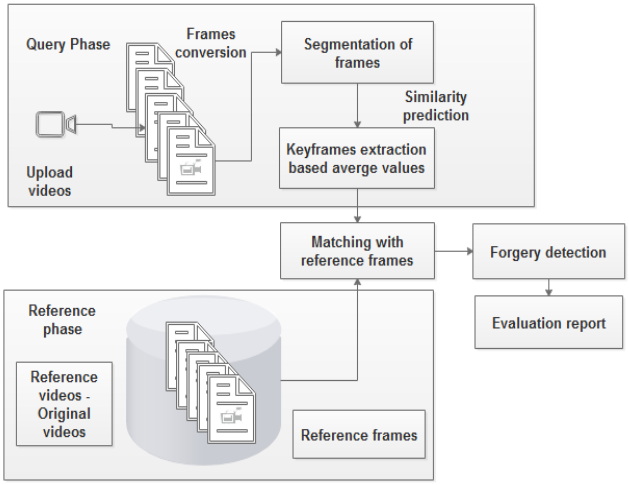

Fig 3: Proposed framework

VIDEO ACQUISITION:

We can upload videos that are deemed inquiry videos in this module. Original videos, sometimes known as reference videos, are available to the administrator. Using video file reader coding, we can transform the videos into frames every 0.5 seconds. Each frame is treated as a separate image.

VIDEO FEATURES EXTRACTION:

The practice of reducing the resources required to explain a large quantity of data is known as feature extraction. The vast number of variables involved is one of the most difficult aspects of conducting extensive data analysis. Feature extraction is a broad term that relates to methods for combining variables to avoid these problems while still accurately describing the data. We may extract features from each frame in this module, such as color, object form, background features, and so on. These characteristics are extracted in order to perform future integrity checks.

SEGMENTATION OF VIDEOS:

Segmentation is the process of grouping frames based on video characteristics. Video segmentation is a technique for separating frames into meaningful chunks. Segmentation is best used in the context of video capture to capture a screen presentation that the presenter goes through slide by slide. Detection offrame [15] and the program compares and calculates

the similarity of each video frame in order to determine whether or not the scenery has changed. We'll break the video here if there's a change, and then we'll break it into shots. We consider the first frame of each shot to be the crucial frame and show it to the users. To compare the similarity of two video frames, we use the Color Indexing concept. Key frames are retrieved and saved as segmented frames in this module.

VIDEO FRAMES CLASSIFICATION:

Following segmentation, we can get a list of feasible frames that are less than the total number of video frames. The query video segmented frames are matched with the reference video segmented frames in this module. Both frames are used to determine similarity values. These figures are derived from each frame's color, shape, and texture data.

FORGERY PREDICTION:

If the similarity values aren't the same, the video should be regarded as a counterfeit. Otherwise, take the values as they were. Predict the forgery frames from inquiry videos if it's forgery.

V. EXPERIMENTAL RESULTS

The proposed work can be implemented as Video forgery detection framework using C#.NET as front end and SQL SERVER as back end. Based on proposed algorithm we can detect the forgery pixels in uploaded videos. The performance of the proposed system can be evaluated in term of time in seconds. In this screen, display the features matching for original Every crucial point can benefit from videos and similarity matching. The original videos are displayed on the screen.

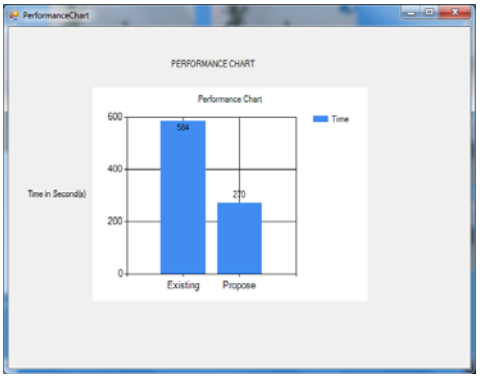

Fig 4: Performance chart

The system's performance can be measured in terms of time. In comparison to the present framework, the suggested framework examines forgeries frames in a fraction of the time.

VI. CONCLUSION

By recovering information about a video's history, digital video forensics tries to verify its validity. Copy paste forgery is when a segment of a video is changed with a segment from another video (with possible transformations). Because the cloned segment is Significant aspects like noise, color palette, and texture from the same video will blend in with the rest of the movie, making it more difficult to recognize and detect. The purpose of video copy detection is to provide an automated video analysis tool for copyright control, monitoring, and database structuring that can recognize original and modified copies of a video amid a large amount of video data. Video on the internet forensics is a relatively young branch of study that tries to verify the authenticity of videos by retrieving information about their past. Natural, forgery detection, flow mapping, and source identification are the four fundamental difficulties identified by studies in the literature. As a result, determining the originality and validity of movies or data has become a difficult task in many circumstances. We offer various novel digital forensic approaches in this research to detect indications of editing in digital multimedia information. For forensic tasks like cut-and-paste forgeries from JPEG compressed movies and SIFT, we apply segmentation-based forgery detection. This SIFT-based approach relies on key point detection for feature extraction. If there is an occurrence of duplicate move attack, this method is most commonly applied to locate vengeful control with computerized records (advanced frauds). The planned effort has yielded a viable result in the form of a correlation with the leaving model.

VII. FUTURE SCOPE

In future, effective research is required toCopy paste forgery is when a segment of a video is changed with a segment from another video. Also we can reduce a time and accuracy of the video in the application. The video forgery can be easily identified Using future techniques.

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Fuel Cell Based Vehicle

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Abstract.

The effective usage ofreversible PEM fuel cell for vehicle application is presented in this paper. The PEM fuel cell is anunconventionalenergy carrier, particularly for transportation and stationary power generation applications because of its higher efficiency, the operating temperature is less, power density is more, quick startup, and system robustness.The reversible PEM fuel cell will act as electrolyzer to produce hydrogen gas and oxygen gas. When the electrical energy is required, the stored hydrogen gas is given as input fuel to the fuel cell to generate electrical energy. An investigation on the performance ofelectrolyzer, hydrogen flow rate and fuel cellare presented. The generated electrical energy from the fuel cell is given as input to DC motor which is connected to the wheel of vehicle. The vehicle model and its performance are also discussed. The byproduct of Fuel cell vehicle is water and thus there is no emission of harmful gases.

Keywords.Electrolyzer, Fuel cell, Fuel cell vehicle

1. INTRODUCTION

On the renewable energy source the intermittent problem is a major drawback; to overcome the issues a suitable energy storage system is used. The energy storage in the form of hydrogen is appropriate for long term storage compare to battery storage system. Hydrogen [1] is an emerging renewable energy resource which contains high efficiency, high calorific value and clean gas which is become as a replacement for gasoline. It is plentiful but is not a naturally occurring gas, it passes through a number of processes that allow it to be produced as a free gas and stored safely and efficiently inside the tank [2]. There is various ways to generate hydrogen gas from renewable resources. The most suitable one is electrolysis method. Here the water is used, the electrolyzer separate the hydrogen and oxygen gas. The separated hydrogen is stored in hydrogen tank in form of gas. The stored gas is used in fuel cell. Fuel cell is a device where electrochemical reaction takes place which converts free energy as electrical energy.

The dynamic modeling of electrolysis process for the effect of temperature and flow rate in both analytical and experimental way the results were shown [3]. The fuel cell integration with grid was simulated and results are shown [4]. The hydrogen production using PEM electrolyzer and filling fuel cell car using compressor model was simulated [5]. In the literature [6], the innovative idea of Fuel cell car based on renewable energy sources was discussed. The conventional vehicles, hybrid vehicle, electric vehicle and hydrogen fuel

cellbased vehicles are compared based on their economic performance and environment impact [7]. The literature [8] represents investigated results of economic efficiency on using hydrogen fuel cell. The Fuel cell vehicle was controlled by fuzzy logic controller is illustrated in [9-13]. Energy management system is developed and simulated to prevent the lifetime of the storage system in fuel cell vehicle [14]. In these paper, Mini reversible PEM Fuel cell characteristics on both the electrolyzer and fuel cell process is discussed in first section and the second section presents the results of Fuel cell based vehicles.

2. REVERSIBLE PEM FUEL CELL

In the reversible PEM Fuel cell, it can function as electrolyzer and also as a fuel cell. The hydrogen gas and oxygengas act as input to the fuel cell togenerate electrical energy andbyproduct as water is produced [4]. When it act as an electrolysis device,on applying electrical energy it seperate water as hydrogen ion and oxygen gas. The Schematic diagram of Reversible PEM Fuel cell is shown in Figure 2.1.

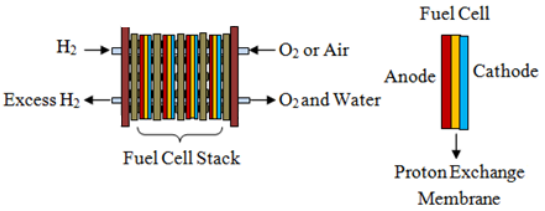

Figure 2.1. Schematic Diagram of Reversible PEM Fuel Cell

In a plastic housing, PEM fuel cell has two electrodes placed together within gaskets and held tightly together. The twoElectrodes function as electrical contact points. In the two electrodes, different electrochemical reaction occurs on them. The electrode on the hydrogen side is named asan anode;another electrode is the oxygen side so it is named as the cathode. During the process, the anodeelectrode electrically separates the neutral hydrogen molecules aselectrons [3]. A chemical reaction occurs at the catalyst. The positively charged hydrogen ions move through the polymer membrane and reach the negatively charged cathode. The electrons pass throughthe circuit from the anode to the cathode. The splited hydrogen ions are known as protons. The photons are small pass through the holes of membranes, but oxygen ions are larger in size cannot move through the membrane hole. Hence, it is called as Proton Exchange Membrane [3]. At the cathode side, the hydrogen ions combine with the oxygen molecules and separated electrons passes through the external circuit. As a result of reaction, water is formed. That is the hydrogen and oxygen ions are again combined to produce water molecules.

In the electrolysis process, the energy is needed to split the water molecules and thesame energy is producedduring the recombination of ions. In such a way, an electrical voltage is produced in the fuel cell. On connectingan electrical load (the electric motor)on the anode and cathode, the electrons move from the anode to cathode [5]. Thus an electric current passes to the motor and it starts to run. The conversion takes place catalytically, whereas the electrodes do not change during the chemical reactions. There are no flames, so heat is not produced. The following electrochemical reactions occuron the electrodes of the fuel cell [4],

Anode: $2\ H_2 \rightarrow 4\ H^+ + 4\ e^-$

Cathode: $O_2 + 4\ H^+ + 4\ e^- \rightarrow 2\ H_2O$

Net Reaction: $2\ H_2 + O_2 \rightarrow 2\ H_2O$

The water production at the cathode (oxygen side) can be easily collected. When the fuel cell generates current proper care should be considered. On increasing the current flow, the water is regenerated faster from the hydrogen and oxygen gases.

2.1 Fuel Cell based Vehicle

The vehicles working on hydrogen gas are increased due to reduce the environmental pollution. Fuel cells for transportation have also been verified in public bus systems. There have been some prototypes buses on the road around the world are available. Majority of these buses are produced by UTC power, Toyota, Ballard, Hyrogenics and the Proton Motor. In the recent study of United States National RenewableEnergy Laboratory, it has proven that the fuel economy of hydrogenfuel cell based buses is higher for the factor of 1.8 to 2.4 than the fuel economy of diesel or compressed naturalgas buses [15].

Fuel cell vehicle is use hydrogen gas to generate electric power with the help of this electric power motor run. Unlike conventional vehicle which runs on gasoline, fuel cell combines hydrogen and oxygen which is used to generate electricity to run motor. But range of fuel cell vehicle is comparable to conventional trucks and buses. Hydrogen fuel cell vehicle have a significant potential to reduce emission from the transportation sector, because they do not emit any greenhouse gases during vehicle operation [14]. The Fuel cell vehicle has four wheels, dc motor with gear set up and gas tank.

3. RESULT AND DISCUSSION

The experimental study is done separately for two processes as electrolyzer unit and fuel cell unit. Initially, an electrolyzer process is done for segregating the water molecules as hydrogen gas and oxygen gas. The process includes the electrolyzer stack; distilled water is to be filled in 30ml tank, and two separate tanks with 24ml and 12ml to store hydrogen gas and oxygen gas respectively. The electrical energy is given as input to the electrolyzer. On supplying electrical power, the water split into hydrogen ion and oxygen separately stored in two tanks. The hardware setup of electrolyzer process is shown in Figure 3.1.

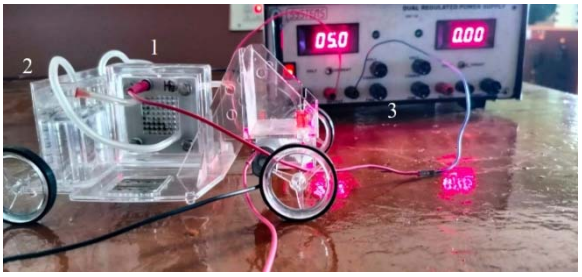

Figure 3.1. Hardware Setup for Electrolysis process
1. Electrolyzer stack 2. Tanks 3. Regulated Power supply

The cell voltage and current density characteristic is shown in Figure 3.2. From the Figure 3.2, it is shown that on increasing the current density the cell voltage also increases. The cell voltage is depending on equilibrium voltage, activation loss, ohmic loss and concentration voltage.

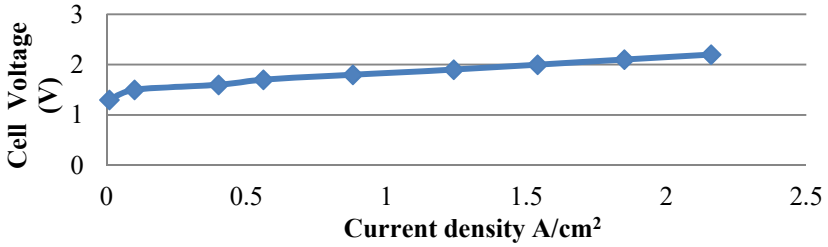

Figure 3.2. V-I characteristics of Electrolyzer

The hydrogen and oxygen flow rate from electrolyzerfor the input voltage 1.5V is shown in Figure 3.3. The both gases are separetely collected in two tanks of 30ml and 15ml respectively. In order to maintain the temperature, the tank is circulated by distilled water.

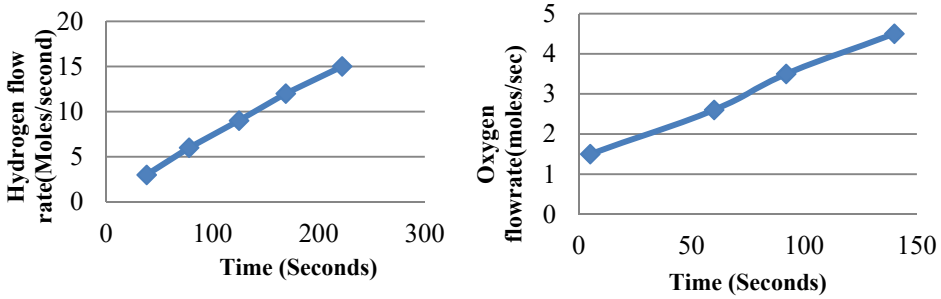

Figure3.4. Hydrogen and oxygen flow rate from electrolyzer

The stored hydrogen gas is passed as input to the fuel cell for the variable load (Decade resistance Box). The V-I characteristics of fuel cell is shown in Figure3.5.

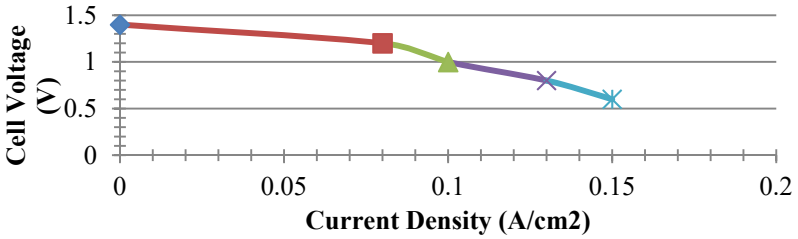

Figure 3.5. V-I characteristics of Fuel cell

To run the fuel cell based Vehicle, the fuel cell is connected to 5V DC motor. The DC motor linkedwith the wheel shaft. The vehicle can cover a distance of 12 feet in 25 seconds. The model of fuel cell based vehicle is shown in Figure 3.6.

Figure 3.6. Fuel cell based Vehicle

4. CONCLUSION

In this paper, the experimental study of both electrolyzer process and fuel cell process is carried out using reversible PEM Fuel cell. The hydrogen and oxygen are produced from electrolyzer and the flow rates are shown in the result. When the motor connected to fuel cell the electrochemical reaction carried out, the electrical energy is produced due to the movement of electrons.Thus the vehicle starts to move for a distance of 12 feet. The toxic gases production from vehicle is drastically reduced and environmental friendly vehicle.

5. FUTURE SCOPE

In future the vehicle model is designed with large tank capacity to cover long distance with suitable controller for better performance of vehicle.

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Hydrogen and Oxygen Production from Solar panel Using Electrolyzer

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Abstract.

Now a day the utilization of renewable energy resources is raised to meet out the energy demand. The major drawback in renewable energy sources is discontinuous energy supply. Hence, to overcome the drawback, a proper energy storage system is required. Usually, the batteries are used. On using batteries, periodic maintenance is required and not appropriate for long-term storage. Therefore, for long-term usage, the excess energy can be stored in hydrogen gas form. For storing excess energy, as hydrogen gas an Electrolyzer method is used. During the conversion process, oxygen gas is produced as a by-product. In this paper, a buck converter is designed to step down the voltage. The output of the converter is given as input to the electrolyzer for the production of hydrogen and oxygen gas. This system is pollution less system.

Keywords. Solar PV system, Buck converter, Electrolyzer, Hydrogen gas, Oxygen gas.

1. INTRODUCTION

Energy is the prime source for socio-economic development of country [1]. The renewable resources have become the most vital field in research, based on availability of resources and it will reduce the impact of fossil fuels in the environment. These unconventional energy carriers are always obtaining the greater popularity in particular to the awareness of shortcomings of fossil fuels and its rise in price cost [5]. Among the non-conventional renewable resources, the energy produced from solar energy has become an affordably greater probable for the conversion of electric power [2].

A hybrid renewable energy system comprising of solar panel/wind turbine generator/biogas generator/fuel cell is investigated for both standalone and on-grid applications in [1]. An optimal configuration of the system is developed to meet the electricity demand for both economical and environmental point of view. A case study on electricity generation in South Australia State [3] by utilizing the stored hydrogen in large quantity and longtime storage applications are discussed. The storing the energy in battery and in the form of hybrid battery hydrogen storage systems are compared based on the development of technology and as well as on economical point. As a result, it is found that hybrid battery hydrogen system is costlier. Similarly in [4], the energy storing in battery and in the form of hydrogen are compared. It is

concluded that the combination of battery and hydrogen storage system has advantages of both the systems. Hybrid Renewable System with Fuel cell is investigated on techno-economic point of view for Bozcaada Island in Turkey [5]. The study concluded that this method is expensive and the cost per unit of electricity is $0.17/kWh. From these literature reviews, it is understood that the storing energy in hydrogen form is a more promising system for long term storage. In [6], an optimized off-grid solar PV/Fuel Cell/Diesel Generator power system is designed for a university building. In [7], a standalone hybrid solar/wind/Fuel Cell/battery energy source is constructed and experimentally verified for various environmental conditions.

From the literatures, it is found that the solar energy plays a major role in electrical energy generation system. The generated electrical energy from the solar panel is proportional to the intensity of sun light on the photovoltaic (PV) panel. In literature [8-11] presents the solar PV energy system combined with electrolyzer to produce hydrogen. The modeling and simulation of hydrogen production from solar panel is discussed [12]. The nominal analysis of hydrogen production from solar PV array is illustrated [13-14]. The analytical and experimental results of electrolyzer for hydrogen production with various temperature effect and flow rate are discussed [15]. In this paper, the hardware set up of hydrogen and oxygen production system is discussed in first section and the hydrogen production using electrolyzer from solar PV system is discussed in second section.

2. PROTOTYPE DESCRIPTION

The hydrogen and oxygen production system from solar PV system consists of solar panel, buck converter, electrolyzer and two separate tanks for storing hydrogen gas and oxygen gas. The block diagram to describe the prototype model of hydrogen and oxygen production system from solar PV system is shown in Figure 2.1.

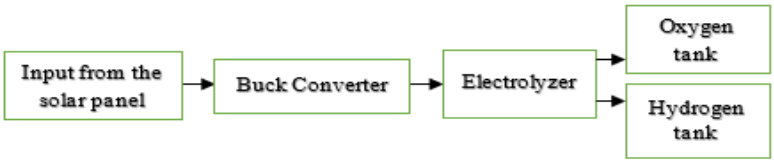

Figure 2.1. Block Diagram of Solar tracking system

2.1. Solar Panel

The light energy (photons) from the sun is flows on Photovoltaic modules to produce electrical energy. Mostly the module uses the wafer-based crystalline silicon cells or thin-film cells [2]. The cells are connected electrically in series with one another. Here 5W panel is used with 12 modules. PV modules are grouped in series to achieve maximum power voltage of 8.2 V. The open circuit voltage is 10 V and short circuit current as 0.29A.

2.2. Buck Converter

For the hydrogen and oxygen production from the electrolyzer, the electrical energy is required for conversion of gas. The DC voltage obtained from the solar panel is higher than the required voltage of electrolyzer. The required range of single cell electrolyzer is 1.5V – 3V. For that, a suitable buck converter is required. A Buck converter is a switching mode DC to DC electronic converter. It helps to transform the higher voltage level to the lower level voltage as required. Hence, it is also named as step down converter [11].

2.3. Electrolyzer

Electrolysis method can be used for hydrogen gas and oxygen gas production from the renewable resources. In the Electrolysis process, the electrical energy is used to segregate the water molecules as hydrogen and oxygen [8]. The electrolyzer composed of electrolyte, cathode and anode. In this paper, polymer electrolyte membrane (PEM) electrolyzer is used and the electrolyte is a solid plastic material placed in between the anode and cathode. At the anode side, the water entered and as a result of chemical reaction the oxygen and positively charged hydrogen ions (protons) are produced. Through the external circuit, the separated electron flow and the hydrogen ions passes through the electrolyte membrane (PEM) and reaches the cathode end. At the point, the hydrogen ions react with electrons from the external circuit and produce hydrogen gas. The reaction at anode and cathode end is expressed below [10],

Anode Reaction: $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$

Cathode Reaction: $4H^+ + 4e^- \rightarrow 2H_2$

3. RESULT AND DISCUSSION

In this research work, a solar panel of 5W is used with a maximum output voltage of 8.2V, short circuit current as 0.29A. From the panel, 8.64 V is produced during the full sun rays falls on the panel. The output voltage of solar is converted to 3 V by using buck converter. Then the output of buck converter is given as input to the electrolyzer. The hardware setup of Solar PV panel with electrolyzer is shown in Figure 3.1.

Figure 3.1. Hardware setup of Hydrogen and Oxygen production from solar PV panel using Electrolyzer 1. Solar PV panel 2. Buck Converter 3. Electrolyzer

The electrolysis process is used for separating the water molecules as hydrogen and oxygen. In the electrolyzer, the electrodes are connected to an external electric field and thus the electrons travel across the electrically conductive electrode at that time the protons travel through the PEM membrane. On supplying electrical energy, the water split into hydrogen ion and oxygen separately stored in two tanks with the capacity of 24ml and 12ml tanks respectively as shown in Figure 3.2.

Figure 3.2. Hydrogen and oxygen gas are separately stored in two tanks

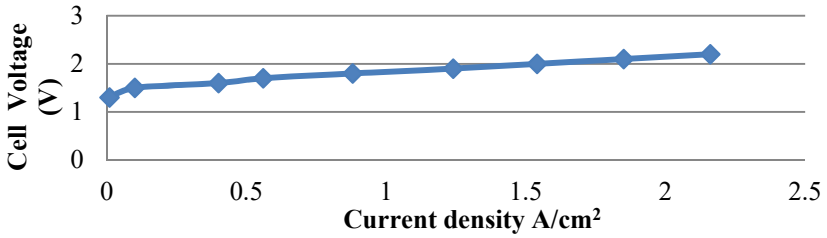

Figure 3.3. V-I characteristics of Electrolyzer

The Electrolyzer cell voltage and current density characteristic is shown in Figure 3.3. The increase in input voltage level, the corresponding production level of hydrogen and oxygen gas is also increased. The flow rate of both the hydrogen gas and oxygen gas is shown in Figure 3.4.

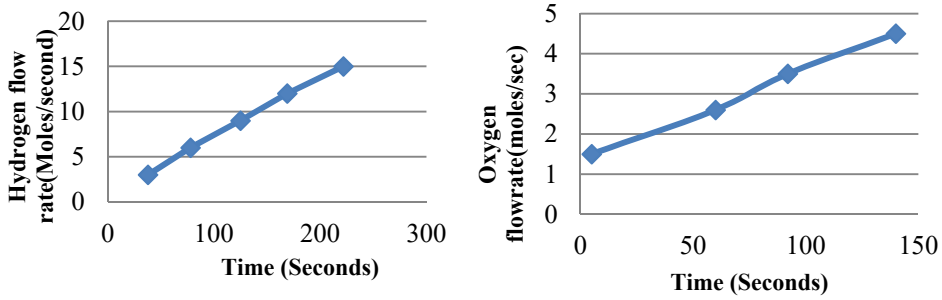

Figure 3.4. Hydrogen and oxygen flow rate from electrolyzer

4. CONCLUSION

This paper presents the hardware setup of hydrogen production and oxygen production from solar panel using electrolyzer. The energy generated in solar PV is reduced using buck converter as required for single cell PEM electrolyzer. An electrochemical reaction takes place during electrolysis process and split the water molecules as hydrogen and oxygen gas. The two gases are stored separately in 24ml and 12ml tank. The generated hydrogen gas can be used in fuel cell for production of electrical energy and oxygen can be used for medical purpose. This system saves the excess energy of solar without any lose and rectify the intermittent problems of renewable energy resources.

5. FUTURE SCOPE

In future, the fuels are going to be rare factor. At that time, the hydrogen gas plays an important role in the automobiles. This method of hydrogen production can be automated with suitable controller as a future work.

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Stock Market Close Price Forecasting Using LSTM And Candle Stick Charting

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ABSTRACT:

Stocks that are on an exceptionally fundamental level related with each other will regularly move together.Considering such typical examples is acknowledged to assist with loading advancement deciding endeavors. Regardless,such signals are not piddling to show in light of the fact that the relationship among stocks are not really presented andoughttobesurveyedfromerraticdata.Motivatedbythisinsight.Stockexpenseassumptionacceptsabasicpartinbuildinga trading system for monetary benefactors. The productive deciding of stocks' future expense will help the monetarybenefactors with extending their advantage. In any case, it is difficult to anticipate unequivocally the example of theprotections trade as a result of the muddled association between stock expenses and external elements like news, overalleconomy,generalsuppositions,andothertrickyfinancialinformation.Weproposeaconstructionthatsolidifiesthebetweenrelations hipoffirmstofigurestockexpenseoffollowingdaysharecost.Significantlearningapproachacceptsfundamentalpart in estimate of money related time series data. One of the strategies to do insightful examination using time series datais long transitory memory (LSTM). The figure precision of LSTM has been assessed using three estimations - RMSE, MSEand MAE.

KEYWORDS:

LSTM,CNN,ML,DL,TradeOpen,TradeClose,TradeLow,TradeHigh

1. Introduction

Securities exchange Future Forecasting is the endeavor on unambiguous assessment, depiction, andpresumption. Theinformation given by Maruti is utilized for our analysis.[1] Apart from this information is also gathered fromthemoneyrelatedexchangesuchasmonsterheadwaystocksandtheothers.Theopenandclosingstockofeverydayforaorganizationis monitored in order to predict the opening stockvalue of the next day. Our work aims at helping those who are interested ininvestingin stockmarket.Thefuture value ofthestock ispredictedusing LSTM.

2. Purposesofthe StockMarket– CapitalandInvestmentIncome

As discussed in [2],the money related exchange is important for two reasons. First is to give money to affiliations which helps tofoster the affiliations. If any stock value is less, then theaffiliation pays for an undertaking bank to deal with the stockresponsibility. By offering stock recommendations as opposed to getting the capital expected for increase, the affiliation avoidsaccomplishing responsibility and paying interest charges on that responsibility. The association keeps away from achievingcommitment and payinginterest charges on that commitment. For example, accepting a monetary patron buys parts of anassociation'sstockat$10adealandtheexpenseofthestockinthismannerclimbsto$15aproposition,themonetarybenefactorcanthen geta halfadvantage on theirtheory byselling their bits.

Bankswhoareinvolvedinthisstocktradingmakeuseoftheadvicefromesteemstockresearchspecialists as discussed in the work in [3].Thesepeople areresearcherswho checkwhethertheassociationsstockislikelytoriseorfall.Storebossesora portfolioboss,whichfusesadaptableventuresexecutives,sharedsavechiefs,andexchangetradedhold(ETF)bosses,are criticalmonetarytrade individualssince they exchange tremendous measuresofstocks.

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AnalyzingStocks- MarketCap,EPS, andFinancialRatios

ManyTradeanalystsandmonetarypatronscouldlookatagroupingoffactorstoshowhowastockreachesa

conceivable up or down in terms of cost in near future. There are many factors that help in analyzing the stock and help instockassessment.Monetarytradecapitalizationcontributestotheoveralllargenumberofremarkablesegmentsofthestock.A Market capitalization that is higher contributes more segments of stock to the association even though the association ismorefiscally sound.

Coming up next are two or three the key money related extents that monetary sponsor and specialists consider:Cost to Earnings (P/E)Ratio:An associationstockexpenseisequivalent to its EPS.

Commitmenttoequityshare

Commitment to Equity Ratio: A lower commitment to esteem extent, exhibiting fundamental supporting from monetarypatrons,isideal.

3 ReturnonEquity(ROE)Ratio

The benefit from ROE as pointed out by *X.Qiu and et. al in [4]* is considered to be a good indication of an associations improvement in potential asit showsthe relationbetweenthe associations net additionrelativetothetotal worthinterestintheassociation.

By and large income: There are a couple of in generalincome extents that monetary benefactors should seriouslythinkabout, including working generallyincome and netgenerallyincome.

TwoBasic Approaches toStockMarket Investing -Value Investing andGrowthInvesting

[5]D. G. Gloubos There are limitless procedures for stock picking that agents and monetary patrons use, but basically allofthemaresomesortofthetwofundamentalstockbuyingapproachesofcriticalworthcontributingorimprovementcontributing.Regard contributing is more based on avoidingrisk than improvement contributing is, in spite of the way that regard monetarysupportersreallyattempttobuy stockswhen they trustthe stock expensetobeanunderrated bargain. This has been stated by D.G.Gloubas in his work.[5]

OpenHighLowCloseinStocks

In trading with the stock, the words high and low indicates the limit and the smallest expenses in a given time frame.The words open and close are the expenses at which thestock value begins at the start of the day and the value of the stock at theendofa comparable period.

5 TimeMatters

TheperiodoftimeisveryimportantforanyassurancesesteemastheyfocusonOHLCV.Thisindicatestheopen, high, low, close, volume and is stated by *K.A.Althelaya[6]*.But if regardless showed, the period is for the most part regular; in any case, representativesjoinvariousperiodswhilekeeping an eye onthe worth movement ofa security.

"Open"and"Close"Prices

Many have the habit of going through the protectionstrade fragment of the morning paper everyday. We see as our mainstock,yet seethere issome differentoption from one worth near it. The header on one of them is "open". Open meanstheexpense atwhich astock started trading while theunderlying ringerrang.

Block input (z^t):

$$z^t = g(W_z x^t + R_z y^{t-1} + b_z) \quad (1)$$

Input gate (i^t):

$$i^t = \sigma(W_i x^t + R_i y^{t-1} + b_i) \quad (2)$$

Forget gate (f^t):

$$f^t = \sigma(W_f x^t + R_f y^{t-1} + b_f) \quad (3)$$

Cell state (c^t):

$$c^t = z^t \odot i^t + c^{t-1} \odot f^t \quad (4)$$

Output gate (o^t):

$$o^t = \sigma(W_o x^t + R_o y^{t-1} + b_o) \quad (5)$$

Block output (y^t):

$$y^t = h(c^t) \odot o^t \quad (6)$$

"High"and"Low"Prices

Theterms“high”and“low”costareconsideredtobethepossiblefusebythefinancialperiodicalsanddestinations. The former word indicates the most excessive expenseat which a stock was traded during a period. The laterwordindicatesthemostdiminishedcostoftheperiod.Thehighandthediscouragedspotsofastockforthedayiscalledas

intraday high and low. This is stated in *[7]E.Cambria and et al.,*

The qualification between the stocks open and close apportioned by the opening value is the stocks return orits presentation in terms of its rate. Let us extend our view point on the stocks presentation, example one-year, we would usetheendcostfromayear earlierand balanceitwiththeendcostfrom todaytogettheyearly return.

6 ProblemIdentified

In [9] K. Nagarathinam states that the financial business was one of the chief dares to embrace the use of AI and significant learning inits hypothesisassessment and exercises to upgrade their clients. Going beforeAI, significant learning, and the entirety "Quant"change in the 2000's so far, examiners and monetary supporters relied upon less precisely subordinate methodologies. Head andconcentratedassessment governedand,inspiteofthewaythattheyreallymakeupasignificantpieceoftheexamination,they'rebyandbygottogetherwithfiguresandassessmentdone by PCs.

Asbyfarmostknow,theprotectionstradeistheplacewherepeopleexchangestocks.Theshowofexchangingthese stocks (for instance trading) occurs in physical and virtual circumstances called "Exchanges". These exchanges are housesfor records (typically acknowledged ones are the Dow Jones Industrial Average and NASDAQ Composite). The exchanges arewheretheexpense of stocks thatmakeuptherundownsareset. The role and the functions of the exchanges are stated in the work of M.Kim in [10]

ThesignificantlearningstudyisasubfieldofAIcomputationsimpelledbytheconcernsandthestructureand limit of the frontal cortex; this is call fake mind association. Byfar most of the learning method uses cerebrum network designing, which is the explanation you want to focus on significant learning model is commonly referred to as a significant mindassociation.Here,themaxim"significant"generallyspeaking,impliestheamountofhidawaylayersofthemind association.Inthestandardmind networkinvolvesonly 2-3mystery layers, whilethedeepcerebrumnetworkswith upto 150 mysterylayers. M.Bildirici[11] and his team has explained this in their work.

In this proposed work, Long Shot Term Memory (LSTM) havebeen utilized for predicting the intraday closingexpense for Maruti association having a spot with different areas of movement. The financial data: Open, High, Low andClose expenses of stock are used for making new factors which are used as commitments to the model. The models aresurveyed using standardkey MARKET:RMSE andMAPE.

ComputationSelection

LSTMdoesnotdealwithsingedata,itneedsprogressionofdataforpreparingtherequiredinformationand to store the evident information. LSTM focuses projecting theoutput based on assumptions and time series data. It iscomfortabletowork with thebackslideissue.

AStockPricePredictorUsingLSTM

The proposed framework that learns online anticipatingthe close costs of the stock with the assistanceof LongShort-Term Memory (LSTM). The Long Short- TermMemory (LSTM) is a phony unpredictable neuralsystem(RNN) plan used in the field of deep learning, not in the least like standard feed forward mind systems, LSTM has inputaffiliations. Not at all does the procedure not revolve around single information (e.g., pictures)but moreover on fullinformationplans,(Forexample,atalkoravideo).Forexample,LSTMismaterialforundertakings,forinstance,undivided,affirmation, talk affirmation and recognition of idiosyncrasies in coordinated busy time gridlock or IDS(interruption regionframeworks).

TheWorkingoftheproposedsystem

H. Yan Tedious cerebrum network is kind of Long transient memory (LSTM). Due to the design of LSTM, theissueof long stretch dependence can be agreed to irregular neural network. To hinder the information's nerve, long flittingmemory is used. The outcome of network endeavors to be in indirect circle that decays or explodes through the analysiscircle, and the long stretch dependence is essential point of convergence of LSTM. In this module four estimations used intheendeavorsareintroduce.

MeanAbsolutePercentageError

W.Bao,MeanAbsolutePercentageError(MAPE)isoftentimesusedto studytheintroductionoftheassumptionstrategies.MAPEis similarlyanextentofassumptionaccuracy fordecidingstrategiesintheAIarea,itregularlypresentsprecisionasarate.Condition(1)showsitscondition.

LSTMPredictionmodel

$$\mathrm{MAPE} = \frac{1}{n}\sum_{t=1}^{n}\left|\frac{A_t - F_t}{A_t}\right| \times 100, \quad (1)$$

MeanAbsoluteError

The LSTM model was verifiable Python, a huge levelmind networks API in view of top of Tensor Flow, which isanopen-sourceprogramminglibrarymadebyGoogle.Itusestherecentlyreferenceddataset,withS&P500elementsoverthecourseoftheperiodoftimeof2003-01-01to2021-02-12andisolatesitin80%readinessdataand20%testingdata.With

Mean out and out screw up (MAE) is an extent of the differentiation between two characteristics. MAE is an averageofthe difference between the assumption and the genuine characteristics. MAE is a run of the mill measure of prediction bungle forbackslide assessment in the AI area. The formula is shown in Equation (2).where At is the real worth and Ft is the assumptionregard. In the situation, the altogether worth

of the difference between those is divided by n (number of tests) and added for eachanticipated worth.

$$MAE = \frac{1}{n}\sum_{t=1}^{n}|A_t - F_t|, \quad (2)$$

RelativeRootMeanSquareError

RootMeanSquareError(RMSE)isobtainedbyfindingthestandarddeviationoftheassumptionbunglesinthebackslidework.Theresidualscalledconjecturebunglesshowthedistancebetweentherealcharacteristicsandanassumptionmodelandalsotheydepictthewayinwhichtheyarespreadoutinthemodel.Theestimationgivesaclearpictureofhowthedataisconcentratedclosetothebestfittingmodel.TheresultofthisRMSEisthesquarebaseofthesquaredcontrastsamongtheexpectationsandthecertifieddiscernments. Relative Mean square error is like Root Mean square error which takes the total squared botch andnormalizes it byparcelingwiththefull scale squaredbungleoftheindicatormodel.Therelatedformulaisshownintheequation.

TheformulaisshowninEquation(3).whereAtisthesawworth,Ft istheassumptionworthandnistheamount oftests.

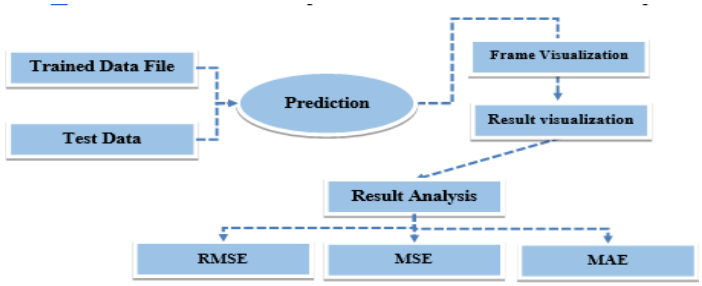
$$RRMSE = \sqrt{\frac{1}{n}\sum_{t=1}^{n}\left(\frac{A_t - F_t}{A_t}\right)^2}, \quad (3)$$

MeanSquaredError

The Mean Squared Error (MSE) measures the idea of a pointers and its worth is for the most part nonnegative (regardsmore like zero are better). The MSE is the second depiction of the goof (about the origin), and unites both the difference in theestimatemodel(howbyandlargespreadthepredictionsarebeginningwithonedatatestthenontothefollowing)anditstendency(how closethetypicalexpectedvalueisfromtheinsight).TheformulaisshowninEquation(4).whereAtistheseenworth,Ftistheestimateworthandnisthe amountoftests.

$$MSE = \frac{1}{n}\sum_{t=1}^{n}(A_t - F_t)^2, \quad (4)$$

thepickedfeature(s) ofthecurrentandpastnumberofdays(identicaltotimeadventure)asinformation(X),theendcostofthefollowingday isexpected asresult(y).



Fromtheabovediagramitshowsthatpredictiondonebythetrainedandtestdataafterthepredictionresultanalysisof RMSE,MSEandMAEis based onFrame visualizationandResultVisualization.

RESULT

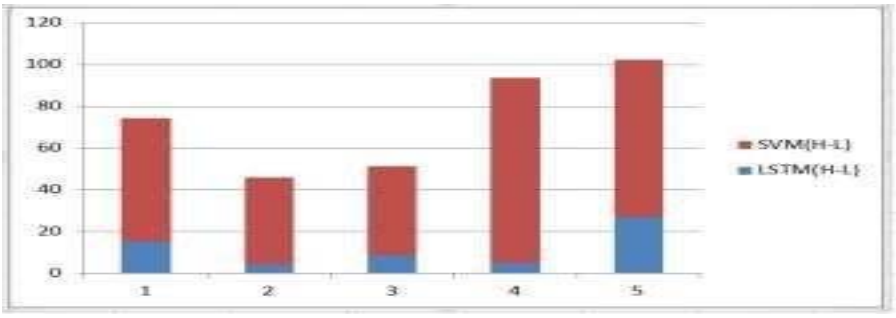


Fig1.SVMvsLSTMwith highandlow parameter

FromtheabovediagramitshowsthatcomparisononSVMandLSTMwiththeparametershighandlowparametersLSTMprovides greateraccuracy.

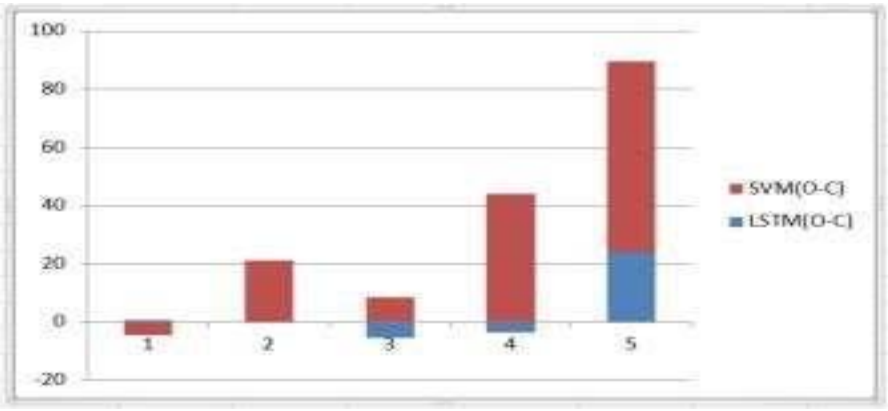


Fig2.SVMvsLSTMwithopenandcloseparameter

FromtheabovediagramitshowsthatcomparisononSVMandLSTMwiththeparametersopenandcloseparametersLSTMprovides greateraccuracy**.**

Conclusion and Future Enhancement

To help predict the stock index, a less error of the predictive model is needed which may take into account the processing of theinput data. RNN cannot learn to connect information because old stored memory will be increasingly useless with time runningdue to overwritten or replaced new memory. Forecast using the LSTM method starts with entering inputs and outputs previouslyintotheforgetlayer.

ThefutureenhancementincludescomparingtheaccuracyofLSTMwithotherpredictionalgorithm.Wehavetaken5yearofdataandpredicted infutureonly1 year ofdata has been takenand predicted withlesstime facility.

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Using Hand Gesture Cognizance and Voice Instruction for Human Computer Interaction

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Abstract.

The human-computer interaction is one of the arduous problems for disabled people and usually, the way to interact with the computers is by using a physical mouse and a keyboard, But this poses a hindrance for disabled people moreover it's not a great experience for the user who is in the architectural and design field. There are some tracking systems available to use for hand recognition, but they are slow and expensive to use. The development of a hand tracking and gesture recognition system with no marker state is implemented with novel technology. The proposed system is easy to use and efficient which allows it continuous tracking of hands even with any type of background. This system removes motion blur and can detect various gestures and different actions for that gestures using computer vision techniques. In order to provide the interactive platform, the detected gesture has a specific set of actions that are executed by the system in addition to that voice commands have been used to give input action to the system. A voice recognition module is implemented to get voice command input from the user and execute the action. This provides an interactive HCI and intuitive System.

Keywords. Human Computer Interaction, Machine Learning, Voice recognition, Gesture recognition, Natural Language Processing.

1. INTRODUCTION

Human-computer interaction is one of the arduous problems that stayed in a traditional way which didn't give any great experience to the user and has some restrictions in terms of usage manner. The way of interacting with the computer is by using regular keyboards and mouse which need to be carried around and in laptops, it adds up as additional space. There are some hand tracking systems available to use, but they are slow and highly-priced. This paper describes the development of hand tracking system with no marker along with gesture recognition feature using very low price hardware components. Hand gestures are a type of nonverbal communication. It also has a significant impact on Systems for human-computer interaction (HCI). As a result, there is a huge demand for automatic handgesture recognition system. Since the rise of machine learning and

computer vision systems has increased, it provides a better solution to these problems. From video games to control systems, HCI offers a broad range of applications. Because of their temporal dependence, Hand gestures, like other time-varying signals, can't be compared directly in Dimensional space. This relationship reveals crucial distinguishing characteristics. It's hard to retrieve meaningful hand-engineered features for hand motions because of temporal misalignment and huge irrelevant portions in every frame. To overcome this, ready-to-use media pipe solutions can be used and on top of that existing solution, a custom model can be built to get the accuracy required for the applications. The required hand gestures are takenfrom the camera that comes with the system and the images are pre-processed at first then normalization is done for the model to understand it better and the images are fed into the machine learning model to get the required output of hand landmarks. These landmarks represent which part of the hand it is and these landmarks can be used to calculate the distance between the fingers and can identify the hand gestures to perform the action. The speech recognition system already has some pre-defined actions and functions when triggered it the right keyword it can be used to perform a certain action, since both of them are customizable the user can keep personal actions as well as general actions.

2. LITERATURE REVIEW

M. Al-Hammadi [1] proposed a solution to develop a 3D CNN model that identifies hand regions and the input is at first processed, In addition to it, to reduce the unwanted features in the frame, cropping and spatial normalization is used to minimize the influence of it, and the hand region is cropped out and normalization is done to the image to focus more on the fingers configurations to detect the gestures. It makes use of the configurations that are local and global to effectively focus more on the hand region and get required features from it. There is no distraction since the unwanted features are removed using cropping techniques

G. Muhammad [2] proposed an method to develop a 3DCNN hand recognition model that focus more on the region rather than unwanted features that affect the model using various techniques like spatiotemporal features for hand gestures recognition and using a separate algorithm to normalize the structural dimensions of the gestures that comes from the video based on the facial position of the user. Spatial Dimension is also needed to control the constant change in distance and height from the camera. A Deep 3D CNN model is used to obtain the local spatio-temporal features that comes from the gestures sequence. The obtained features are given as input into the SoftMax layer for classification and fine-tuned by backpropagation.

W. Zhang[3] proposed an idea to combine a network that combines various different modules together to learn both short and long-term features from video inputs while preventing highprocessing or computation. A frame is selected randomly from each group and displayed as an RGB image and as a sequence of images. These two items are combined and input into a convolutional neural network to extract the features. The parameters for all groupings are shared by the CNN.

F. S. Khan [4] proposed an idea to develop a 3D Hand gestures recognition through Mask RCNN and classification of six different types of 3D hand recognition models with different parameters. It classifies hand motion with a per-trained ResNet 101 Deep Neural

Network model to classify hand gestures and Feature Pyramid Network (FPN) for extracting features.The Region Proposal Network (RPN) is used as substitute to a selective search process, since the production of bounding boxes using a selective procedure is extremely slow.

Z. Lu[5] proposed an idea to develop an effective tool for the extraction of discriminant features to perform gesture detection in Mobile Systems.A rational decision with distance measure is used to implement the one-shot learning of hand gesture recognition.To improve the proposed method's learning and classification performance, a mechanism of discrimination evolution with the innovation of new sample and voting integration based on multi-classifiers is established.

Similar to these,Many studies have been carried to solve human-computer interaction problems using machine learning, computer vision, and speech recognition systems. Like in [6], [8], [9] the Hand Recognition part is implemented using various techniques of computer vision and Kinects. The Study of hand-held systems [8] embraces that hand recognition is effective when each process is separated and has its own unique control. In [7] and [10], The Voice recognition part is studied and analyzed for better understanding and improvement of the Voice Command system. In [11], [12], [13], [14], [15] the study about audio enhancements for better speech recognition and computer vision techniques to use in processing to get at-most data from the hand gestures images have been studied

3. METHODOLOGY

This Project mainly focuses on giving people an alternative and a better method of interacting with the computer system. It uses novel technologies that are simple to use and not very complex, It consists of three major stages the Hand recognition part, the Voice recognition and command part, and then finally the computer interaction app which combines both the features and executes the command from a single place. Hand recognition and Voice commands part works independently and both of them are controlled by a single-core system which is triggered when a user runs or clicks that application.The applications have various step process that is executed in a step-by-step manner in order to run the application effectively. The Input Pre-Processing step is to get the hand images from the camera input and make them ready, In order to give it to the

Mediapipe Hand model.

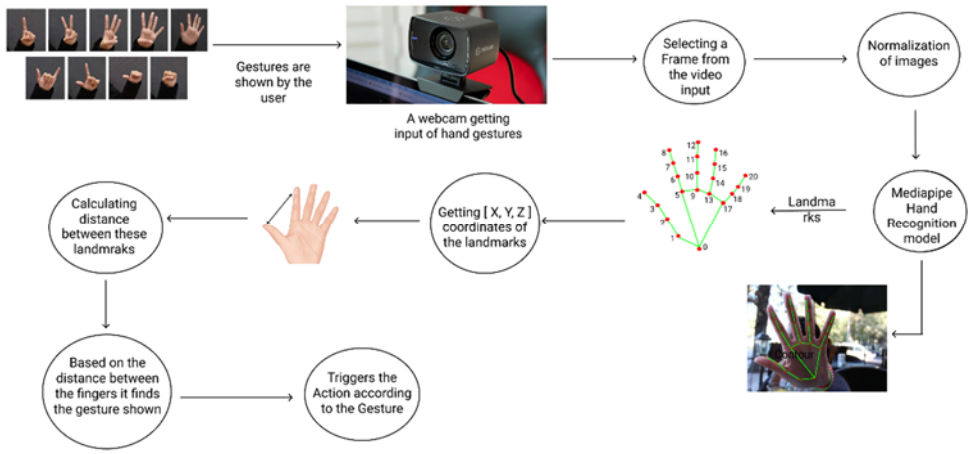

Figure3.1. Architecture of Hand Gesture Recognition

These Input videos are converted into a series of RGB frames, which are then converted to images taken from the video input.These images are normalized at first. This normalization is re-scaling the images to get better results. The re-scaling allows fairness of the input images and provides a better detection accuracy when using the stream of the images in the form of video. Atthe start of the application, the hand gestures recognition system is called and the application gets video input using OpenCV. The Video input is pre-processed at first and then it is fed into the Mediapipe hand recognition model.The Mediapipe hand recognition model is a high-resolution tracking solution for hands and fingers.It uses various Machine Learning algorithms to detect 21 different 3D Hand Markings from a single shot. It delivers real-time performance on a cell phone or desktop and it even scales up to multiple hands. Whereas the other machine learning solutions mostly rely on the hardware requirements.There are a total of 21 different landmarks for the hand starting from the wrist. These landmarks' Real-time locations are obtained from the media pipe hand recognition model. The obtained locations are an Array of size 21, each one of them containing x, y and z coordinates of that specific landmark.After obtaining these landmark locations, the labelingas done for each of the elements with their respective marking in the hand.Using these markings, It is easily accessible and more relevant. The distance calculation is done between all of these landmarks and the system checks for gestures shown and triggers the action for it. For a specific gesture, a set of landmarks is picked and a distance space is calculated based on the values the system understands what type of gesture it is and triggers the relevant action for it.

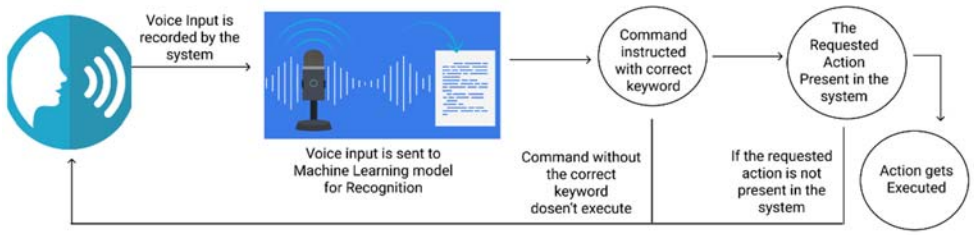

Figure 3.2. Architecture of Voice Command System

The Voice Commands gets the audio input from the system and process that data and trigger the action relevant to it. The voice commands are distinguished using a specific keyword that separates a normal speech and a command for the system. The keyword can be set by the user according to their convenience. The System check for the keyword when the user triggers for voice command system. When said with the right keyword, it takes the action that needs to be done and understands the context with it, and checks whether an action is specified for it, If there is an action specified for it, it just executes the function whichtriggers that action. Since all of this is voice input data, there can many actions which can be personalized for the different user according to their usability

4. RESULTS AND DISCUSSION

The User initializes the HCI-System in their computer and the gestures recognition, voice command module get permission for the camera and mic to capture the frame and voice of the user. The System receives the user's video feed of hand showing gestures and performs the action based on the gesture, this process is continuous as it happens in real-time. The Voice Command System gets the command with a keyword and checks whether the requested command action is defined by the user. If the Action is present in the system then the action gest executed

Figure4.1. Gesture for Right, Left Clicks System

Figure 4.2. Gesture for Drag-drop

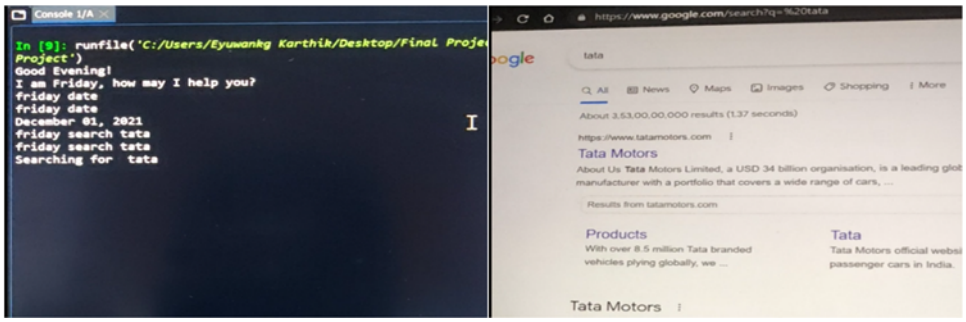

Figure 4.3. Voice Search Command Figure 4.4. Result for Voice Search Command

5. CONCLUSION& FUTURE SCOPE

The main aim of the project is to give an alternative and a better approach to communicate with a computer by adopting into a natural interaction system. There are various ways humans benefit from computers, but the traditional way of interacting with the computer is to have physical hardware of a mouse and keyboard, by eliminating that we have a device that is very much portable and has more space for other improvements in hardware components. Especially some disabled people cannot interact with the computer the usual way like people who lost a hand, for them, it is very useful for interaction and controlling the system. The Future implementation of this project is to add more gestures and have the option of two hands for the user to give as gestures and add more actions to voice commands.

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PRIVACY BASED PERSONALIZED SEARCH ENGINE USING GREEDY ALGORITHM

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ABSTRACT

The profound net is an enormous wellspring of space explicit records placed away in facts base servers available via HTML structures known as net query interfaces (WQIs). Data in the profound net is recovered by using questioning one facts base server at a time, which ends wasteful. A extra eye-catching technique is to make a coordinated WQI (IWQI) that demonstrations as single passage highlight question some statistics base servers all at once for a given vicinity. Pattern coordinating and string (marks in WQIs) examination were the most well-known approaches to make IWQIs. In this work, we advocate any other approach for the incorporation of internet systems in mild of linked information and the VDIS (View-primarily based Information Integration System) engineering. The got outcomes illustrate the adequacy of the connected facts technique added on this work for the WQI incorporation difficulty. The web indexes are utilized to get the statistics from an sizeable assortment of information internal a extraordinarily much less measure of time. For searching or getting any records each one of the clients incline toward net seek gear. A portion of the outcome again via net seek gear are superfluous to customer. To deliver helpful and extensive outcomes to patron, it's far proposed to configuration Personalized Web Search(PWS) . By making use of this PWS, the character of the web seek can be accelerated. The customer profile incorporates of records, bookmarks, clicked interfaces and follows the numerous leveled structure. This purchaser profile in addition develops the object.

Keywords—Privacy protection, Web search, Search Engine, Data Analysis.

1. INTRODUCTION

Internet includes massive sum of records which makes statistics recovery of a muddled errand. The good sized target of web mining is to present the new and moreover pertinent statistics by investigating the design, content material and use of internet. It is additionally used to find out as regards to web clients and their websites conversation.

The maximum common manner of addressing the proper information to the right consumer on the proper time in light of the client desires is known as personalization. For learning the character consumer, the framework need to acquire all non-public facts, shop it, and dissect the outcomes of the client profile . These days the time period personalization is used by anybody. Since it recovers just the desired and crucial records in view of consumer's interest [2]. The PWS can be delegated click on-log-primarily based techniques and profile-primarily based techniques. In the snap log primarily based techniques, the client click on subtleties are simply placed away.

A net index is a product framework that empowers search the facts on network (www) [1] . The facts analysised may be photographs, facts or any other type of document. The price or execution of the net crawler is based upon the pertinence of results it mines. Some web crawlers make use of positioning methogology to the websites for better analysisedresults[5] but the asking for shifts from one motor to any other. The catalog seek is outstanding to discover pertinent analysed vlaues in an exchange point seek. In view of the perspective of the consumer the final results isn't always procured in such situations. A comparable cross on with the inquiry "Kingfisher" that may be a fowl or a providers bringing about occasion of uncertainty [4]. The internet information frameworks are finally confronting many problems. The information is being improved little by little bringing about information over-burdening is one of the substantial difficulties.

PWS can work on its adequacy by generating a precise patron profile [8], accumulating the records from history, bookmarks, utilized reviews. By keeping apart such information might spark off lack of

security. Security difficulty generally ascends from absence of assurance to person facts. A PWS is supposed to be powerful provided that it offers safety to the patron's profile. The deficiency of safety can be seen in purchasing conduct in which a purchaser gives continuous client card revealing his point by using factor profile. Consequently individuals compromises safety for his or her financial gain. Another notion is that point via point statistics isn't always vital to keep the consumer's benefits at popular level. Some superfluous nitty gritty statistics like place, time will become commotion in a few inquiry challenge. Individual information like messages, reports are for the most part unstructured that is tough assignment to gauge safety. It is crucial to sum up and kind out the consumer's statistics to prepared structure [6]. A few things may be shared with the aid of one customer in which as the alternative can also cover it. So the patron should take delivery of command over which statistics need to be unveiled to the server-side. Personal costomization will deliver such advantages for the consumer [7]: Offers an extendible technique for constructing a innovative consumer profile on clients computer. Each consumer in all likelihood might not be intrigued to decide one's inclinations. Carrying out a calculation in order to naturally accumulate the information that fulfilled the goal. Various leveled design of consumer profile makes a decision the more extensive at a more considerable stage and the rare are at low-stage. The profile is labored with the aid of investigating narratives, person facts and messages.

2. RELATED WORK

Bernstein and Melnik [9] introduced the idea of gradual pattern connection creation by showing a intelligent instrument that took care of the bogus perfect matching issue. Those apparatus recommended up-and-comer matches for a chose composition component and permitted helpful route between the applicants.

Wang et al. [10] suggested a pattern model that recognized the interface and the outcome pattern of a web data set in a particular space. They tended to two huge web information base diagram matching issues: intra-site and between site. They proposed a brought together arrangement of the two issues in view of question testing and occurrence based pattern matching methods. Utilizing the model, a cross approval strategy is likewise proposed to work on the precision of the blueprint coordinating.

Nguyen et al. [11] suggested the Prudent Schema Matching calculation via cautiously choosing coordinates with the most elevated certainty; and afterward utilizing these to determine dubious matches and to distinguish extra matches that incorporate inconsistent names.

He and Chang [12] suggested the idea of double connection coordinating (DCM). They investigated the complex semantic connections that a few ascribes were emphatically related since they kept an eye on co-present in inquiry interfaces, while some credits (like equivalent words) are contrarily corresponded in light of the fact that they seldom co-happen. DCM originally mined potential property bunches as positive connections and afterward likely complex matchings as negative relationship. At last, matching development positions and then chooses the most certain and predictable matchings from the mining result.

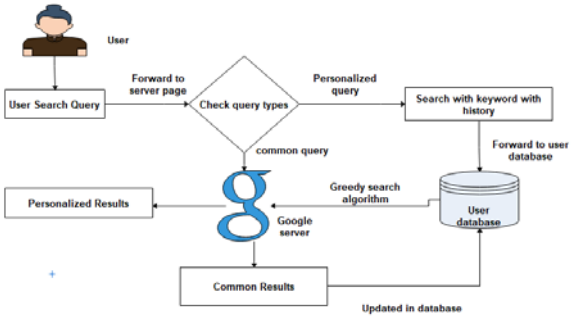
Doan et al. [13] suggested Learning Source Description framework, which previously requested that the client give the semantic mappings to a little arrangement of information sources, and afterward utilized these mappings together with the sources to prepare a bunch of students. LSD joined area imperatives as an extra wellspring of information, and foster a clever student that used the primary data in XML reports.

He et al. [14] planned and executed WISE-Integrator - a device that performed programmed reconciliation of Web Interfaces. WISE-Integrator investigated a rich arrangement of extraordinary meta-data that exists in Web question interfaces and utilized the data to recognize matching qualities from various inquiry interfaces for reconciliation. It likewise settled space contrasts of coordinating ascribes.

Shou& Chen et al. [15] Client profile can be summed up as of late isolated, and tweaking all solicitation from a comparable is utilized substance miscreant. This personalization doesn't develop the different mission level for generally not many demands. This way doesn't get the customization of cover necessities. In the current framework, each of the powerless points are seen utilizing a total assessment called surprisal done on data hypothesis. Iterative client fundamental joint endeavors are typical in different personalization list things. Then, the inquiry things are refined with some estimation like conventional prioritization ranking, This is distant for all runtime profile analyzing and recording, because of it sway a lot of openness of protection break, and in addition requires dealing with time for profiling. As such, these conjecturing assessments to appear at the pursuit quality without iterative viewpoint composed exertion of client.

3. PROPOSEDSYSTEM

Personalization is the most notable way to deal with familiarizing the right data with the ideal client at the best second. To study on a client, frameworks should assemble individual information, review it, and accumulate the eventual outcomes of the assessment in a client profile. Information can be produced using clients in two practices: unambiguously, for example request remark like inclinations or evaluations; or flawlessly, for example see client ways to deal with acting, for example, the time spent investigating an on-line annal. The open profile-based PWS don't hold runtime profiling. A client profile is reliably expansive for essentially a single time isolated, and used to change all solicitation from an in every practical sense, undefined client indiscriminatingly. Such "one profile fits all" framework unquestionably has shortcomings given the assortment of requests. This procedures don't contemplate the customization of confirmation necessities. This perhaps makes a few client security to be overprotected while others inadequately protected. For instance, all of the delicate centers are seen utilizing a flat out assessment called floored considering the data theory, tolerating that the interests with less client report support are more touchy. Different personalization strategies require iterative client relationship while making changed list things. They typically process the recorded records for specific assessments which require different client exchanges, like normal position, rank scoring, etc



Fig(1): Architecture Diagram

4. IMPLEMENTATION

We use an eager methodology in view of the difficulty's hassle. Past motion gathered in Web waiter logs via treats or meeting following modules are times of understood facts. Enrollment systems and assessment research are the maximum widely diagnosed wellsprings of express facts. Extra data can be utilized, like section and alertness statistics (e.G., net commercial enterprise alternate). In certain conditions, new records sources, as an example, Web content, creation, and alertness information may be acquainted with offer similarly light on the subsequent degrees. Information is regularly pre-handled to exchange over it into an organization that is viable with the following stage's exam technique. Cleaning information of irregularities, sifting through insignificant records in mild of the research goal (as an instance, evidently produced solicitations to implanted illustrations can be stored in internet server logs, notwithstanding the fact that they add little data about purchaser hobbies), and filling in missing connections (because of booking) in fragmented navigate methods are on the complete instances of preprocessing. In particular, in view of a heuristic, for example, demands beginning from a comparable IP address internal a given time span, interesting conferences need to be distinguished from the special solicitations. Web records exam - This degree, often alluded to as Online Use Mining, makes use of AI or records mining approaches to cope with uncover charming usage designs and actual relationships among's sites and client characterization. This stage commonly leads in programmed patron profiling, and it is typically done disconnected so the net server doesn't need to manipulate it. The consumer gets proposals in mild of the effects of the previous research step inside the personalization interaction. Regularly, the idea cycle includes making responsive Web content on the transaction process, as an example, adding extended links to the patron's contemporary page call for. A patron profile is picked aimlessly because the seed of any other bunch in the direction of the beginning.

5. RESULT AND DISCUSSION

We can analysis the performance using accuracy metric.

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN} * 100$$

Table (1) Performance measurement

Algorithm	True positive	True negative	False positive	False negative
K-means	10	20	40	60
Page rank	20	16	30	40
Greedy algorithm	40	10	20	20

A principal issue in flexible pursuit is that the endeavors between the clients and web crawlers are restricted by the little improvement parts of the web files. As required, web clients will generally introduce more limited, thusly, extra dubious inquiries assessed to their web search ruffle. We proposed PWS to kill and get to know a client's methodology of experiences and content affinities mulling over the client's profiles. To adjust to the client adaptability, we consolidated the client's subtleties in the personalization joint effort. We saw that profile help to similarly foster recovery reasonableness, particularly for search demands. We moreover proposed protection endpoints, DP and IL, to address security issues in PWS by permitting clients to control how much private data acquainted with the web server. For future work, we will attempt to battle with adversaries with more wide foundation information, for example, more ludicrous relationship among centers or ability to get a headway of deals from the individual being proposed.

6. CONCLUSION

Customized search is a promising technique to similarly develop seek quality. In any case, this method requires client to permit the server-side full admittance of person information on Internet, With disregards clients' safety. To supply every purchaser with extra important records, some techniques were proposed to adjusting indexed lists as in keeping with every patron's data want. In spite of the reality that there are some net indexes as of now present, it has been seen that they neglects to catch patron's inclination and conduct and eventually the listing items might likely be related with the details of the client. A consumer aspect safety warranty structure called UPS for instance Client adaptable Security protecting Search algorithm is proposed. Any PWS can adjust UPS for making client details in numerous levelled medical categorization. UPS allows purchaser to determine the safety prerequisite and therefore the person data of customer profile is saved hidden without compromising the quest best. UPS framework executes two insatiable computations thus, in particular GreedyDP and GreedyIL.This accomplishes better listed lists safeguarding protection.

7. FUTURE SCOPE

In future, we can extend the framework to implement in mobile environments. The proposed framework can be integrated into Web browsers like Internet Explorer, Mozilla Firefox, etc. and also be developed as a mobile application (Android/iOS) and also search various contents such as images, videos, and other data types.

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Critical Issues, Challenges in ERP Implementation and Proposed Solutions

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Abstract.

In today's world almost all the small, medium and large size organizations depend upon the ERP systems for managing their business and yet it would be wrong to say that ERP systems are foolproof. This research seeks to identify and summarize the issues and challenges that could be responsible for ERP failures in various organizations and propose a model as a solution for implementing the ERP in the right manner. After rigorous literature review done on the ERP issues and challenges stated in other research papers, it can be concluded that there are lot of research papers that describe the social and managerial issues in depth but there is a dearth of research which highlights the technical issues. This paper has been written with the intention to extract all the notable issues in an orderly manner that actually hamper the success of any ERP software and propose a solution to tackle the same. Till date, a practical working model for the right ERP implementation in technical aspects has not been proposed and therefore, would be a wonderful addition to the knowledge base in the ERP domain.

Keywords. ERP Issues, Techno-managerial, social issues, organizational issues, CSFs

1. INTRODUCTION

Enterprise resource planning (ERP) systems prove to be an off the shelf solution for replacement of the age old legacy systems for organizations by reducing costs, sharing information, and enhancing the management of business processes by real seamless integration and coordination of business processes. In the 21st century when everyone is in a rat race of being the best, time and efficiency have become the utmost concerns of all the organizations. There is no ERP system that is flawlessly implemented and functioning because till date, there is a dearth of knowledge in the issues related to ERP systems.
The only way to solve any problem is to first know what the issue is. With this motivation, the study below formulates a research in ERP domain for determining the ERP challenges and also proposes a valuable solution to address the issues at various levels.

Fig 1: Potential ERP modules

2. RESEARCH METHODOLOGY

In this article we have first used the SLR i.e. Systematic literature review method to summarize the findings of different research papers. We have also drawn out some techno-managerial problems from survey conducted in multinational software companies having well established business in ERP domain to identify the problems and then propose a solution to address these problems. Various research papers were read and surveyed properly to find the gaps. A survey was conducted to deduce the issues in ERP domain and then carefully understand the ERP issues faced in IT industry.

3. LITERATURE REVIEW

[1] According to a research done in steel industries, some of the crucial issues that have been identified are: clear scope of implementation, commitment of the top management, proper strategy for implementation, vendor selection and end user involvement [2], [3] The other major issues that got highlighted in some studies were as follows: organizational changes and adapting to new ERP system, high subscription costs, business complexities and customizations, network dependencies, issues in security and problems in integration, design and architecture. [4], [5], [6], [7] Some studies also suggest that system quality, information quality, lack of skilled technical staff, change management, not knowing the reason behind implementation and huge funds required are determinants of ERP success and if not integrated appropriately can prove to be one of the biggest reasons of ERP failure. [8], [9], [10], [11] Other knocking issues highlighted are: improper system implementation, unclear scope of the procedure used for implementation, improper project planning and humongous customization needs, change management, gaps between the organizational information and reality, customization issues,[12] improper project planning and [13] the issue of dealing with the formation of IT department in public sectors. In post implementation of the ERP, one pressing ERP issue is deciding whether to outsource the maintenance of ERP or form a self IT department. [14] More experienced, educated and younger generation people are inclined and satisfied with ERP systems. [15] Other issues highlighted in the ERP are: inadequate user training, need to modify the standard ERP codes to suit the business requirements which can be really expensive, no after support from the vendor, user resistance, change management, wrong team selection, update costs [16], [17] business process re-engineering, slow site issues [18], [19] . Data conversion issues [20] and organizational culture issues [21] have also been highlighted in some studies. Improper testing, time-zone limitations and ambiguity of roles also form some potential ERP challenges [22], [23].

This literature review shows that the technical aspects of the ERP issues have not yet been properly explored and therefore, a combination of techno-managerial issues has not yet been summarized.

4. FINDINGS AND DISCUSSION

The table below summarizes top 15 issues found in ERP from rigorous literature review:

	ERP Issue	Relevance/Frequency
1	user training	12
2	BPR	10
3	top management approach	9
4	vendor selection	8
5	Project mnagement	8
6	change management	8
7	High cost	8
8	Integration	5
9	Undefined scope of implementation procedure	4
10	IT infrastructure	4
11	Internal conflicts	4
12	Security	4
13	Business complexities and customizations	4
14	Ineffective communication	3

Table 1: ERP issues

The above work suggests that ERP systems can turn into the biggest failures in design and implementation phases if not handled carefully and also believes technical issues have not yet been studied. With this motivation the research work below highlights top 10 techno-managerial issues that arise in organizations that have implemented ERP solutions and a proposed framework/model to address these issues.

Implementation Issues

1. **Data Migration:** Data migration is a two way process. While importing the data from a legacy system to an ERP system, a major issue arises when data is either not refined or in bulk. The one time job of importing the data consumes a lot of time in refining and importing bulk data and also takes several days which hampers other ongoing operations.
   While exporting the data from ERP systems to excel file, sometimes the data might look tampered. E.g.: 00001 in number format is considered as 1.
   - Solution: To mitigate this, the data must be refined using different refining algorithms at a middleware and then be made ready for importing. In case of bulk data SQL server management can be used to write one time SQL queries that can directly import data into ERP tables as SQL queries have proved to be a time-efficient approach for insertion and updation.
   - While exporting the data, the excel format must either be set to text via the export class code or the data must always start by a letter to avoid the tampering of data (00001 in text format is also 00001).
2. **Third Party Integration:** In case of third party Integration with the ERP systems, usually enumerators are used to define gender, sales order types etc. These enums are manually maintained in both the integrated systems and bulk updation becomes a tedious task at any point in time.
   - Solution: Master tables must be maintained as much as possible. In both the integrated systems the master data must then be shared regularly by using the APIs scheduled in batch processes.
3. **Multi-company ERP:** In case more than one ERP team is working on the same ERP software, tracking, whose implementation has caused the errors to arise, becomes very difficult.
   - Solution: The classes and tables on which some extra customization is done should be added to version control so that the changes can always be rolled back to the previous versions. This will also help in tracking down the error caused by a specific team or a person.
4. **Simultaneous development and integration:** In any MNC, more than a single project gets implemented at a time and then integration takes place to merge the changes at a single level. While integrating, the labels used in one development

environment can get overridden by the other if the label numbers are same coincidently.

- Solution: The developers must coordinate and select a number series prior to starting the development to avoid any such clashes.
- If there is no option for selecting the label series, then the labels must be made at the end after integrating the projects in a single environment. This will help in not hampering the simultaneous development as well as the label numbering.

5. **ERP Software migration:** Migrating the current code from one ERP solution to another can be a tedious and time taking process and yet, with advancement of ERP software, it actually becomes an unavoidable task. The companies often lose their clients when the migration process takes place because it is not a one day task.
   - Solution: This problem can never be fully mitigated but can be considerably reduced if developers try to keep their code as much secluded as possible from the standard code. Migrating the standard code is a difficult task and needs a lot of care. So, developers must keep their customizations localized.

Post Implementation Issues

1. **Update conflicts:** Update conflicts occur whenever some user modifies a table column and simultaneously a scheduled batch process modifies some other column in the same table. Due to this the system enters a deadlock.
   - Solution: The batch jobs which access busy tables (e.g.: transactional tables) must be scheduled in non-working hours so that fields only get modified by the batch jobs during non-working hours without any other user interference.
2. **Requirement gathering and brain-storming sessions:** Requirement gathering and brain storming sessions with the client often contain a lot of information that is discussed in one particular session. Many different test cases may also be discussed. If not noted down properly, this can create a problem in projects.
   - Solution: Noting down the requirements is a tedious and unreliable task as the client's intention might get distorted as noted by some other person. The best possible way is to record the sessions so that the developer can at least have the access to the client's requirements while developing. Each project must start after preparing the requirement documents that clearly state the requirements.
3. **Service request load:** Any solution provider is expected to provide after development support to the client if any errors arise in the development. This often increases the load of non-chargeable efforts, thereby reducing the load of new chargeable requirements.
   - Solution: Developers must be trained to monitor the minute defects and must unit test their code correctly. The rare test cases that might get ignored while tester's testing should also be tested to deliver fool-proof solution. It has also been noted that there is a difference between the data present on production environment and development environment. This reduces the testing quality as testing must always be done on the real-life data. DB store process from the production environment to the core development environment must be done frequently to avoid such issues.
4. **Importing issues:** Whenever some data is imported into the ERP systems, it usually enters the staging table first. After entering the staging table, the data

undergoes some validations and enters into the main backend tables. However, it has sometimes been observed that the data gets validated but does not get imported into the ERP system tables. The status of the data in the staging gets changed to 'validated'. Developers or users get confused and think that the validated record is not getting imported as it should actually be imported after getting validated by the process written. However, in reality, the record is not validated properly and therefore does not get imported.

- Solution: Since ERP systems have an ocean of pre-implemented code within the ERP's standard functionality, so many internal validations are also applied for various processes like: sales orders, purchase orders, etc. So, in order to avoid any such validation issues and problems, all the validations that system applies to any record must be pre-added in the code that validates the staging data. In this manner, the data will be blocked/marked as error at staging table level itself and won't be subjected to the validation of the standard system.

5. **Empty header import:** Many times there strikes a need to import data which has a single header and associated lines (eg: purchase order). In such cases, if no line gets imported, the header import must also be rolled back. However, this does not always happen and many users complain about seeing an empty header without any line.
   - Solution: Proper try catch implementation can be used and entire record (header and line included) must be imported using the transaction control block. Rather than doing the entire work in two separate transactions, a single transaction must be used for the entire process of importing a single record (header and line included).

After considering all the issues and suggested solutions, we can create a named model that acts as a basis for better understanding of the ERP issues that are techno-managerial in nature. The model below: TRIUMSEEDS MODEL, summarizes and provides a clear understanding for the ERP issues for which, the discussion and proposed solutions have already been mentioned in the above text.

TRIUMSEEDS MODEL

Triumseeds model is formulated in a way that it will provide a deep insight into identifying the issues in the ERP systems and can be considered before ERP implementation in any industry. Each letter of the model corresponds to a potential issue that can arise in ERP.

T	• Third party integration
R	• Requirement gathering and brainstorming
I	• Importing issues

U	• Update conflicts
M	• Migration issues
S	• Service request load
E	• Empty header import
E	• ERP software migration
D	• Data migration
S	• Simultaneous development and integration

5. CONCLUSION

For research, this work can help budding researchers in considering the topics, gaps and findings in the ERP implementation process. The working model suggested for the right ERP development will definitely be a resourceful tool for implementing the ERP correctly and will also reduce the possibility of the technical issues in the ERP system. It can be concluded that, to implement the ERP solution correctly it is really important to strike a balance between technical, managerial and social aspects of the issues that can occur and then proceed accordingly. If the possible issues and their solutions are pre-noted before implementing the ERP system then the possibility of its failure is bare minimum.

6. FUTURE RESEARCH AVENUES

Although the research has summarized most of the critical issues in the ERP domain, this research also concludes that the technical and managerial issues go hand in hand and are yet not fully explored with reference to the ERP domain. Moreover, ERP success and the use of data analytics and machine learning with integration in ERP would be very interesting research topics in the near future. The advanced technologies when combined with an ERP system will prove to be a boon to the IT industries and therefore, research work can be carried out in this field in the future.

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VIRTUALIZED RESOURCE ALLOCATION AND INFORMATION RETRIEVAL IN CLOUD STORAGE

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Abstract: Cloud computing has the ability to manage a large volume of expanding effort in a predetermined means for the benefit of corporate clients. Virtualization, which sums up the foundation and makes it simple to make due, is a pivotal innovation empowered for distributed computing. The virtualization technique is utilized in this proposed work to allocate cloud resources in light of their prerequisites and to help the computing thought. The "skewness" rule is carried out right now, in which the equivalent is minimalized to blend errands and augment server use. Overseeing buyer demands for asset distribution makes testing states of available for any emergency's asset allotment. So Virtual Machine (VM) allotment procedure can be upheld, it has been locked in for asset supply. The use of virtualized environmental factors is unsurprising to decrease normal undertaking reaction time while likewise executing liabilities as per cloud asset accessibility. Thus, VMs are allotted to customers contingent upon task attributes. While the execution is running, the VM and PM (Physical Machine) planning is conceivable on account of the VM movement innovation. Successful and dynamic utilization of cloud sources can assist with settling the weight and stay away from issues, for example, slow construction run. This approach can utilize a neighborhood discussion based VM union technique to expect each assignment demand and lessen over-burdens to give virtual space when a few solicitations are made simultaneously. The proposed framework utilizes a co-area procedure to combine underused little spaces to make extra virtual space, consequently further developing server execution. Execute an implosion technique to eliminate flawed information relying upon an opportunity to-live property. The proposed framework works progressively and apportions assets productively. To start with, build an expectation model that can assess the divider sizes of abatement commitments at runtime in this system. Furthermore, after powerfully identifying data newness, appointing higher effects to minimizes with enormous boards to assist them with finishing quicker.

1. INTRODUCTION

Due to the rapid development of cloud computing on worldwide, standard distributed computing techniques like virtualization, equal handling, and spread data set and capacity have seen huge progression and are presently broadly utilized in an assortment of settings. Virtualization method, as one of the center instruments of distributed computing building, assumes a genuine part in offering dependable distributed computing administrations. Virtualization is a fundamental methodology that can be utilized to perceive the speedy arrangement, dynamic designation, and move region the executives of IT assets by growing two or three mimicking virtual machines (VMs) on a lot of high-show network servers and giving on-request contributions to clients through these PC created machines. [5] However, since clients' desires are continually changing, both the assortment and responsibilities of virtual machines change consistently, which, incidentally, makes another venture for source figure and migrations of computerized machines. The choice of the convey have gadget and objective host is the most basic stage for virtual gadget relocations, as indicated by a selective element of the computerized apparatus movement system.

The supposed live migration approach for digital machines is offered by a few academics to help make decisions about the options for deliver and destination host computers, as well as to avoid unnecessary digital system migrations due to temporary high workload values. There are two kinds of advanced contraption movement philosophies now accessible in the writing: one is to float the gathering gadget's better and lower edges to oversee asset use; the other is to utilize the host instrument's responsibility edge to foresee the example of its succeeding abilities. While the past arrangement can resolve the issue of help squander brought about by the static responsibility adjusting technique's asset, it can't resolve the issue of blend fight that happens in obsolete responsibility adjusting procedures [6]. The latter solution, on the other hand, is capable of resolving the matter of "false alarm" virtual device re-locations caused by some brief height workload values, but it overlooks the hesitation and stochastic nature of the workload values, and also the aggregate of each, on host computers. Therefore, to draw nearer to fusing the hesitation and chance of responsibility values into the decision-making methodology of computerized framework movements, and accordingly bringing about a superior relocation technique, the proposed work proposes another virtual gadget movement system that depends on time series expectation in cloud statute. This strategy basically functions as follows: it first sets the higher and lesser responsibility edges for have machines, then utilizes the cloud idea to estimate the future responsibility pattern of the host machine, lastly determines a movement want measure, which is then used to choose the stock host, objective host gadget, and advanced system to play out the needed relocation [12]. This proposed relocation strategy tends to the vulnerability, fluffiness, and haphazardness of responsibility values, changes over subjective to quantifiable ideas as well as the other way around, wipes out the conglomeration fight migraine made by computerized machine movements due a couple of transient and momentary top responsibility esteems, and adds to accomplishing dynamic source coordinating.

Cloud storage is depicted as data putting away in which information is saved in judicious pools, actual capacity traverses a couple of servers (and habitually puts), and the actual environment is traditionally moved by constrained by a site facilitating

organization [3,9]. The provider vendors are in custody of keeping the saved data available and available to the user, as well as the physical environment's security. People and businesses rent or buy garage space from vendors to preserve customer, company, or software programmed data.

Cloud storage administrations can be recovered by a lumped cloud framework, a net supplier application programming connection point (API), or API-enabled software, like a distributed storage server, a carport door, or Web-based content material fabric control structures. Cloud Distributed storage depends on virtualized foundation and, concerning reachable connection points, close moment obstruction and versatility, multi-tenure, and metered resources, it is like more extensive distributed computing. Distributed storage can be gotten to through an off-premises source (Amazon S3) or introduced locally.

Cloud storage is most commonly associated with a hosted object storage provider, although the term has come to embrace other types of data storage that are now accessible as a service, such as block storage. Object storage facilities such as Amazon S3 and Microsoft Azure Storage, object storing software such as Open stack Swift, object storage systems such as EMC Atmos, EMC ECS, and Hitachi Content Platform, and distributed storage research initiatives such as Ocean Store and VISION Cloud are all examples of garage that can be held and organized using cloud storage characteristics [12].

The following is a list of cloud storage services:

• A federated or cooperative garage cloud structure is made up of numerous allocated assets that act as one.
• Highly fault resistant due to redundancy and statistical dispersion
• Extremely long-lasting due to the use of versioned copies
• In terms of data replicas, they are usually regular sooner or later.

2. RELATED WORK

Cui, et.al,… [1] HotSnap is a VMC photo strategy that was created to empower for the catch of hot scattered pictures with milliseconds of device personal time and TCP ease off length. In the focal point of Hot Snap is a brief preview that saves the littlest immediate country in a short measure of time, and a thorough photograph that saves the whole VM country over the course of the day. The picture convention is set down here to arrange the individual VM previews into VMC's worldwide customary country. Then, I presented Hot Snap on QEMU/KVM and ran more tests to choose the system's suitability and capability. Hot Snap brings about several milliseconds of postponement contrasted with the conventional relocation based distributed picture method, which causes seconds of hardware vacation and organization interruption.

Shen, et.Al,… [2] Virtual Machine I/O Access Redirection is a cloud-explicit, prompt, non-meddling, and light-weight I/O streamlining layer (VMAR). VMAR makes a square interpretation map at the hour of VM depiction creation/catch, and uses it to reroute gets to a similar report framework handle before they arrive at the OS. With the constant extension of the cloud climate, the quantity of various sorts of virtual machines is quickly expanding. In cloud insights focuses, these depictions, each holding gigabytes or several gigabytes of measurements, make weighty plate and local area I/O troubles. Since the depictions all have something similar or comparative OS, middleware, and bundles, a portion of the VM previews incorporate many measurements blocks with copy content.

Zhang, et.al, [3] introduced a bunch of worldwide planning decides that execute on VMs in the cloud. This approach collects the global response by solving linear equations and adapting to sufficient and insufficient situations using dynamic baselines. In the recommended tests, authentic benchmarks are used as occupations, and 10 virtual machines are used. In this work, I developed a system for automated memory manipulation based entirely on Xen virtual machines. Researchers are free to use this proposed toolkit, which is distributed under the GNU GPL v3 license. Propose gadget focuses for overbooking or potentially adjusting the memory page of Xen VMs to advance the strolling cases of utilizations in merged settings. In contrast to conventional resource allocation approaches, the suggested device, coupled with MEB, is lightweight and can be introduced into user space without interfering with VMM operation. Make a worldwide booking technique that is for the most part founded on the powerful gauge to recognize the best worldwide memory distribution.

Wei Zhang, et.al… [4] sees a support provider who uses present dispersed figuring capacities as a low-esteemed hidden other choice. For the separation of content impressions, the deduplication framework increases memory costs. Memory question is ordinary in packs since each real contraption has different VMs. Cloud transporters by and large blessing that the help association uses not very many or no assets, having irrelevant disturbing effect existing cloud associations. Another task is that old pictures looks for selecting resources, as the data dependence made by using duplication date across overviews adds managing unusualness. All of the three parts - time, worth, and deduplication capability - ought to be relinquished for the others. For example, if we were creating a deduplication machine with a high cost of duplication detection and a lightning-fast reaction time, we'd need a lot of memory to store the fingerprint index and cache.

Yoshihisa, et.al… [5] The function of virtual machine migration in cloud performance is crucial. While it permits the VMs to accurately share actual resources, it additionally permits them to interfere with one another, subsequent in general execution decrease. Experiencing the same thing, relocation permits you to reassign another gadget to these virtual machines progressively. Organizations might be more cutthroat in sending VMs assuming that the activity is quicker in settling the opposition. Individuals that put a high worth on by and large execution ought to leave asset execution for more static valuable asset portions, as well as Amazon EC2 Placements. Albeit such arrangements can guarantee in general VM execution, they waste property because of their moderate distribution. Subsequently, movement for testing VMs has its own rate, which can influence resource segment rules. Regardless, due to its different supplies, movement of various Virtual Machines in a genuine environment offers inconvenient issues to decide. It ought to restore the overall show of all the tortured VMs, particularly their blend all around execution.

2. EXISTING SYSTEM

The booking issue in asset portion takes into account the goal of unbalance in adventure inconvenience; for this situation, an equal hereditary calculation is used, which is a lot quicker than a normal hereditary calculation. The booking counsel utilized by GA progressed using resources when VMs are appointed, settling on it an incredible decision for managing planning issues. Hereditary Algorithms (GA) are solid methodologies that might be utilized to handle complex issues in an assortment of fields. Equivalent Genetic Algorithms (PGAs) are equivalent executions of inherited estimations that can give expanded admittance with regards to execution and adaptability. On organizations of heterogeneous PC structures or on equal centralized computers, PGAs can be effortlessly constructed. [13]. PGA is preparing for them to have cloud sources in a more productive manner, in regards to the rate at which the gigantic part series has been acquired with fast mixing. For the present circumstance, a scheduler is given on each cloud center point. In the schedule, three games are essentially wrapped up. Immediately, the machine screens inert assets, and the availability of cutting-edge machines is conceivable invigorated at standard ranges, similar to when new VM requests appear, or when VMs are in conclusion mode, or when any movements in genuine assets are recognized. Then, using the PGA, sort out which portion gathering test has the greatest model size. Subsequently, the important real machines will be apportioned to the VM requests. A couple of huge factors are considered during the most well-known approach to settling disproportionate endeavor issues with our PGA. While allocating the referenced sources, it is fundamental for review the specific innate computation limits, which consolidate chromosome model, appropriate wellbeing brand name plan, and the utilization of the fitting movement technique.

The Continuous Double Auction (CDA) has been investigated for lattice processing asset distribution. CDA is quite possibly the most notable procedure, and it's been utilized in the virtual securities exchange for quite a while. Offers from an assortment of individuals can be submitted whenever during the public deal [19]. That's what they propose, when contrasted with non-commercial center instruments, the market-based approach performs better regarding project usage and effective asset distribution. Nonetheless, the fundamental issue of this approach is that it knows nothing about asset assignment for a couple of sources, and just a single viable asset designation technique has been thought of. This method was used to allocate CPU time in a local grid context. Combinatorial twofold sale has been presented as another asset portion approach for commercial center based environmental factors in lattice, which added pay expansion and economy generally speaking execution. This arranged strategy enjoyed the benefit of being a totally money related based technique with a ton of adaptability.

1.1 Advantages of VM Migration

Load balancing:

Load adjusting limits the divergence in asset utilization levels across each of the PMs in the group. This dodges several machines from becoming over-inconvenience inside seeing different machines that are fundamentally gently stacked and have adequate extra limit. Live development can be utilized to keep the contraption stable. Moving VMs from over-trouble PMs to under stacked PMs can help with changing the ordinary machine load.

Server Consolidation:

Server consolidation methods are necessary in Carrier Company in order to reduce server sprawl. These techniques are VM pressing procedures that endeavor to fit however many VMs as would be prudent onto a PM to augment asset utilization and mood killer undesirable machines. Solidification will bring about lower energy utilization, bringing down current functional expenses for server farm executives.

Hotspot &Cold spot Migration:

Area of interest and cold spot identification is continually founded on limits that can be set with the utilization of a help organization's asset or in light of the Service Level Agreements given by cloud clients. A greater useful resource utilization price near the maximum is usually ready owing to the top threshold, whereas a completely low useful resource utilization fee is usually ready due to the decrease threshold. PMs with aid usage levels over the upper criterion are referred to as hotspots, whereas those with usage values below the lower threshold are referred to as cold spots [15]. The former denotes excessive use, while the latter denotes insufficient use, and both are true regardless of resource length.Transfer a running virtual records garage to a new server. Customers can also flow into the digital machine discs or folders to a fantastic statistics shop as an option. The term "hot migration" refers to the use of another term such as "live VM migration" or "vMotion." People can transfer their digital devices using vMotion without affecting their availability.

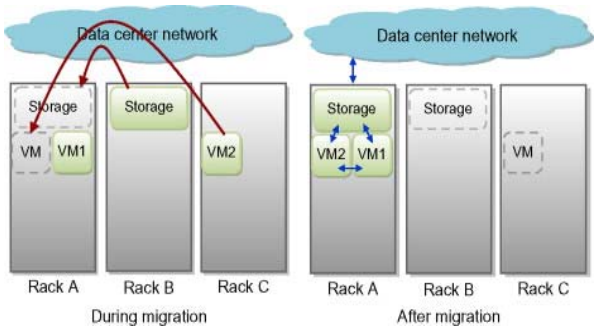


Fig 1: VM Migration Approach

4. PROPOSED FRAMEWORK USING VM MIGRATION WITH SELF-MONITORING APPROACH

The outstanding development of information in different application areas, for example, internet business, person to person communication, and logical registering, has provoked tremendous interest for huge scope information handling as of late. In this specific situation, the VM consolidation method has recently received a lot of traction as an equal processing design. Each solicitation takes a block of input data and generates an interim scheduling phase by running a user-specified function. Following that, each job accumulates intermediate requests and produces the final result using a user-specified reduce function [12]. A one-sided responsibility decrease circulation can make genuine impacts. A clever asset distribution technique was made in this proposed framework to effectively limit framework over-burden while restricting the quantity of servers used . Present the possibility of "skewness" to depict how a server is utilized unevenly. Nonetheless, server farms could utilize these elements to just acknowledge more VMs than the actual assets accessible in the server farm. The term "resource overbooking" or "resource over commitment" is commonly used to describe this situation. The all-out accessible limit in the asset the executive's interaction is not exactly the hypothetical greatest mentioned limit [16]. This is an eminent methodology for directing insufficient and significant resources that has been used in a collection of fields for a long time. In cloud settings, over-burdening cloud assets is the best methodology for expanding machine use. The program may detect a rising trend in resource utilization patterns and assist location negotiation in greatly reducing placement churn.

This recommended work investigates stochastic burden adjusting through VM movement to beat the issue of demand unpredictability and dynamic workloads. Dissimilar to existing strategies, the stochastic weight changing way of thinking probabilistically depicts VM resource interest and obligation territories of, still up in the air to ensure that all out cloud resource use on each PM doesn't outperform its capacity with a high probability. The SLA understanding appraisals the likelihood and illuminates every PM regarding the gamble of SLA infringement. Stochastic load balancing can handle the unpredictability and dynamic variations in resource consumption. The heap adjusting decision can guarantee that the came about application execution is stronger against exceptionally powerful jobs while guaranteeing productive measurable multiplexing of assets [18] with the probabilistic guarantee for handling overloads. Nonetheless, stochastic burden adjusting presents new challenges, for example, assessing stochastic asset interest, identifying areas of interest, and performing VM movements while catching multi-faceted stochastic asset prerequisites.

The proposed work executes the VM combination strategy, which is an establishment for dynamic asset assignment. Lately, the VM solidification procedure has turned into a conspicuous idea for huge scope information handling. The result of asset planning assignments is unevenly disseminated among different frameworks because of existing booking procedures. The VM union method, which is a structure that permits run-time parceling slant relief, is introduced in this venture. Dissimilar to earlier methodologies that endeavored to adjust the responsibility of minimizers by repartitioning the middle information assigned to each lessen work, we manage parceling slant in the VM combination system by changing undertaking run-time asset portion. We show that with our strategy, VM union components can lessen information repartitioning upward. In the VM consolidation method, there are two key issues that must be solved [18]. This recommended work recognizes parcel slant to build a run-time expectation technique that figures every minimizer's segment size. Second, an endeavor execution model that associates task running time with resource conveyance ought to be made to perceive the appropriate holder size for each diminishing work. The repartitioning strategies are based on a partitioning plan, which necessitates the execution of a progressive report each time the work is started. There is compelling reason need to change the apportioning execution in the proposed work; the parcel size forecast should be possible completely on the web. Thus, we found that our current forecast plot is essential yet successful in delivering excellent outcomes. We can set up a co-found virtual machine when assets become accessible. We can combine unused little proportions of virtual machine space to supply new virtual machine space to clients, as well as apply an implosion procedure to flush information from the cloud supplier by using an opportunity to live element. We save personal data in Cloud Storage that contains details that take up more space when their validity expires. Cloud Service Providers copy and cache this information [22]. The basic goal of a self-destruction system is to destroy the user's important data based on the time live property. All information, as well as copies of information, has been destroyed. Present a framework that fulfills the reconciliation of dynamic stockpiling techniques in this proposed study. Figure 2 depicts the fundamental layout of the VM migration.

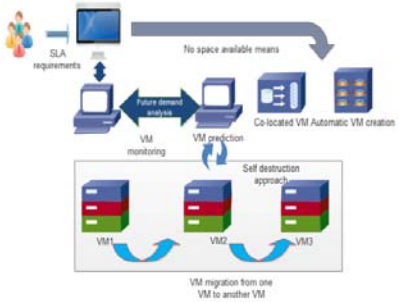


Fig 2: Proposed framework

ALGORITHM IMPLEMENTATION

The proposed approach depends on expected execution time instead of complete time. As a result, utilizing this method to schedule jobs in a cloud environment can achieve a shorter make span than using the original heuristic set of criteria.

The following is a description of the suggested algorithm:

for all endeavors Ti in Meta experience Mv

for all assets Rj

Cj= Ej+rj

complete till all liabilities in Mv are arrangedin case the number of sources is even,for each commitment in Mv consider the earliest

complete time and the assets that goes along with it

notice the TaksTk to the resources Rk with most prominent earliest culmination time

apportion task Tk to the assets Rk that offers the earliest last detail time

erase task Tk from Mv

update Rk

update Cij for all I

else

for each assignment in Mv find the earliest

complete time and the sources that wires it

observe the TaksTk to the assets Rk with most noteworthy earliest completing time

relegate project Tk to the sources Rk that offers the earliest last touch time

erase task Tk from Mv

update Rk

update Cij for all I

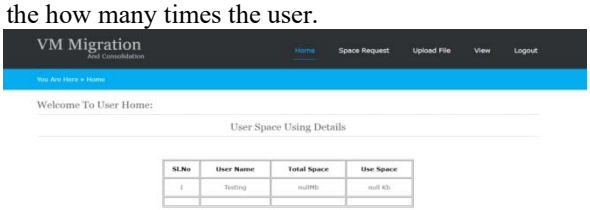
quit if

cease do

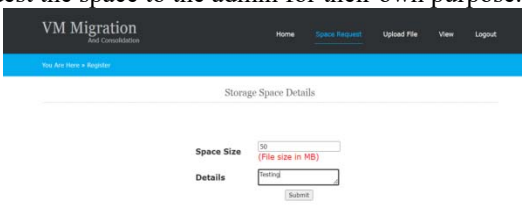
Expect that m assets Rj(j = 1,...,m) are expected to satisfy n commitments Ti(i = 1,..., n). An arrangement for each errand is the assignment of no less than one periods of time to no less than one assets. The surveyed time of execution When Rj has no stack when Ti is designated, Eij of mission Ti on help Rj is portrayed as the time period it requires greater investment to complete Ti. The ordinary fulfillment timeCij of errand Ti on help Rj is portrayed as the divider clock time when Rj completes Ti (resulting to having finished any recently allotted commitments). Permit bi to mean the beginning of task Ti's execution. Cij = bi+Eij, as exhibited by the definitions above. Permit Ci to the mission's end up back at ground 0 importance time, and Cij be when help Rj is given out to do endeavor Ti. We can examine the device's show to the extent that reaction time, still up in the air as the time between the completion of a solicitation or requesting on a PC contraption and the start of a reaction.

5. RESULTS AND DISCUSSIONS:

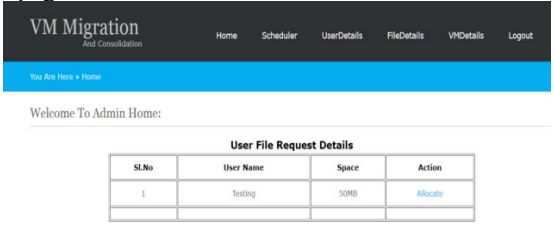
1-This is the page which will accrues right after the user logged in to the page which shows the total and used space the user has. In here the user will be able to see the how many times the user.



2-In this page the user will be able to request the space to the admin for their own purpose.



3-The below page is the one of the admin pages. In here the Admin will able to allocate the space for the requested user.



After the space allocated to the user from the admin the user will be easily able to use the cloud space and store their data without

the problem of leaking.

6. CONCLUSION

In Cloud Computing, a Resource Allocation System (RAS) is some strategy that inspirations to guarantee that the architects' necessities are met exactly utilizing the financier's design. Alongside this attestation to the fashioner, significant resource assignment parts should similarly think about the current remaining of each and every resource in the Cloud environment, with the objective that estimations can be used to better apportioning of physical and moreover virtual resources for specialists' applications, cutting down the cloud environment's working costs. Our system adaptively complexes digital to physical capitals based entirely on the conversion need. The proposed artworks make use of the Migration technique to combine VMs with different support qualities, as it should be so that server capacity is correctly utilized. For systems with many resource constraints, the proposed approach accomplishes overload reduction and green computing.

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Time Series for Managing Food Waste Using Machine Learning

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ABSTRACT-— In this financial period, lots of foods is getting wasted in food courts and in other source, especially from the different causes. According to the UN World Food Programme and other agriculture organization reports, one third of the foods are getting wasted daily, accounting for 1.3 billion tons of waste. Whereas the food shortage is one of the world's biggest problem. A survey that explains the wastage of food from hostels of IITB per year is 16,000 kg. This proposed system is to reduce and manage food waste using machine learning concepts. Load cell can be used to measure the weight of the waste food. Waste food measurement data can be fetched and transmitted to server. Transmitted data can be stored in database and further used to trainee the data set to predict the accuracy rate using Random forest algorithm. Through that, a comparison of the previous data and current data are taken in to account. From these data's, we conclude the accuracy rate which helps to reduce the food waste on production side on further days. Finally, we can reduce the food waste in public or hostel messes by proposing our method in their system regulations and also bring awareness among the people. Thus, an efficient way of utilizing the food and avoiding the wastage of foods is done.

KEYWORD—Machine Learning, Food waste, Random forest, IOT, time series

I. INTRODUCTION

For those that operate in food service facilities, the operational food waste management [1] faces a daunting challenge. Public and enormous number of private organization is keeping on working to find a perfect solution to solve this problem [2]. Technology gets evolving and internet of things (IOT) plays great role to improve the economic growth. As more and more data are generated and these data must be transported through the cloud [4], after the data is processed and resourcefully analyzed by objects and entities introduced to the Internet of Things[6]. In this article, we have built a test rig for the weights of food waste using IOT components. The data collected can be sent to a local server and processed (XAMPP). We suggest a machine learning algorithm [5] to train the dataset in order to produce comparisons on reports in order to quantify food waste based on that data. We should infer and control food waste on the supply side before it is served to the plates based on the study of real-time food waste [7]. It provides a clear insight into the accuracy rate of waste food to the supply side, allowing them to handle food wastes more effectively by means of using machine learning concepts [8] to trainee the dataset to generate comparison on reports to analyze the food waste. Through that analysis from real time wastage of food we can conclude and to reduce the food on production side before it serves to the plates. It delivers a detailed insight on production side to manage food wastes and it reduces the food waste on various public places [9].

II. LITERATURESURVEY

Since food recycling is a difficult challenge, we will concentrate our efforts in this paper on a food wastage measuring scheme [2] in the workplace, which delivers real-time data on food waste to employees through a computer-based dashboard. This study is primarily concerned with the incorporation of the various locations found in the workplace. In this model, higher management and employers will get a clear understanding of real-time food wastage data results by analyzing and generating comparative reports. This can be accomplished in one of two ways: manually (or) automatically (using the Internet of Things (IOT) as the underlying architecture) [10]. Existing system were smart dustbin and smart conveyor to isolate and remove waste from public places using concepts of Cloud networking and Internet of Things (IOT).

The absence of appropriate waste management has caused considerable financial and environmental problems. In order to reduce food waste, this paper introduces a smart garbage system (SGS) based on the Internet of Things (IOT). Wired mesh networks in an SGS allow intelligent battery waste containers (SGBs) to exchange information, which is collected and analyzed by a router and server for service provisioning [11]. A approach is suggested that combines inventory estimation and forecasting with smart dustbins, which evaluate waste thrown into bins using state-of-the-art object tracking techniques to provide insights into how to maximize the use of raw materials used in food preparation and further redistribution and valorization of unexpected waste. As a result, food waste is kept to a minimum. Smart dustbin was using strain gauge weight the waste food, through that we can remove waste once it filled [12]. Smart conveyor uses camera to capture the pictures of food to clustering the waste food items. Based on that captured images, the food can be isolate from the conveyor mqved to their respective trash based on their clustering.

III. PROPOSED SYSTEM

The Load cell or strain gauge calibrated and used to calculate the weight of the food waste. HX711 to Node MCU data can be multiplied (ESP8266). Via the Node MCU, measured data can be sent to a local server. The data is handled by the Node MCU, which acts as a microcontroller. Data will be sent to the archive after it has been retrieved. The weight calculation is shown using an OLED monitor. Data can be saved locally and shown on a web page. To compare and train the datasets, we used the Random Forest algorithm [13]. Based on real-time analysis of data that is being lost in hostel messes, a trained dataset can be used to estimate the accuracy rate of food wastage [14]. This forecast can be used on the manufacturing line to reduce food waste. Used concepts are listed and discussed in the below section.

A. Internet Of Things

The Internet of Things (IOT) is a term that refers to a collection of physical and virtual devices that can capture and transmit data over a wireless network without the need for human intervention. Computing devices and digital computers are linked together by a special and precise identifier that allows data to be transferred from one location to another. IOT based ecosystem consists of various web-enabled kind of smart devices that save, to allocate and use the embedded based systems including the processors, the sensors, and the communications related hardware to the data from their surroundings. An IOT sensors connect to an IOT or other edge node, which can then be transported to the cloud or analysed locally, for the sharing of sensors. For making calculations, many existing weighing systems depend on the phase reaction of one or more force transducers [15]. Force transducers, on the other hand, may have a long settling period, limiting the overall measurement rate. The effect of an object on a load cell is used in this paper to demonstrate a weight calculation technique. Since the Dirac delta function will approximate the impact impulse, the output looks like the impulse response. This impulse response can be used to estimate the size of the impact impulse and the object's weight. The long oscillatory reaction of the force transducer is eliminated by signal processing.

B. RANDOMFOREST

The Random forests method or the random based decision-making forests are a group oriented learning approach to identify, re- regress and other functions, which work by building numerous decision trees during training and by creating the class mode or medium-average projection between the different trees. Random decision forests are correcting their training in deciding tree habits, but, their level of accuracy is poor when compared to the gradient-enhanced based trees. The random based forest predictors which are naturally lead to a degree of differentiation between observations. The aim is to construct a random forest predictor that differentiates the observed data from properly produced synthetic data, which can also describe a random forestry based dissimilarity related measure between the unlabeled details. It can be attractive to random based forest differences, since it can handle mixed variable forms in good manner, it is invariant for monotonous changes in input variables and it is robust to external observations. The random forest dissimilarity can conveniently address a wide range of semi-continuous variables due to its inherent variable set.

C. CONFUSION MATRIX

An intermediate matrix is an engine learning classification output analysis methodology. This is a kind of table that allows you to learn the classification model's output on a collection of test results, so that true values are understood. The word confusion matrix is clear, but it may be a little misleading about its associated terms. A basic explanation for this technique is given here. Confusion matrix is a helpful machine learning[3] tool for measuring recall, precision, precision and AUC- ROC curve. Below is an example of the concepts True Positive, True Negative and True Negative.

- **Positive Predictive Value (PVV):**

That's very close to accuracy. The PVV considers the prevalence as a substantial distinction between two terms. The optimistic predictive value is same as accuracy in situations where classes are perfectly equal.

- **F Score**:

F1 score means an overall weighted score of real good (recall) and accuracy.

- **Precision:**

The accuracy parameter indicates the accuracy of the positive class. It tests how probable the optimistic class prediction is correct. The highest score is 1 if the classifier categorizes all positive values
in perfect order. Accuracy alone is not advantageous when the derogatory class is overlooked. Typically the metric is combined with the metric recall. Remembering the sensitivity or true positive rate is often named.

- **Sensitivity**: The ratio of correctly detected positive groups is computed using sensitivity. The model's ability to classify a positive class is measured using this metric.

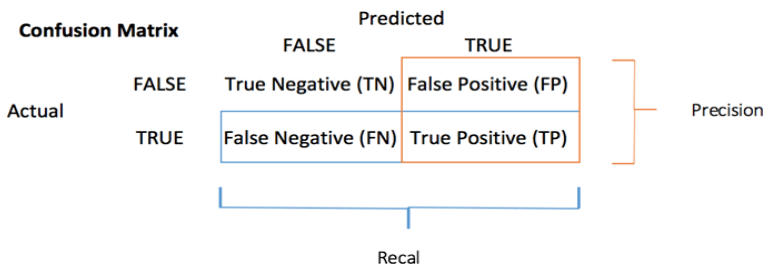


Figure: 1 Confusion Matrix

$$Precision = \frac{TP}{TP + FP} \qquad Recall = \frac{TP}{TP + FN}$$

IV. METHODOLGY

We use machine algorithms to analyze from real time food wastage data to predict the time line of wastage so that we can reduce the wastage of food. The average amount of the food waste is calculated and measured approximately through the load cell. The HX711 to Node MCU data transfer can be amplified (ESP8266). Via the Node MCU, measured data can be sent to a local server. For data processing, the Node MCU serves as a microcontroller. Data will be sent to the archive after it has been retrieved. The weight calculation is seen on an OLED display. Every calculated food waste data is transmitted and stored in the server. The data which has been fetched from strain gauge can be used to compare the present data and past data can be used to predict the accuracy rate of the food waste. After the comparison of both data, prediction rate has been generated which is used to reduce the food waste certain manual calculations on the production desk, so that we can reduce the gross rate for the next time of preparation and also create awareness among the people. The Local Server and the sample dataset is shown below.

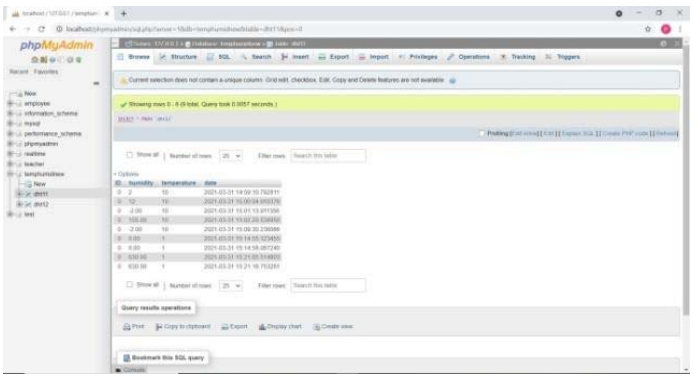


Figure: 2 Local Server

[ ]

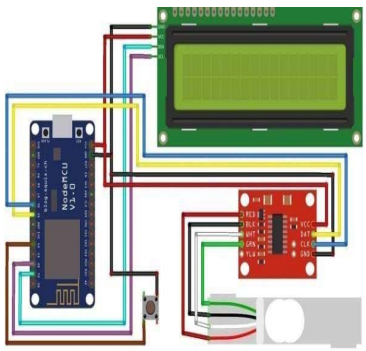
	Sl.no	ID	T.Weight	L.Weight	date	112th	year	day
0	1	1	4	544	1	1	2020	114
1	2	1	5	362	2	1	2020	115
2	3	1	6	546	3	1	2020	116
3	4	1	7	245	4	1	2020	117
4	5	1	8	663	5	1	2020	111

```
[ ]  #to display how many rows and columns in the dataset
     dataset.shape

     (5114, 8)

[ ]  X = dataset.iloc[:, 0:4].values
     y = dataset.iloc[:, 4].values
```

Figure: 3 Dataset

V. CIRCUITDIAGRAM

The working model and circuit flow diagram to do the processing of our work is given below:



VI . FLOWCHART

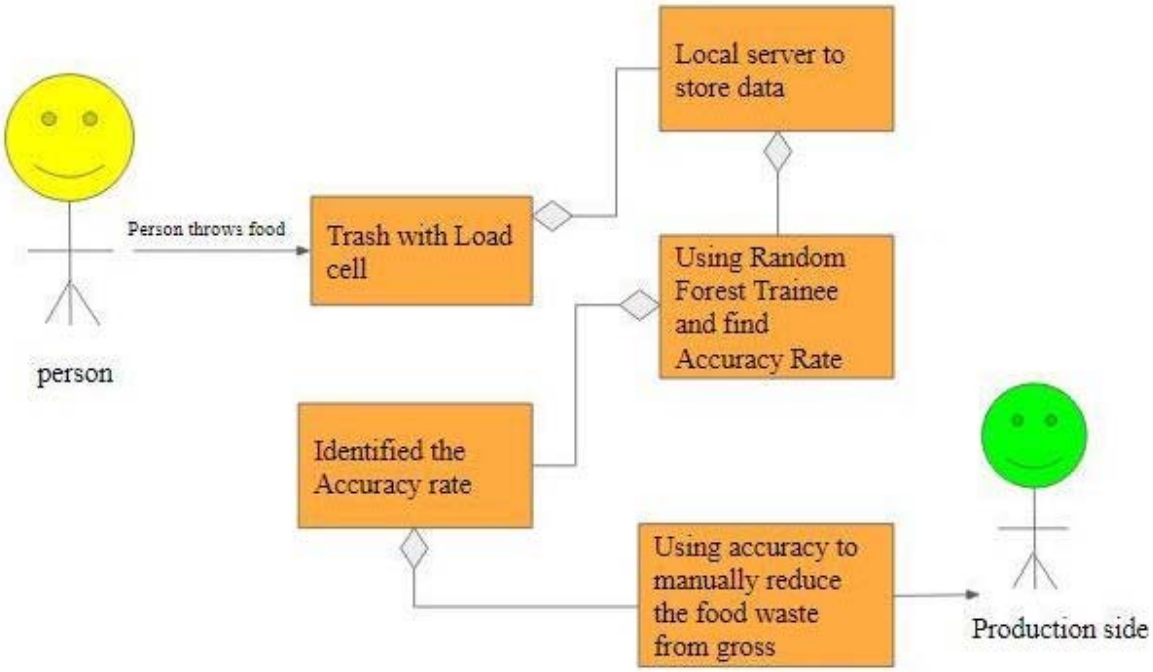


Figure: 5. Flow diagram

The above diagram explains the workflow model of our proposed work

VI. ANALYSIS ANDDESIGN

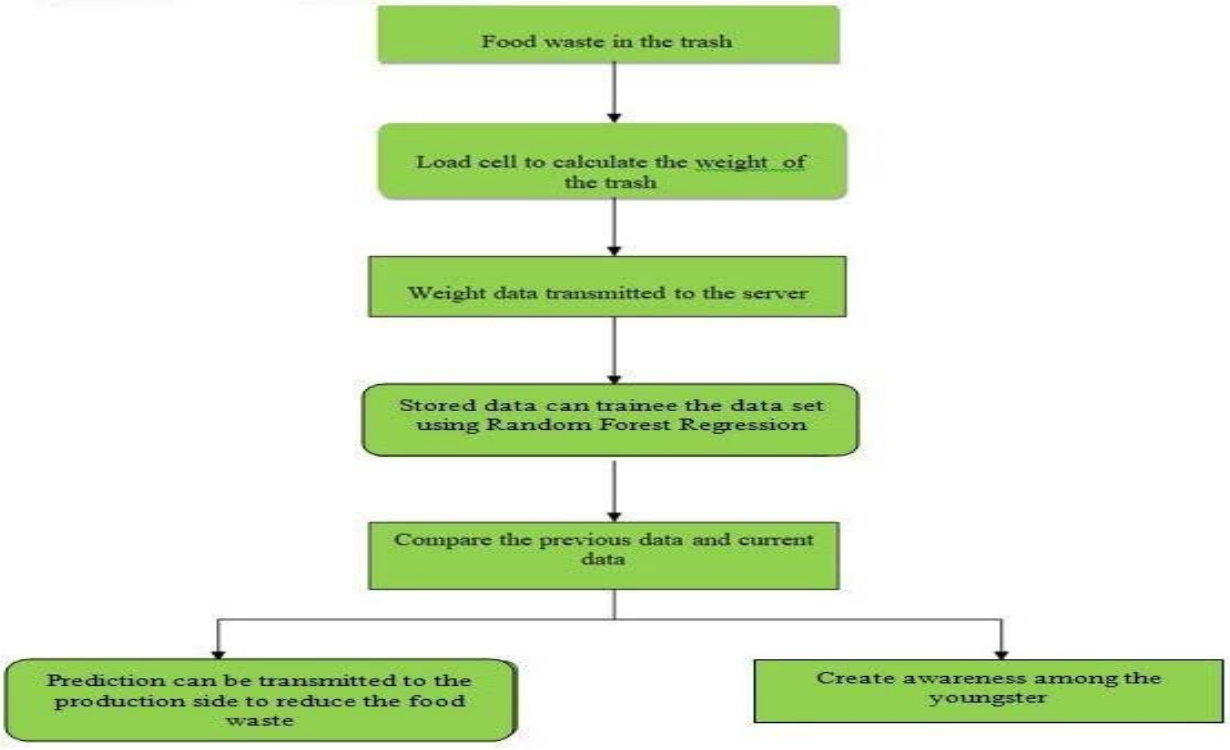


Figure: 6.Uml diagram

The analysis and design to execute the process model was shown in the above diagram

Procedures:

Step 1: Person put food on trash**.**

Step 2: Trash carries load cell to measure weight.

Step 3: Measured data can be transmitted to Node MCU

Step 4: NodeMCU act as WIFI module to transmit data from Local server.

Step 5: Transmitted data can be stored in Local Database.

Step 6: Through that data Using Random Forest regression to predict the accuracy rate by comparing thedata.

Step 7: prediction can be used to reduce the food waste by reducing it from gross quantity on production side**.**

VII. CONCLUSION AND FUTURE WORK

We can efficiently manage the food waste in huge amount by introducing our innovation in public food courts and hostel messes. Through that we can manage the food waste through the predicted accuracy rate of the food waste. Our future work has huge advantage, because introducing the camera to capture picture to clustering the waste food to separate them, through that we can reduce that particular item from the chart of the production site. Future work has huge advantage, because introducing the camera to capture picture to clustering the waste food to separate them, through that we can reduce that particular item from the chart of the production site.

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PREDICTION OF CARDIAC DISEASE USING MACHINE LEARNING ALGORITHMS

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Abstract
Healthcare provision is amongst humanity's most formidable challenges. Diseases of the heart and blood vessels are major killers worldwide. Researchers will need to create a mechanism to detect this cardiac irregularity and stop the spread of heart problems, which are on the rise. In this study, we improved the accuracy of cardiovascular disease prediction by using a Cardiac MRI picture and other advanced image processing techniques. It aids in the diagnosis of cardiovascular illness and enhances the assessment of heart conditions in patients. To back up our assertions, we analysed the performance parameters of many machine learning algorithms, including their accuracy, precision, f1-score, and recall.

Keywords: Cardiac Magnetic Resonance (CMR) Imaging, segmentation, deep learning, U-net, Convolutional Neural Networks(CNN),Random Forest.

1. INTRODUCTION
The primary focus of this research is on the application of machine learning techniques to the problem of predicting cardiovascular disease. There is no more vital a part of a human body than the heart. Basically, it regulates the circulation of blood throughout our body. Any kind of cardiac problem may lead to discomfort elsewhere in the body. Any disturbance in the heart's normally rhythmic pumping action is considered cardiac disease. Heart disease has emerged as a major global killer in recent decades. Tobacco use, excessive alcohol use, and a diet heavy in saturated fat have all been linked to an increased risk of cardiovascular disease [1]. More than 10 million people worldwide die annually from heart disease, according to the World Health Organization. Providing high-quality services and correct diagnoses is the major problem in modern healthcare [2]. Cardiovascular disease may be the biggest cause of mortality globally, yet it is also a condition that can be treated and controlled. The effectiveness of medical treatment relies entirely on early diagnosis. Machine learning (ML) is a kind of data mining that makes quick work of very big, properly organised information. Many medical conditions may be diagnosed, detected, and predicted with the use of machine learning. This effort is motivated by a desire to provide medical professionals with a method for early diagnosis of heart illness [3]. Therefore, patients will get better care with fewer negative side effects.

2. LITERATURE REVIEW

Avinash Golande et al. look at several ML algorithms that might be used to categorise cardiac diseases. K-Nearest Neighbor (KNN) and K-Means (K-Means) classification accuracy was studied [1]. This research found that the decision tree was the most accurate

tool, and that it could be improved upon by incorporating insights from other approaches and playing with the settings. Common cardiac image segmentation tasks, including examples using MRI, CT, and ultrasound. Model-based approaches (e.g., active shape and appearance models) and atlas-based methods were demonstrated to perform well in cardiac image segmentation before the advent of deep learning (5–7). Lord Krishnan S. J. Geetha S [8] created a system to predict the consequences of cardiovascular disease. The results of this system raise the risk of cardiovascular disease. Similarity in data structure to treatment parameters was taken into account. The information mining plan methodology is used to analyse these criteria within their framework. Both the explicit Decision Tree Algorithm and the Naive Bayes Algorithm, which are considered to be the two gold standards of machine learning, were used to build up their datasets in Python, and their results showed that the former provided the more accurate prediction of heart disease.

3. PROPOSED WORK

The series of steps involved in our proposed model are as follows: Data preprocessing,splitting datasets, Feature Extraction and Selection, Disease Prediction using Machine Learning algorithms as shown in fig.1.

3.1 DATA PREPROCESSING

Data preprocessing is a required task for cleaning the data and making it suitable for a machine learning model, which improves the model's precision and efficiency. Here's what you need to do: 1.Read picture, 2. In order to do step 2 (Image Resizing), Third, silence the background chatter (Denoise), 4 Segmentation 5 Morphology (smoothing edges).

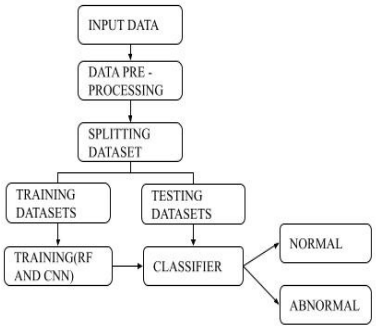

Fig 1 Flowchart for Proposed Work

3.2 CONVOLUTIONAL NEURAL NETWORK (CNN) ALGORITHM:

Convolutional neural networks (ConvNets) are a kind of deep learning network that can take an image as input, prioritise (using learnable weights and biases) certain qualities or objects in the picture, and then extract meaningful results. When compared to ConvNet, other classification methods need extensive preprocessing. ConvNets, given sufficient training, can learn these filters and properties, but essential approaches still need human intervention.

ARCHITECTURE OF CNN:

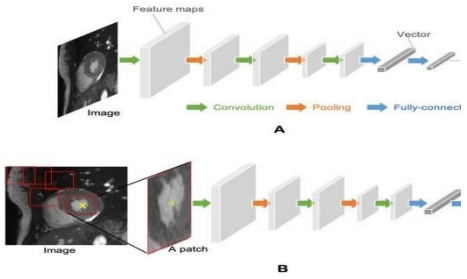

Fig.2 Architecture Of CNN

CNN receives an MR picture of the heart and uses a series of convolutions and pooling operations to learn the image's structural properties. These maps of spatial features are transformed to a vector form by flattening them using fully linked layers. Depending on the situation, this vector might take on a variety of forms. As can be seen in fig.2, these outputs may be probabilities for a collection of classes (image classification), bounding box coordinates (object localization), a projected label for the input's centre pixel (patch-based segmentation), or an actual value (regression issues).

3.3 RANDOM FOREST ALGORITHM:

The Random Forest machine learning technique is widely used for supervised learning. Both classification and regression issues may be tackled with the help of machine learning. The model's superior performance may be attributed to its foundation in ensemble learning, a technique for integrating several classifiers to address difficult problems. The accuracy of a dataset may be improved by using a classifier called a Random Forest, which takes an average of the decisions made by many decision trees applied to various subsets of the dataset. The random forest takes the predictions from many different trees and uses the ones with the most votes to determine the final result.

ARCHITECTURE OF RANDOM FOREST

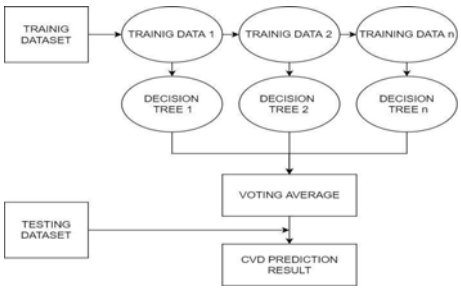

Fig 3 Block Diagram for Random Forest Classifier

Many different decision tree models compose the random forest. Each tree in fig.3 was constructed using bootstrap samples from the training dataset, and each node was partitioned using a randomly selected optimum subset of explanatory variables or features. The model prediction was chosen using a majority vote based on the class predictions produced by each tree in the forest. By randomly assigning samples to nonoverlapping training samples for building the prediction model and testing samples for determining sensitivity, specificity, accuracy, positive predictive value, and negative predictive value of

prediction models, we were able to evaluate the performance of the random forest prediction model.

3.4 PERFORMANCE EVALUATION

Confusion matrix, accuracy score, precision, recall, sensitivity, and the F1 score are all employed in the assessment procedure. Confusion matrices are tabular representations of data that include both actual and expected (or true positive and true negative) outcomes. True positive (TP) is the first of four components of the definition, and refers to cases when the values have been recognised as true and are, in fact, true. The second kind is known as a false positive (FP), and it occurs when erroneous results are incorrectly labelled as true. The third kind is known as a false negative (FN), in which a valid result was incorrectly labelled as negative. In the fourth case, called true negative (TN), the value was really negative. Figure 4 displays the data table.

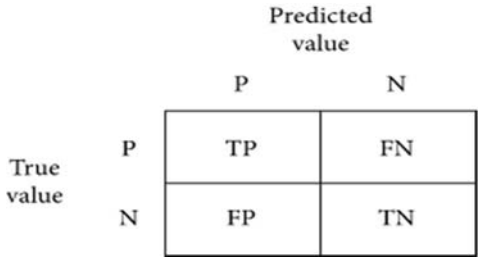

Fig 4 Confusion Matrix

In Figure 4, P = positive, N = negative, TP = true positive, FN = false negative, FP = false positive, TN = true negative.

Then, an accuracy score is utilised to evaluate a model's performance. It is calculated by dividing the sum of all true positive and true negative values by the sum of all true positive and all false negative values. The equation is

$$\square\square\square\square\square\square\square\square = \frac{\square\square+\square\square}{\square\square+\square\square+\square\square+\square\square} \qquad (1)$$

Then there is sensitivity in which the proportion of actual positive cases got predicted as positive (or true positive). Sensitivity is also termed as recall. In other words, an unhealthy person got predicted as unhealthy. The formula is

$$\square\square\square\square\square\square\square\square\square\square\square\square = \frac{\square\square}{\square\square+\square\square} \qquad (2)$$

4. RESULTS AND DISCUSSION

The classification's accuracy was measured by contrasting the anticipated with the actual type. The suggested approach analysed the dataset using the four classifiers shown in fig.5 to achieve its categorization goal. As can be seen in fig.5, the highest accuracy (99.98%) is achieved by the Random Forest tree classifier. Table II displays the agreement rates between training and testing. The Random Forest tree classifier was employed because it achieved the best levels of accuracy. We compare the accuracy of predictions made by Convolutional Neural Networks with the Random Forest approach for cardiovascular disease.

METHOD	DATARATIO	ACCURACY	SENSITIVITY	PRECISION
SVM	50:50	57%	38%	43%
KNN	50:50	75%	54%	63%
CNN	50:50	87%	90%	72%
RF	50:50	99.98%	92%	85%

Fig. Table for Performance Evaluation

5. CONCLUSION

Many of today's algorithms are not well suited to making reliable CVD disease predictions. Even medical professionals have trouble making accurate prognoses of the situation. So, the suggested strategy helps doctors with their predictions. In this script, we used convolutional neural networks and Random Forest to create a model for predicting the onset of disease. The research also compared the suggested method to the state-of-the-art algorithms. The suggested model consists of two convolutional layers, two dropout layers, and one output layer. The proposed network will have to process a large amount of data. Unlike the prior technique, which required separate solutions for preprocessing, feature extraction, and prediction, the present one does all three in a unified fashion.

6. FUTURE SCOPE

Findings from evaluations may be enhanced via the use of machine learning and other optimization techniques. It is possible to use several techniques for data normalisation and then compare the outcomes. For the benefit of both patients and medical professionals, further methods might be investigated for integrating ML and DL models trained on heart disease with specialised multimedia.

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A Hybrid Model Combining Encryption Algorithms for Biometric Data Hiding

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Abstract

The use of covert, wireless medical sensor networks has been shown to significantly improve patient care. However, there are a number of security risks associated with the transmission and storage of sensitive physiological data pertaining to patients across public networks. The following are some of the most often raised safety issues when implementing healthcare apps using WSNs. A patient's confidentiality might be compromised by eavesdropping. An eavesdropper with a powerful receiver antenna might potentially get health information from a patient's medical sensors. The patient's privacy may even be compromised if he were to disclose the patient's medical condition online. Impersonation poses a threat to the integrity of patient records. During transmission of patient data to a distant location, an attacker might fake a wireless depend on point in a home care application. The patient's fingerprints have been encrypted using Advanced Encryption Standard (AES) for a more effective solution, and the hospital administration can only view the data if the patient matching them gives their permission.

Keywords.

Encryption, Biometric, Data Hiding, Decryption, AES Algorithm, Wireless Sensor Networks, Database

1. INTRODUCTION

Remote clinical sensor organizations (WMSNs) have exploded in popularity in the medical services market over the The time frame being considered is the recent past. Remote clinical sensors are state-of-the-art add-ons for medical apps that provide a more personal style of service without compromising patient convenience. An off-site clinical sensor network is characterised by its low-powered, low-memory, low-calculation-handling, and low-transfer-speed devices. Wearable clinical sensors (such as electrocardiogram (ECG) anodes, pulse oximeters, circulatory strain sensors, and temperature sensors) capture physiological data from a person and transmit it wirelessly to the handheld devices of healthcare practitioners (i.e., iPhone, PC, PDA, and so forth). [13] These measurements from clinical sensors may be used to provide a more complete picture of a patient's health to the attending physician. In a typical emergency room setting, a patient's vital signs may include heart rate, body temperature, blood pressure, oxygen saturation, and more. Therefore, medical services frameworks are the applications that most benefit from using remote clinical sensor technology that can perform patient consideration inside clinics, facilities, and homecare. Various research groups and businesses are working in wellbeing monitoring utilising remote sensor organisations, for example, and so on. Continuous patient monitoring, mass-causality disaster monitoring, a variety of in-field clinical monitoring, crisis response, and so on have all benefited greatly from advancements in remote clinical sensor technology. These WMSNs also provide a plethora of enhanced methods for in-depth disease analysis (such movement analysis for Parkinson's analysis).
However, there are various challenges associated with the development of remote medical care, including but not limited to: reliable information transmission, fast event localization, timely conveyance of information, executive power, hub calculation, and middleware. Additionally, patient safety is a major concern while developing healthcare software.

in particular adopting a system for remote medical care (i.e., remote clinical sensors, remote entryways, cell phones, and so on) Although there are benefits to remote patient monitoring, the security of a patient's physiological data is a major concern. Additionally, vitals are very sensitive and should be protected from prying eyes and other security risks. In addition, the remote concept of gadgets (i.e., clinical sensors, iPhone, PDA, etc.) makes it much simpler to inquire about and screen (i.e., in a specially appointed way) the patients' vital bodily functions inside the emergency clinic ward rooms using cutting-edge mobile phones, iPhones, PDAs, and PCs, meaning that any enemy can be listening in on patients locally in the wardroom using their hand-gadgets, potentially resulting in patient harm.

The practice of storing data on the cloud has become routine. A rising number of clients are storing their vital data on cloud servers rather than retaining a copy on their local devices. When data is stored in the cloud, it is sometimes so important that clients must ensure it is not lost or tampered with. [9] While it is simple to examine information trustworthiness after downloading all of the information to be reviewed, downloading a large amount of data just for the purpose of assessing information trustworthiness is a waste of communication data transmission. As a consequence, a great deal of work has gone into building far-off information trustworthiness checking conventions

that enable information uprightness to be reviewed without fully downloading the data. The first is a presentation of far-off information uprightness checking, which openly suggests RSA-based strategies for dealing with this problem. Then, using pre-processed challenge-reaction sets, suggest a remote stockpiling reviewing approach.

Many recent efforts have focused on introducing three advanced components to remote information respectability conventions: information dynamic, public obviousness, and security against verifiers.

[15] The framework aids information aspects such as block addition, block adjustment, and square cancellation at the square level. It fosters the sharing of information. Furthermore, it can be easily changed to aid with information dynamics. Using the tactics, it's possible to change it to help with information aspects. On the other hand, public obviousness encourages anybody (not just the customer) to play out the honesty by observing the behavior. Outsider verifiers are protected under the framework. Compare and contrast the suggested framework with the previous framework.

Distributed computing is the long-awaited idea of registration as a service, in which clients may keep their data in the cloud and get top-notch programmers and administrations on demand from a shared pool of programmable figuring assets. Clients can be relieved of the burden of nearby information hoarding and support by re-appropriating information. As a result, enabling public auditability for cloud information capacity security is critical so that clients may rely on an outside review party to assess the trustworthiness of reevaluated data as needed. The following two essential conditions must be addressed in order to securely present a persuasive Third-Party Auditor (TPA): TPA should be able to conduct a productive examination of cloud data capacity without having to rely on the local network. In particular, our commitment to this work can be summed up as the accompanying three viewpoints

Checking information ownership in organized data frameworks, such as those associated with essential foundations (power offices, air terminals, information vaults, safeguard frameworks, and so on), is of critical importance. Distant information ownership checking protocols ensure that an uncorrupted record may be accessed by a distant server, removing the need for the verifier to know the whole document being verified ahead of time. [10] Regrettably, present standards either allow only a limited number of progressive confirmations or are computationally unfeasible. This project proposes another far-off information ownership looking at the convention in such a way that 1) it allows an unlimited number of record honesty confirmations, and 2) its maximum running duration may be chosen at set-up time and compromised against verifier capacity.

Issues of Security In distributed computing, security is a crucial concern. It's a subset of PC security, network security, and, most likely, data security. [7] The term "distributed computing security" refers to a collection of tactics, innovations, and controls used to protect data, applications, and the underlying infrastructure of distributed computing. The following are some security and protection options to think about.

- Authentication: Only authorised users are granted access to cloud-stored data.
- Authenticity of data: This is how the customer can be certain that their data stored in the cloud is safe.
- Easily accessible and open, cloud data should have no restrictions. Access to data stored in the cloud should be as simple for the user as if it were stored locally.

- Zero carrying capacity The user is relieved of the burden of worrying about storage needs and data maintenance while using a cloud service, which reduces costs and simplifies support.
- When stored in the cloud, sensitive customer data is only accessible to those with proper authorization. Therefore, all chemicals are accessible with the client's exclusive permission.
- For the sake of the client's reputation maintenance, the service provider may bury any data loss that has occurred in the cloud. A cloud client and a cloud specialised co-op/cloud server make up the cloud information capacity in distributed computing. A cloud client is an individual or organisation that stores vast amounts of data on a server hosted in the cloud and maintained by a cloud specialist cooperative. The customer's data may be safely transferred to the cloud without them having to worry about additional resources or maintenance. A cloud services provider will provide its customers a variety of support options. Ensuring the data quality and integrity in the cloud is the biggest obstacle to cloud information capacity. For customers to feel certain that their data is secure in the cloud, their CSP should provide some form of verification tool. There won't be any unlucky disclosures .

Wireless Medical Sensor Network Security Requirements for Healthcare Applications

Given the above attack model and research, this section lays out the primary safety requirements for implementing a healthcare application in WMSNs, as follows.

Safe User Authentication

When providing remote medical treatment, the potential for unwanted clients to get access to sensitive patient information through remote connections is a major risk that must be addressed. In addition, the safety of medical applications that make use of remote clinical sensor firms is bolstered by trustworthy client verification, also known as two-factor verification.

Definition of a Common Authentication Mechanism

When used in conjunction with medical service applications, clients and clinical sensors must continuously verify one another so that a clear correlation may be established.

Classification

Since patient health data is very sensitive and clinical sensors are located far away, it is important that persistent physiological data be protected from covert attacks like eavesdropping and traffic analysis. Hence, patients'well-being information is simply gained to or employed by authorised specialists.

Establishing Crucial Contacts

For secure communication to take place between a client/expert and a clinical sensor hub, a meeting key must first be established.

Low-Communication and Computational Cost

Because remote clinical sensors are resource-intensive equipment, and the medical services application's capabilities also demand space to carry out their responsibilities, the convention should be competent in terms of communication and computing cost..

Date of Last Updated Data

Experts often need physiological data from patients at certain intervals, thus it is important that this data be current or recently collected. Furthermore, it ensures that an adversary cannot retransmit previously sent information by being completely up-to-date.

Safe from the Typical Attacks

There are a number of well-known attacks that must be prevented at all times, including the replay attack, pantomime attack, taken verifier attack, secret key speculation attack, and data leaking attack, among others. Because of this, the convention may be useful for future developments in remote medical care.

Simple Operation

As an example, a patient should be able to securely update his or her secret word whenever they want using medical care technology.

2. RELATED WORK

A essential arrangement in the current framework [3] for saving information protection is to encrypt information documents and then move the encoded information into the cloud. Unfortunately, figuring out how to safely and efficiently share data between groups via the cloud is no easy task. In the current System information proprietors store the encoded information records in un confided away and disseminate the comparing unscrambling keys just to approved clients. [1] Since the unscrambling keys are kept secret, neither unauthorised clients nor archiving servers can learn anything about the contents of the information documents. However, the number of data owners and the number of disavowed customers are directly increasing the complexity of client investment and disavowal in these schemes.

It's challenging to gather and keep track of private data. Critical data frameworks can't be developed via a cookie-cutter approach. In this paper, we provide a mathematical approach for resolving this problem that is both provably sound and generally applicable. The solution, called SHAREMIND, [6] is a share registering-based virtual computer for secure data processing.

The current system [3] for saving data security relies heavily on the encoding of data documents before uploading the ciphertext to remote servers. A well-thought-out and secure data-sharing strategy for groups working in the

cloud is, however, no easy feat. Owners of sensitive data under the existing system often keep encrypted copies of their files in an insecure location and give out decryption keys to only verified users. Since the unscrambling keys are kept secret, [1] neither unauthorised clients nor archiving servers can learn anything about the contents of the data files. However, the complexity of client investment and disavowal in these schemes is growing proportionally with the number of data owners and the number of renounced customers.

It's not easy to get your hands on secret information and keep it safe. There is no universally applicable methodology for developing mission-critical data frameworks. This work presents a mathematical method for tackling the aforementioned issue that is both provably sound and broadly applicable. [6] SHAREMIND is a share registering-based virtual machine for secure data-handling.

This is a standard approach of assessing capacity safely in a distributed computing environment with several participants. Our unusual answer may be seen in the fact that we opted for both the mystery sharing plan and the convention suite package.

3. PROPOSED SYSTEM

Advanced Encryption Standard (AES)

The image of the finger imprint is subsequently stored and encrypted using the Advanced Encryption Standard Algorithm (AES). As a kind of security, it provides the user with a secret access code. Encoded data is processed in order to execute the element extraction. It averages the Advanced Encryption Standard's relative number of squares. The comparison is drawn between this means and the manner for the information that is presently stored.

While enrolment was taking place, the data was collected. It compares the two images and returns a result independent of the client's authenticity.

Images from a Dataset

Figure 3.1 is an example data collection consisting of fingerprint pictures acquired for use in later encryption processes.

Figure 3.1 Sample Fingerprint Images

Image that has already been preprocessed

We provide the image as the contribution for the further encoding and decoding; the handled picture is the information, and the picture of the patient's unique fingerprint is the contribution to the capacity of information from the patient record.

Care Information

Patients' ages, blood pressures, heart rates, cholesterol levels, client relationships, and blood sugar levels. Using a strong encryption algorithm, encode the data. It is unnecessary to keep both of these records together.

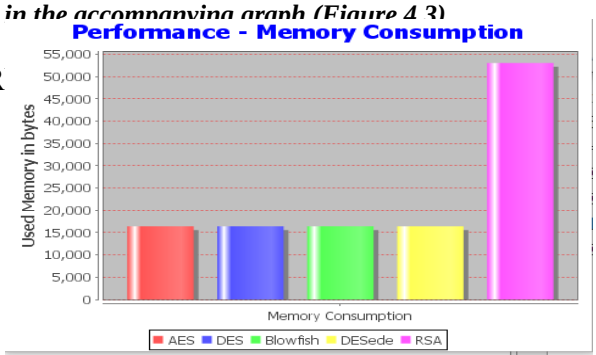
Encryption

Our idea employs a more sophisticated kind of encryption, known as encryption. As a demonstration that the display may be studied and decoding is feasible even in the most secure corporation, the picture presented as information will be scrambled with medical data. The AES calculation is an even square code calculation that transforms regular text into 128-piece squares, which may then be encrypted using keys of 128, 192, or 256 pieces. Given the widespread consensus that the AES algorithm provides enough security, it has quickly become the de facto standard. Following encryption, algorithmic parameters are considered. The memory footprint of each method is shown in Figure 4.1 below. Figure 4.3 displays a graph that allows comparison of the encrypting times of several algorithms.

Cover Your Tracks

Using encryption through a high-level encryption standard organisation is a good way to keep personal medical information private. Therefore, it is important that the record be maintained up to date properly so that the unscrambling may be achieved. Once the data has been hidden, a key will be formed, and its creation time may be seen in the accompanying graph (Figure 4.3)

4. R



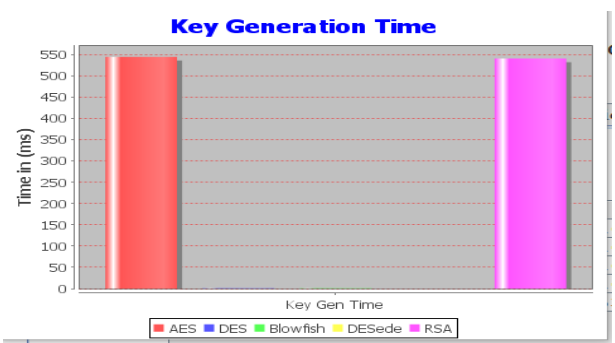


Figure 4.1 Performance – Memory Consumption

Figure 4.2 Key Generation Time

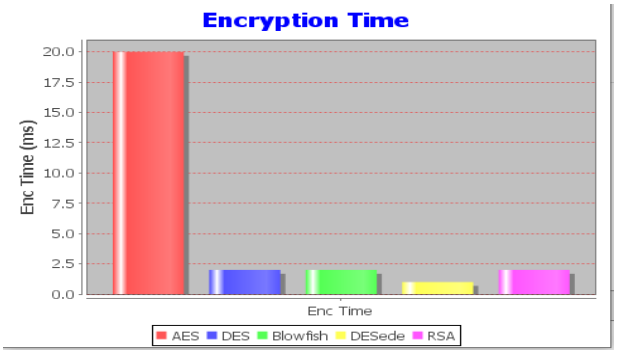


Figure 4.3 Encryption Time

5. EXPERIMENTAL SETUP

When comparing the results (Figure 5.1) of presenting information on a plate vs displaying it in a shop, it is clear that the throughput of the circles prevents IB- DPDP from reaching all of the squares. Since Linear scaling execution, no convention has been able to outdo IB-DPDPP in terms of cost, except for maybe initial investment. Today, the Linear scaling may be rendered obsolete by the faster and more efficient practise of storing a large number of concentric circles. Long-term, the rates will increase beyond that of plate data transmission, and linear scaling will continue to apply. The linear relationship between the size of a document and the amount of time needed to provide proof of ownership is broken by testing. If compared to the more common indirect approaches, the suggested AES framework performs better. Indicators of what can be called "hypothetical traits" are shown in the provided graph and table. It's possible that the final result will be different.

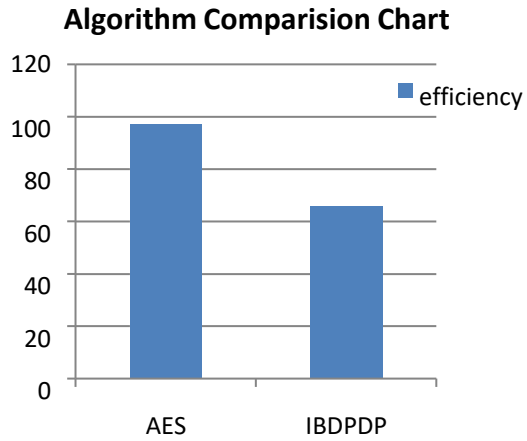


Figure 5.1 Algorithm Comparison Chart

6. CONCLUSION

Distributed computing is used to develop a novel way for identifying inaccuracies in big informational indexes generated by sensor network frameworks. Initial focus is on introducing error grouping for massive information indexes. In addition, we show how sensor network architectures relate to non-scale complex systems. We present a time-effective method for detecting and fixing errors in massive cloud-based information indices that takes into account the various kinds of errors and data from small and medium-sized businesses. Our distributed computing environment, U-Cloud, was used to conduct research that demonstrates how the suggested zero-scale error-finding method may significantly reduce the optimal opportunity for fast error identification in large data sets.

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CLAMAC: Design of a Continuous Learning Aspect-Analysis Model for development of Multidomain Adaptive Chat Companions

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Abstract: Chatbots (or robo advisors) assist users to quickly solve trivial issues with minimum support staff. Chatbots are often designed via use of rule-based models, which allows them to identify solutions to fixed question sets. But such bots are static in nature, and their use often affects customer retention when used under real-time scenarios. To overcome this issue, dynamic Machine Learning (ML) based bots were designed, which use a large training corpus with multiple domains for assisting users. But these models have limited aspect-aware capabilities, due to which a single classification error reduces the usability of entire chat sessions. Moreover, these models train the chatbot on multiple domains, which reduces its accuracy & increases delay needed to classify user inputs. To overcome these limitations, this text proposes design of a novel continuous learning aspect-analysis model for development of multidomain adaptive chat companions. The proposed model initially uses an aspect-based classification layer, that assists in segregating user input into multiple aspect types. Based on this segregation, multiple domain-specific deep learning models are trained, which assist in improving usability of the chat sessions. The aspect-based model is built using Genetic Algorithm (GA) based adaptive clustering model, while a MobileVNet2 Model is used to train multiple deep learning methods that assist in user query classifications. Due to use of GA based clustering, the model is capable ofidentifying aspects with an accuracy of 98.5%, which allows the Convolutional Neural Network (CNN) to effectively select the correct training model for solving user queries. The model also uses an incremental learning layer, that assists in continuously improving its performance w.r.t. intelligent user feedback analysis. The proposed model was deployed on a wide variety of domains including Medical Assistance, Hospitality Management, E-Commerce Websites, and Online Food Ordering websites. Upon evaluation of the proposed model on these applications, an accuracy of 97.6% was observed, along with a precision of 95.4%, recall of 96.5%, and delay of less than 1 second for different input queries. Due to such a high-performance, the proposed model is capable of deployment for a wide variety of chat companion scenarios.

Keywords: Chatbot, Machine, Learning, Genetic, Algorithm, MobileVNet2, Aspect, CNN, Clustering, Model

1. Introduction

Chatbot design is a task of multiple domain that entails modelling of corpus collection techniques, pre-processing, query evaluation, text matching, sentiment analysis, clustering, classification, and post processing models. Design of a typical chatbot model [1] is depicted in figure 1, wherein user input is processed via entity evaluation, intent classification, dialog-based modelling, multiple social & professional channels, etc. to estimate query-based responses.

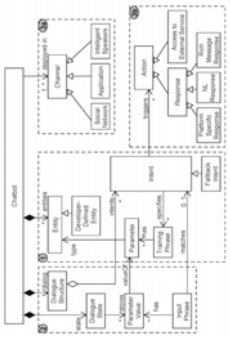

Figure 1. Design of typical chatbot model

These responses are aggregated via an action layer, that assists in selecting input-specific responses, which are presented to the users. The model uses a combination of multiple deep learning models, that work in collaboration to improve chatbot's real-time performance. Efficiency of these models largely depends upon quality of training corpus, due to which these chatbots require large multidomain training datasets. Similar models [2, 3] along with their nuances, advantages, limitations, and future research scopes are discussed in the next section of this text. Based on this discussion it can be noticed that the existing models are either static or have limited aspect-aware capabilities, due to which a single classification error reduces the usability of entire chat sessions. To overcome these issues, section 3 proposes design of a novel continuous learning aspect-analysis model for development of multidomain adaptive chat companions. The proposed CLAMAC model uses a combination of Genetic Algorithm with dynamic clustering for aspect-based analysis, and MobileVNet2 based CNN for identification of input-based responses. The proposed model was tested under different applications, and its efficiency was evaluated in section 4, where it was compared in terms of accuracy, precision, recall, and response time metrics. Finally, this text concludes with some interesting observations about the proposed model and recommends methods to further improve its performance.

2. Literature review

Chatbot models are increasing rapidly due to availability of simplified interfaces. For instance, work in [4, 5, 6] propose use of QANet (Question Answering Network) model, retrieval-polished (RP) model, and trust-based response model, which assists in estimation of context-specific features to answer user queries. But these models work in single domain environments, and cannot be scaled due to their internal design characteristics. To design a scalable chatbot, work in [7] proposes combination of Modelling Language for Artificial Intelligence, Sentiment Analysis&automatic Natural Language Generation, which assists in improving multidomain answering capabilities via effective feature augmentation analysis. This model is useful for Sports, Entertainment, E-Commerce, and other real-time applications. Extensions to this model are discussed in [8, 9, 10], which propose use of Business Transformation chatbots, knowledge base bots (KBot), and bioinspired optimization bots, that assist in improving scalability via effective feature augmentation process. Performance of these models is further improved via use of Machine Learning Bots (MLBs) [11], cognitive behavior therapy (CBT) based bots [12], manually tuned bots [13], ad Utterance-to-Utterance Interactive Matching Network (UIMN) bots [14], that assist in extensive feature analysis. These bots can be trained for multiple domains, but are highly complex to deploy due to their inherent corpus-based large-feature set extraction characteristics. To simplify this process, work in [15, 16] propose use of Seq2Seq (S2S), and Modular Cognitive Agent (MCA) based chatbots, which assist in reducing feature complexity via use of variance-based feature selection processes. These models are further extended via use of Robustly optimized Bidirectional Encoder Representations from Transformers (RBERT) [17], and Natural Answer Generation (NAG) models [18], which assist in aspect-based analysis. But these models use single CNNs for multidomain learning, which limits their real-time performance under linked user queries. To get over these limitations, the succeeding sectionsuggests a design of a continuouslylearning aspect-analysis Model for development of Multidomain adaptive chat companions. The proposed model was tested on a wide variety of datasets and compared with various state-of-the-art methods for showcasing its utility under different scenarios.

3. Design of Continuous Learning Aspect-Analysis Model for development of Multidomain Adaptive Chat Companions

In contingent to the literature survey, it was perceived that the existing chatbot models have limited aspect-aware capabilities, due to which a single classification error reduces the usability of entire chat sessions. These models work on single classifier-based multidomain training process, which limits their accuracy when multidomain queries are asked during user sessions. To integrate multidomain queries while maintaining high efficiency, this section proposes design of a novel continuous learning aspect-analysis model for development of adaptive chat companions. Design of the suggested model is depicted in figure 2, wherein it can be noticed that an aspect-based classification layer for segregation of user input into multiple aspect types is connected with multiple, domain-specific deep learning models. This combination assists in improving usability of the chat sessions due to high accuracy for real-time user queries. The aspect-based model is built using Genetic Algorithm (GA) based adaptive clustering model, while a MobileVNet2 Model is used to train multiple deep learning methods that assist in user query classifications. The GA Model uses Natural Language Processing (NLP) based operations to identify different aspects via Bidirectional Encoder Representations from Transformers (BERT) process.

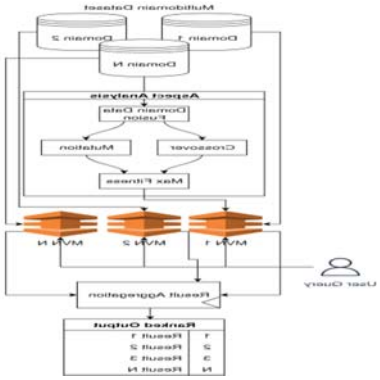

Figure 2. Complete flowchart of the proposed model. The model works via the following process,

- Initialize GA Parameters,
  - Number of iterations (N_i)
  - Number of solutions (N_s)
  - Learning rate (L_r)
  - Maximum number of BERT Embeddings ($E(Max)$)
- Initially mark all solutions as 'to be mutated'
- For each iteration in 1 to N_i, perform the following tasks,
  - For each solution in 1 to N_s, perform the following tasks,
    - If the solution is marked as 'not to be mutated', then go to the next solution for checking process.
    - Else, generate a new solution via the following process,
      - Stochastically estimate maximum number of BERT Embeddings via equation 1 as follows,

$N(Emb) = STOCH\big(L_r * E(Max), E(Max)\big) \dots (1)$Where, $STOCH$ represents a Markovian stochastic process used to generate a number between the given range of inputs.

- Process training set input queries for each set of BERT embeddings, and estimate accuracy of aspect evaluation via equation 2, $Acc = \frac{N_{CA}}{N_T} \dots (2)$

Where, N_{CA}&N_T represents correctly classified aspects and total aspects used for classification by the BERT process.

- Estimate solution fitness via equation 3,

$f = \frac{\sum_{i=1}^{N(Emb)} Acc_i}{N(Emb)} \dots (3)$At the end of each iteration, estimate iteration fitness threshold via equation 4 as follows, $f_{th} = \sum_{i=1}^{N_s} f_i * \frac{Lr}{N_s} \dots (4)$

  - At the end of each iteration, mark the solutions as 'to be mutated', where $f_i \leq f_{th}$, else mark others as 'not to be mutated'
- Upon completion of all iterations, select BERT configuration with maximum fitness levels Due to selection of highest accuracy BERT Model, the GA Method is capable of identifying input queries with high accuracy, which assists in selection of proper MobileVNet2 Models. Depending upon number of domains used for analysis, individual corpuses are collected and a particular MobileVNet2 Model is selected for answering queries. Internal layers for the used MobileVNet2 Model are depicted in figure 3, wherein Dilated convolutions, Depth wise convolutions, Pointwise convolutions, Depth wise separable convolutions, and Global average pooling operations can be observed. Here each input query is processed via Word2Vec feature estimation which is trained for 150528 different corpus words. These features are converted into a size of 224x224x3, which assists in effective convolution-based feature representation for classification process. The convolutional features (CF) are extracted via equation 5, wherein leaky Rectilinear Unit (LReLU) is used for dynamic feature sizing for different input representations.

$$CF = Leaky_{ReLU}\left(\frac{r}{2}+a,\frac{c}{2}+b\right)*\sum_{a=0}^{\frac{r}{2}}\sum_{b=0}^{\frac{c}{2}} W2V(i-a,j-b) \ldots (5)$$

Where, r, c represents row & column size for dilated convolutions, a, b represents padding sizes, while $W2V$ represents Word2Vec features for the given input texts.

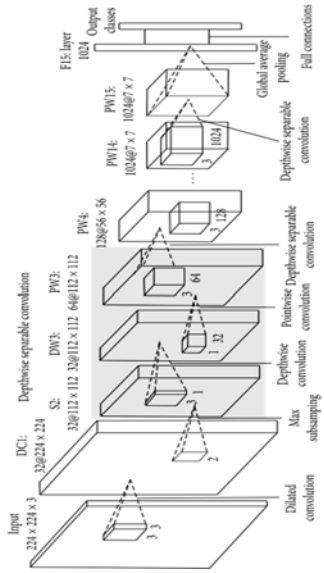

Figure 3. Design of the used MobileVNet2 Model for query response processThese features are activated via a Leaky ReLU Model, which is represented via equation 6 as follows,

$$LReLU(x,y) = 0.1 * CF, when\ Var(CF) \geq 0$$
$$else, 1, when\ Var(CF) \leq 0 \ \ldots (6)$$

The leaky RELU activation layer used in this case removes 10% of all low variance features, which assists in feature selection process. This process is continued for multiple layers, which assists in identification of large input set features. The extracted features are classified using a Fully Connected Neural Network (FCNN), which uses Soft Max based activation layer, and is represented via equation 7 as follows,

$$R(Out) = SoftMax\left(\sum_{i=1}^{N_f} b + CF_i * w_i\right) \ldots (7)$$

Where, w & b represents weights and bias values for different input feature sets, and are tuned via hyperparameter tuning process, while $R(Out)$ represents output response for given input query, which is selected from the pre-set answer classes stored in respective datasets. Based on this process, multiple models are trained on different datasets, and their efficiency is evaluated in terms of accuracy, precision, recall, and response delay metrics. These metrics are evaluated for different datasets, and their performance is discussed in the next section of this text.

3. Results & performance evaluation

To evaluate performance of the proposed method, corpuses from standard datasets were used for training different MobileVNet2 models. These datasets were collected from the following sources,Microsoft Research WikiQA Corpus, available at https://www.microsoft.com/en-us/download/details.aspx?id=52419

- Question-Answer Dataset from Wikipedia, available at http://www.cs.cmu.edu/~ark/QA-data/
- Question Answering Collections from TREC, available at https://trec.nist.gov/data/qa.html
- Yahoo! Language Dataset, available at https://webscope.sandbox.yahoo.com/catalog.php?datatype=l
- ConvAI3 Dataset, available at https://convai.io/data/

A collection of 1.5 million records were used to train 5 different MobileVNet2 Models for Medical Assistance, Hospitality Management, E-Commerce Websites, and Online Food Ordering applications. The dataset was divided in a ratio of 70:30, wherein 70% entries were used for training, while remaining 30% were used for testing different performance metrics. These metrics include Accuracy (A), Precision (P), Recall (R), & Response Time (RT) of the proposed model, and was compared with QA Net [4], UI MN [14], and RB ERT [17] methods. Based on these configurations, accuracy of chat responsew.r.t. Number of Evaluations (NE) is tabulated in table 1 as follows,

NE	A (%)	A (%)	A (%)	A (%)

	QA Net [4]	UI MN [14]	RB ERT [17]	CLA MAC
2.93k	73.57	65.87	84.33	96.95
5.85k	73.98	66.24	84.81	97.37
9k	74.22	66.44	85.08	97.67
11.93k	74.44	66.65	85.34	97.89
14.85k	74.56	66.75	85.47	98.00
18k	74.60	66.78	85.51	98.03
20.93k	74.61	66.79	85.52	98.04
23.85k	74.61	66.80	85.53	98.04
27k	74.61	66.80	85.53	98.05
29.25k	74.62	66.80	85.54	98.05
33.75k	74.62	66.80	85.54	98.05
36k	74.62	66.80	85.54	98.06
38.93k	74.63	66.81	85.55	98.06
41.85k	74.63	66.81	85.55	98.06
45k	74.78	66.95	85.73	98.22

Table 1. Accuracy of different chatbot models

From these results and figure 4,it can be perceived that the suggested model is 23.8% better than QA Net [4], 31.5% better than UI MN [14], and 10.5% better than RB ERT [17] in terms of multiple domain accuracy performance.

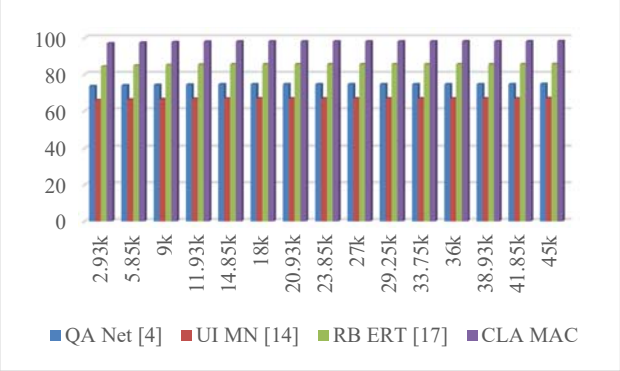

Figure 4. Accuracy of different chatbot models

This is due to use of MobileVNet2 with GA based BERT Modelling, which combines different high-performance classification &aspect-based selection to achieve better performance with lower error rates when compared to standard models. Similar observations are made for precision (P) values, and can be observed from the following table 2,

NE	P (%) QA Net [4]	P (%) UI MN [14]	P (%) RB ERT [17]	P (%) CLA MAC
2.93k	80.79	71.35	84.42	85.68
5.85k	81.24	71.75	84.90	86.05
9k	81.49	71.97	85.17	86.31
11.93k	81.75	72.20	85.43	86.51
14.85k	81.88	72.31	85.57	86.60
18k	81.92	72.35	85.61	86.63
20.93k	81.92	72.36	85.61	86.64
23.85k	81.93	72.36	85.62	86.65
27k	81.93	72.36	85.62	86.65
29.25k	81.93	72.37	85.62	86.65
33.75k	81.93	72.38	85.62	86.65
36k	81.93	72.38	85.62	86.66
38.93k	81.94	72.38	85.63	86.66
41.85k	81.95	72.38	85.64	86.75
45k	82.12	72.53	85.81	86.91

Table 2. Average precision values for different chatbot models

From these results and figure 5,it can be perceived that the suggested model is 3.5% better than QA Net [4], 14.5% better than UI MN [14], and 1.4% better than RB ERT [17] in terms of multiple domain precision performance. This is due to use of MobileVNet2 with GA based BERT Modelling, which combines different high-performance classification &aspect-based selection to achieve better performance with lower error rates when compared to standard models.

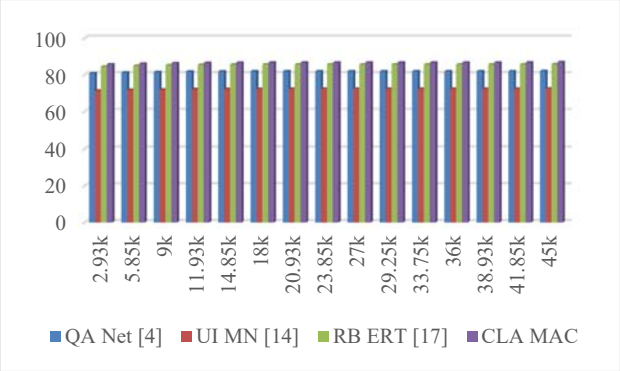

Figure 5. Average precision values for different chatbot models

Similar observations are made for recall (R) values, and can be observed from the following table 3,

NE	R (%) QA Net [4]	R (%) UI MN [14]	R (%) RB ERT [17]	R (%) CLA MAC
2.93k	79.78	70.47	83.38	91.12
5.85k	80.23	70.87	83.85	91.52
9k	80.48	71.08	84.10	91.80
11.93k	80.72	71.30	84.36	92.01
14.85k	80.84	71.41	84.49	92.10
18k	80.88	71.45	84.54	92.13
20.93k	80.89	71.46	84.54	92.14
23.85k	80.90	71.46	84.55	92.15
27k	80.90	71.46	84.56	92.15
29.25k	80.91	71.47	84.56	92.15
33.75k	80.91	71.48	84.56	92.15
36k	80.91	71.48	84.56	92.16
38.93k	80.92	71.48	84.57	92.16
41.85k	80.93	71.48	84.57	92.26
45k	81.09	71.63	84.74	92.44

Table 3. Average recall values for different chatbot models

From these results and figure 6,it can be perceived that the suggested modelis 10.5% better than QA Net [4], 19.5% better than UI MN [14], and 8.3% better than RB ERT [17] in terms of multiple domain recall performance.

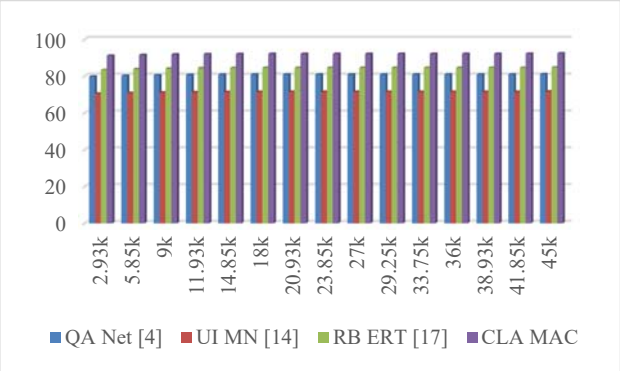

Figure 6. Average recall values for different chatbot models

This is due to use of MobileVNet2 with GA based BERT Modelling, which combines different high-performance classification &aspect-based selection to achieve better performance with lower error rates when compared to standard models. Similar observations are made for delay (D) values, and can be observed from the following table 4,

NE	D (ms) QA Net [4]	D (ms) UI MN [14]	D (ms) RB ERT [17]	D (ms) CLA MAC
2.93k	37.38	42.32	35.76	27.20
5.85k	37.16	42.08	35.56	27.06
9k	37.04	41.96	35.44	26.98
11.93k	36.92	41.82	35.34	26.88
14.85k	36.88	41.74	35.30	26.86
18k	36.88	41.72	35.28	27.30
20.93k	36.88	41.72	35.28	27.60
23.85k	36.88	41.72	35.28	28.00

27k	36.88	41.72	35.28	28.56
29.25k	36.88	41.72	35.28	28.52
33.75k	36.88	41.72	35.28	28.72
36k	36.88	41.72	35.28	29.04
38.93k	36.88	41.72	35.28	29.10
41.85k	36.88	41.72	35.28	29.14
45k	36.81	41.63	35.21	29.31

Table 4. Average delay (D) values for different chatbot models

In contingent to this assessment and figure 7, it is noticed that the proposed model is 15.5% faster than QA Net [4], 20.5% faster than UI MN [14], and 14.5% faster than RB ERT [17], under different types of user queries.

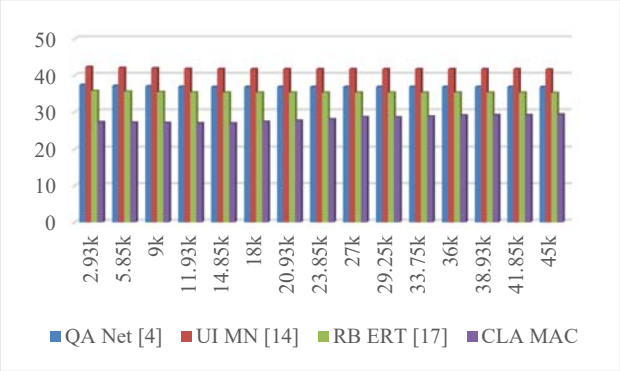

Figure 7. Average delay (D) values for different chatbot models

Due to which, the proposed model is capable of being deployed for a wide variety of real-time high-speed applications. This is due to use of MobileVNet2 with GA based BERT Modelling, which combines different high-performance classification &aspect-based selection to achieve better performance with lower error rates when compared to standard models. Due to this high-performance, the proposed model is useful for a wide variety of real-time chat bot design deployments under multidomain application scenarios.

4. Conclusion and future work

The proposed model initially uses a GA based BERT training method, which is capable of effective aspect classification under multiple datasets. The BERT model is followed by multiple MobileVNet2 based CNN blocks, which assist in deploying a domain specific query resolution process. The model is trained on multiple datasets, and it was observed that the proposed model is 23.8% better than QA Net, 31.5% better than UI MN, and 10.5% better than RBERT in terms of multiple domain accuracy, it was also observed that the proposed model is 3.5% better than QA Net, 14.5% better than UI MN, and 1.4% better than RBERT in terms of precision, while the proposed model is 10.5% better than QA Net, 19.5% better than UI MN, and 8.3% better than RBERT in terms of multiple domain recall performance. Apart from this, the proposed model was observed to be 15.5% faster than QA Net, 20.5% faster than UI MN, and 14.5% faster than RBERT, under different types of user queries, which makes it useful for a wide variety of chatbot design applications.

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An Economical Deep Learning Framework for COVID-19 Diagnosis Using Lung Ultrasound Images

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Abstract.

The pandemic of Coronavirus illness (COVID-19) and subsequent control measures have resulted in a global health crisis that has affected most of human life. The critical prerequisite for COVID-19 diagnosis is that the disease be detected early. The ML algorithm aids in the speeding up of the process while preserving energy in this way. In COVID-19 detection, when time-to-delivery and training data availability are crucial, transfer learning achieves the same purpose and is a successful technique. This strategy saves time and money by doing machine learning tasks with pre-trained models from universities, research institutes, and open-source communities. It transfers learnt parameters or information to different algorithms using constructed features. As a result, this study uses real-time to give full information on Lung Ultrasound indicators in COVID-19. The design of Deep Neural Network (DNN) lung ultrasonography markers with the detail of COVID-19 is studied with promising results.

Keywords. Corona Virus 2, Covid-19, Deep Learning, Lung Ultrasound, Machine Learning.

1. INTRODUCTION

Infections of the lungs that are dangerous Coronavirus 2 is the third most commonly identified human pathogenic coronavirus, capable of causing pneumonia in 15-20% of infected people and demanding emergency care in 5-10% of all cases. It all started in Wuhan, China, and has since expanded around the globe. Pneumonia, lymphopenia, lymphocyte depletion, and cytokine release syndrome are other indicators of a serious disease. As the COVID-19 virus spreads, testing and decision-making tools that are swift and trustworthy are in high demand. Because the outward indications are identical to those of the flu, clinical trials are required for diagnosis. The most popular approaches are ribonucleic acid extraction from mucus or a nasal swab, as well as chest radiography. However, these tests are not always successful in detecting this condition Born et al.[2020]. To prevent the virus from spreading further, prompt diagnosis and touch monitoring are critical components of COVID-19 emergency preparedness. With the influx of new patients, particularly those in need of emergency care, health care providers can assess the impact of key management decisions. Although CT is a well-established way of detecting COVID-19, it has a number of drawbacks that limit its use: it is not generally available, reaction times are considerable, and patients must be transported out of their unit by procedure. Using CT devices securely during a pandemic is exceedingly impossible and can exhaust limited resources. CT scanners, even though cleaned properly, may become a cause of bacteria for other patients who need imaging Tsai et al. [2021].

LUS is supported during the COVID-19 pandemic due to a paucity of evidence for sickness trends in lung US, notably B-lines and pleural line abnormalities. According to the argument, LUS should be employed on a frequent basis in COVID-19 suspects and should form part of the clinical toolset for the COVID-19 diagnostic procedure. LUS for COVID-19 has diagnostic accuracy comparable to CT and is even more sensitive in detecting lung imaging biomarkers, according to some research. As a result, in triage or resource-constrained circumstances, LUS can be a valuable tool for doing direct cascade testing as a globally available first-line inspection strategy. Furthermore, establishing the necessary LUS pattern can be complex and time-consuming, necessitating the use of skilled individuals. This reminds me of machine learning-based medical image recognition systems, which are designed to be used as clinical support tools for clinicians, assisting with data collecting, patient diagnostics, and monitoring Desai et al.[2020].

Experimental trials have been undertaken in all directions in a frantic attempt to combat the COVID-19 epidemic, and DL paired with medical image processing methods has also been intensively examined in order to discover a final cure. One of the primary challenges with the COVID-19 investigation is the absence of precise and sufficient data. Due to a lack of diagnostics, multiple fatality reports and virus-affected illnesses go uninvestigated. [21] It's difficult to say whether the COVID-19 infection detection failure factor is three, 300, or even higher. None of the countries around the world have been able to provide reliable data on this subject. However, research and development activities must continue, and therefore knowledge fusion is critical. Information fusion allows several datasets to be combined and used in DL models to improve prediction accuracy Crisitianaet al.[2020]. The current pandemic situation has touched millions of individuals all around the world. Thousands upon thousands of people are infected with this highly contagious sickness, increasing fears about the human race's survival and long-term viability. The only way to keep the disease under control is to catch it early and avoid infecting anyone else. This demands an accurate and timely diagnosis that poses no health concerns. [20] Due to obstacles such as detection time, cleaning needs after each use of the diagnostic apparatus, and resource availability, traditional approaches struggle to achieve the same outcomes. Therefore, in this study a deep learning based classifier for COVID detection using Lung Ultrasound markers is developed. With this detailed introduction, Section II reviews the related study, Section III describes the outline of LUS, Section IV explains the proposed Deep Neural Network with experimental results, followed by conclusion in Section IV.

2. LITERATURE SURVEY

The global epidemic of COVID-19 has sparked the development of a wide range of novel medical technologies, from telehealth to remote sensing. Simultaneously, the epidemic is putting a strain on the healthcare system. Coronavirus infections will be diagnosed and treated using medical imaging, which encompasses everything from chest radiography to computed tomography and thoracic ultrasound. We investigated the usage of Artificial Intelligence (AI) in the COVID-19 management MI that has been implemented

thus far. difficulty testing, as well as clinical application. In COVID-19 in 2020, we found 4977 papers on MI, with 872 mentioning the word AI. In the meantime, CXR data made up 49.7% of the AI literature, with CT accounting for 38.7% and LUS accounting for 1.5 percent. Only around a quarter of the papers are found to be mature (2.7 percent). 71.9 percent of AI publications focused on disease identification. According to this study, physicians and AI groups place different emphasis on imaging modalities and performed tasks Born et al. [2020]. Lung ultrasonography (LUS) has recently gained popularity as a reliable method of diagnosing COVID-19 pneumonia. Several papers on its utilization based on hypothesis investigations, case reports, or a series of retrospective cases, as well as the predictive status of LUS in COVID-19 patients, have yet to be published. In a case-control study, LUS was used to investigate if it could predict death and ICU admission in COVID-19 patients who were screened in the emergency room. LUS could detect COVID-19 pneumonia and predict high-risk patients for ICU admission and mortality during the initial assessment in the emergency department, according to our findings Bonadia et al. [2020].

The fastest-growing field of ultrasound technology is lung ultrasound (LUS). During the current COVID-19 outbreak, numerous doctors all over the world employed LUS to detect lung disease in patients who were suspected or infected by the virus. However, standard ultrasound imaging is frequently used to develop LUS, which is not designed to sustain the high-pressure pressures found in lung tissue. LUS, as well as computation methods, are not yet available in configuration. To increase the use of alternative ultrasound imaging, certain features of LUS deserve scientific research and treatment. This summary tries to provide you with a good understanding of what occurred to Demi et al. [2020]. A new coronavirus discovered in 2019 causes severe pneumonia. Lung ultrasound (LUS) may be an important method for physicians who obtain a random distribution of diagnostic results, thanks to a mind-altering idea. The goal of this investigation was to see how blocking LUS tests in specific locations of the chest influenced the results. Patients were tested at 14 different anatomic sites using a standard LUS scan procedure. The study enlisted the participation of 38 patients. The prior location had a 0 point greater score than the entire body (44.08 percent). Three points, on the other hand, accounted for 21.05 percent of rear areas and 13.62 percent of peripheral regions, [19] but only 5.92 percent of peripheral regions. To establish the amount and severity of lung disease, a comprehensive LUS study is recommended Smargiassi et al. [2020].

A convolutional neural network was fixed in LUS images with B-lines of varied etiologies. The accuracy of CNN's diagnosis was equivalent to that of other LUS doctors using a 10% data recovery set. As natural facilities, two Canadian tertiary hospitals are employed. An in-depth study model can distinguish between the emergence of LUS pathology, such as COVID-19, that people can't tell the difference between. The difference in picture quality between humans and models shows that biomarkers are not evident in existing ultrasound images, and that multidisciplinary investigations have been confirmed Arntfield et al. [2020].

In most cases, we're creating a new deep network of Spatial Transformer Networks that forecasts the severity of the sickness connected with the input framework while also delivering a subtle state-of-the-art environment. We've also added a new uniform-based method for collecting active framework points at the video level. Finally, we compare deep-level models to derive COVID-19 scanning biomarker pixel-level market components. The suggested database's research yields satisfactory findings for all observed activities, establishing the groundwork for future research in the DL of COVID-19 assisted diagnoses from LUS data Roy et al. [2020]. To assess the consistency of in-depth research methods of the COVID-19 diagnostic process, the LUS database of patients with COVID-19, bacterial pneumonia, non-COVID-19 nonCOVID-19 pneumonia, and eligible participants was constructed. We believe that a neural-based convolutional neural network with high sensitivity and specificity may appropriately identify the COVID-19 LUS. The following are the findings of the 202 LUS video analysis. We also used maps to teach students about the design of the biomarker respiratory tract in a blinded research with medical professionals under real-world situations. -19 strength scores, and it was discovered to be beneficial Born et al. [2021].

3. ROADMAP OF LUNG ULTRASOUND MAKERS

A. Use of LUS

- Active infections can be prevented and controlled if they are detected early. Patients with minor illnesses do not require hospitalization unless there is a high danger of deterioration. In the near term, a comprehensive strategy to support health professionals in identifying patients and estimating the likelihood of developing a critical or critical condition, or transitioning from critical to violent situations, can assist hospitals in better accessing scarce resources.
- LUS imaging allows exiled patients to be closely monitored at home. This is especially crucial in long-term care facilities and places with high-quality hospital beds.
- LUS can help diagnose patients if there aren't enough COVID-19 test kits available.
- With LUS, the patient can see the same doctor who will do all of the necessary tests. This is a crucial topic since, according to recent research, about 3 to 10% of infected patients in the worst-affected nations are health workers, compounding the already severe lack of health experts.
- LUS is a non-invasive supplementary screening technique that can be utilised in any healthcare setting. A preliminary screening could be used to distinguish between patients who are low-risk and those who are high-risk.
- LUS is non-ionizing and can be done every 12–24 hours, making for careful supervision of health conditions as well as early detection of lung activity.
- Since portable ultrasound devices have a smaller surface area than CT scans, they are easier to sterilize.
- Medical professionals can easily perform LUS in the area of illness. This will also make it possible for pre-hospital care to be more accurate for patients who have to be hospitalized.
- LUS pictures should be taken next to the bed, reducing the number of health professionals who can meet ill person. The CT scan now necessitates referring the patient to a radiology clinic, potentially exposing more people to the virus.
- LUS is at ease to accept as a diagnostic tool than other imaginative approaches, which allow for pre-existing and standardized lung testing, including non-hospital COVID-19 testing centers.
- Finally, LUS is a cost-effective tool that can be used quickly in low-resource areas. Common assumptions, such as CT scans, are more important to plan in the event of a greater spread than LUS.

B. Role of LUS

LUS is currently widely used to diagnose a variety of respiratory illnesses. Because SARS-CoV-2 is a novel virus with a molecular weight of only 120 nm, it may easily be inhaled from the airways and alveoli without obstructing the intestines, lesions found in CT scans of COVID-I-19 patients are typically peripheral and subpleural. Because LUS is a classic imaging method for lung testing, it's a great COVID-19 test instrument. By administering LUS close to the bed, the same doctor in charge of the patient can obtain images of the lungs, decreasing the number of health care personnel who may be infected. This is crucial because figures from Italy and Spain, two of the nations with the highest COVID-19 levels, show that 9 to 12 percent of health professionals were poisoned and had to be separated. Ultrasound equipment (both portable and ultra-portable) has a lot of appealing characteristics. Because of their portability, long battery life, and ability to connect to smartphones and tablets, they are excellent even for distant places. The compact size is also beneficial since it allows for a quick cleaning process, which is critical in this pandemic. The use of portable devices for LUS allows testing to be performed without referring a patient to a radiology institution, which could raise the risk of infection. Another significant benefit of digital technology is communication, which allows for image sharing via social media and other internet applications, making telemedicine a useful tool for local medical experts. Handheld devices, on the other hand, are not usually available in medical facilities. LUS becomes particularly crucial in the early stages of COVID-19 illness. As a result, any ultrasound machine that is available should be used. Portable ultrasound equipment is available at certain places to screen patients suspected of having COVID-19.

C. Comparative analysis image classification methods

LUS images are categorized using one of two methods: 1) Featured segregation, stochastically analyzed the distinct elements 2) Neural Network, read-based method, will give black box solution. Geometric patterns would use to train the illustrious images and found LUS images for other diseases.

Method	Specificity	Accuracy	Sensitivity
ANN (Barrientos et al.[2016])	100	-	91.5
CNN (Kulhare et al.[2018])	79	92	96
SVM (Carreret al.[2020])	-	94	-
RVM (Veeramani et al.[2016	100	100	100
Supervised Feed Forward Correa et al.[2018])	100	-	90.9
Stochastic approach (Brattain al.[2013])	-	100	-

TABLE 1. Comparison Analysis of different methods

There are two major NN methods for classifying images: using pre-divided images in which the interested regions are professionally classified and included into the NN, or training the NN to conduct classification and classification. Although it is worthwhile to split the LUS picture, NNs are also computer-aided method and it needs more training sets than other methods. Stochastic methods are a simplistic, simple method that might be better suited to a portable LUS system. Statistical retranslation and image filtering are used by classified classifiers to examine classed images and categories image information. The SVM separator was chosen over the NN separator because it takes very little data to read, which is critical given the absence of COVID-19 training data. RVMs identify potential rather than ambiguous detection, like SVMs do. This method outperformed SVM and NN in terms of accuracy, sensitivity, and clarity.

4. SYSTEM MODEL

Segmentation of the image is a crucial stage while image analysis process. The goal of creating a deep learning framework for lung segmentation is to improve lung segmentation by using more meaningful data. The prospect of performance improvement of a Lung segmentation system is a crucial for widening the range of medical applications. After the growth of neurological symptoms imaging only we can identified the Lung problem. Doctors examine the CT images to check whether any abnormalities are present. Discrimination, decision-making, and diagnosis, on the other hand, are extremely challenging for clinicians in other situations. Misdiagnosis and inappropriate treatment methods impose a large financial burden on patients, reduce patient comfort, and result in irreparable illnesses. In the resultant part, DNN classification algorithm for automatic COVID 19 prediction is proved, can able to predict the COVID 19 automatically.

4.1 Preprocessing

Human viewers and other lungs affected portion segmentation and measure the affected portion systems can be grasp, to know the operations going on in the images thanks to preprocessing. To introduce a lot of visible data, bright spots in the original CT-scan images are employed. However, certain areas are too bright, while others are excessively dark. Before classifying details, it is necessary to improve local contrast in order to acquire a more precise segmentation. COVID-19 targets provide positive local contrast, indicating that the lesion regions are lighter in all directions than the background.

4.2 Procedure

Straightforward ideas are executed such that mirrors natural choice. Whenever a multitude has a more drawn out time of endurance, it has a superior possibility delivering posterity. The neural organization's life will be expanded assuming it finds a more reasonable state, like great modification, however it will be shortened in the event that it doesn't arrive at an appropriate state, like ominous adjustment.

- Utilizing the first force picture, make non-covering logical zones.
- Involving the dark levels in the cluster picture, work out the histogram of each logical zone.
- Compute the differentiation restricted histogram for the relevant area.
- Reallocate the leftover pixels until they're all in a similar spot.
- The Rayleigh change is utilized to further develop the power esteems in each zone.
- Playing it safe to decrease the effect of an abrupt change.
- The new dim level task of pixels inside a sub-grid relevant area is created utilizing a bi-direct addition between four elective mappings to wipe out line antiques.

4.3 DNN Classifier

In a neural organization, DNN is carried out per layer. It's viable with a wide scope of layers, including thick completely associated layers, convolutional layers, and intermittent layers like the long momentary memory network layer. DNN can be utilized on any or the organization's secret layers in general, as well as the apparent or information layer. On the result layer, it isn't utilized. A new hyper boundary is made that controls the chance of the layer's results being exited or kept up with. On informational collections from a scope of fields, we prepared dropout neural organizations for order difficulties.

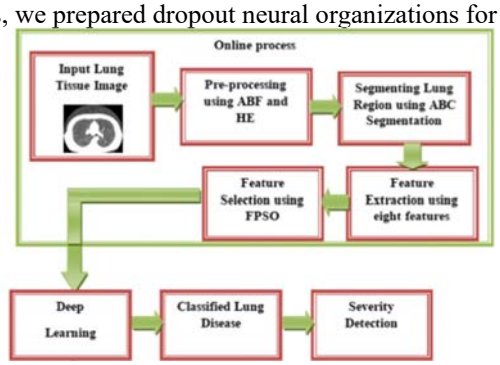

Figure 4.1. Framework for Classification

5. RESULTS AND DISCUSSION

Performance parameters	Watershed	Graph Cut	MIS metho	DNN method
Accuracy	0.94	0.80	0.82	0.99
Specificity	0.96	0.89	0.91	1
Sensitivity	0.94	0.84	0.87	0.98
F-Measure	0.93	0.78	0.82	0.99
Precision	0.95	0.87	0.91	1
MCC	0.940	0.878	0.912	0.980
DICE	0.946	0.862	0.922	0.980
JACCARD	0.945	0.865	0.891	0.960

Table 5.1 Comparison Based on Performance

To start, we exhibit that our strategy produces results on a COVID-CT-Dataset, which contains COVID-19-positive CT examines as well as ground-truth injuries physically recognized by a radiologist specialist. Second, we checked out new CT filters from a close by emergency clinic that included patients who had tried positive for the Covid. At last, a three-layered portrayal of the COVID-19 injury and its impacts on the patient's lungs is shown. The measurable upsides of the fragmented COVID-19 injury are contrasted with the discoveries of regular ways to deal with break down and decide the exhibition of the suggested division approach. The provided calculations' presentation was surveyed utilizing broadly acknowledged evaluation scores. The capacity to quantify the COVID-19 injury, see the contaminated locale, and watch illness changes progressively are among our work's key assets. Besides, in spite of the low-force contrast among injuries and sound tissues, the recommended approach might recognize strange districts. Regardless of whether our proposals were effective, there are still disadvantages to know about.

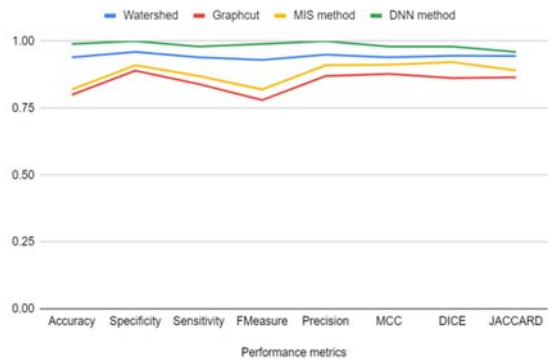

Figure 5.1 Comparison Analysis

The strategy has been upgraded with the end goal that section examples of injuries portrayed by ground-glass obscurity, insane clearing, or solidification can be perceived separately. We plan to consolidate imaging information with clinical markers and research facility testing results to further develop COVID-19 recognition, conclusion, and appraisal. Coronavirus keeps on spreading unusually and wildly over the world.

6. CONCLUSION

Due to the spread of the SARS-CoV2 virus and the growing demand for resources needed to contain COVID-19, the world is facing a catastrophic epidemic. -COVID-19 pneumonia LUS tests performed at bedside allow for immediate treatment of dialysis patients, which often occurs in dialysis units where other treatment options are limited. Despite the fact that few articles support it, ultrasonography may be used in patients with COVID-19. Until date, CT-scan imaging has been a broadly utilized, minimal expense, complete screening technique that productively supports the representation and quick evaluation of COVID-19 sore seriousness. Utilizing chest CT information, we tried the viability of DNN for COVID-19 lung disease division and evaluation.

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Detection of Citrus Leaves and Fruit Diseases Using YOLO

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Abstract.

Citrus natural product illnesses are the significant reason for outrageous citrus natural product yield declines. Subsequently, planning a mechanized location framework for citrus plant infections is significant. Profound learning strategies have as of late gotten promising outcomes in various computerized reasoning issues, driving us to apply them to the test of perceiving citrus foods grown from the ground sicknesses. In this paper, a coordinated methodology is utilized to recommend YOLO classifier. The proposed YOLOclassifier model is planned to separatesound leafy foods from organic products/leaves with normal citrus illnesses like Blister, Black spot, Greening, Melanose, and Scab. The proposed YOLOclassifier model separates correlative discriminative elements by incorporating various layers. The proposed model was compared against otherbest in class profound learning methodologies on Citrus Plant datasets. The exploratory outcomes show that YOLOclassifier Model outflanks the contenders on various estimation measurements.

1. INTRODUCTION

Horticulture research means to increment food creation and consistency while bringing down costs and helping benefits. Natural product trees assume a significant part in any state's monetary turn of events. Citrus Plants are a notable natural product plant species,which has high L-ascorbic acid and is present in the Africa, Middle East, and India.Citrus plants are linked to a variety of health advantages and are used as an unprocessed material in the agricultural industry to make a variety of products and other agriculture products including desserts, frozen yogurt,jams, and candies etc. Citrus plants in India are most significant organic product crop, represents a huge part of the country's green commodities.The various diseases that affect citrus plants are given in Fig.1.

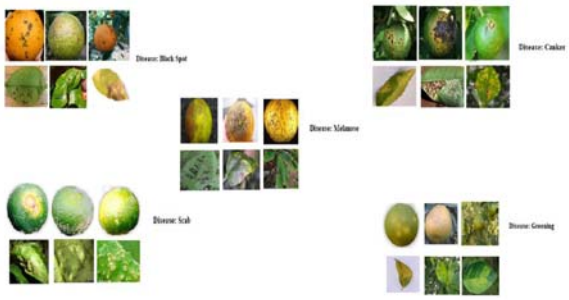

Fig 1. Citrus Diseases

2. RELATED WORKS

Computerized picture handling is utilized in numerous areas of science to distinguish and break down issues. This approach aims to involve picture handling strategies for citrus blister disease detection through leaf investigation. Citrus infection is a severe bacterium-based citrus plant sickness. The side effects of citrus canker infection normally happen in the leaves, branches, natural products,and thorns. The leaf pictures show the wellbeing status of the plant and facilitate the perception and recognition of the infection level at early stages. The leaf picture analysis is a fundamental stage for the detection of various plant infections.

The current methodology comprises of two phases to further develop the clarity and nature of leaf pictures. The essential stage uses RSWHE - Recursively Separated Weighted Histogram Equalization, that further develops the differentiation level. The second stage removes the undesirable commotion utilizing a Median channel. This proposed approach utilizes these techniques to work on the lucidity of the images and executes these strategies in lemon citrus ulcer disease detection. This can get the better quality in saving, eliminating noise and confining commotion spikes utilizing the Median channel. The median could be a gathering of numbers. The middle could be a midpoint pixel esteem that is drawn from the neighborhood arranged dissemination values. It doesn't produce a new, ridiculous pixel esteem. The middle administrator arranges the values inside the pixel component neighborhood at each pixel component area. This decreases edge obscuring and misfortune of image detail.

The proposed technique utilizes a cutting-edge CNN model for characterizing citrus sicknesses into various classes, to be specific Blister, Greening, Scab, Black Spot, and Melanose. The proposed model coordinates an adequate quantity of layers in the proposed profound learning model. Differentiating the proposed model's proficiency to comparable examinations, move toward helps in the improvement of additional modern reasonable applications in plant infection acknowledgment in view of their visual side effects.

MiaomiaoJi, Lei Zhang et.al., has proposed. Grape diseases are the primary cause of major grape loss. An integrated method is proposed for a united convolutional neural networks architecture. The suggested CNNs architecture, named the United Model, is intended to differentiate healthy leaves from infected leaves with diseases such as black rot, isariopsis leaf spot and esca. The suggested United Model extracts complementing discriminative characteristics by combining multiple CNNs. As a result, United Model's ability to represent has been improved. The United Model was tested against other CNN models using the Plant Village dataset.[1]

Zongshuai Liu et.al., has proposed. Crop diseasesare one of the main “disasters” with a wide range of influence and varietyetc.Artificial intelligence may significantly boost disease control and prevention efficiency and solve the problem of inadequate forecasting by replacing agricultural disease monitoring staff. Crop disease identification which is quick and precise is critical to assuring crop production and food safety. These photos are trained and learned using a deep learning network, which can efficiently recognize and classify crop diseases. We employ the MobileNetV2 model in the experiment and verifywith other models in terms of accuracy, model size and speed. [2]

Bo Wang et.al., has proposed. From the standpoint of environmental and ecological protection, a deep learning-based pest and crop disease diagnosis model is proposed. To acquire data, crop images are obtained via field sampling, and image preprocessing is finished using nearest neighbor interpolation. Pests and Crop diseases are identified using the AlexNet model. [3]

Harpreet Singh et.al., has proposed. Most plant infections can be detected early and treated to increase the quality and quantity of fruits by using their leaves. The texture and color features collected after employing CES enhancement and segmentation of the affected part are used in this paper to detect and classify citrus leaf illnesses. The k-means clustering algorithm was used to segment the data. Splitting each component in theYCbCr, HSV and LAB color spaces extracts color characteristics. To exclude irrelevant features, feature selection was based on an ANOVA F-test. Finally, linear discriminant analysis, support vector machines,multi-layerperceptron’s and k-nearest neighbors are used to classify the data. The accuracy parameter has been used to evaluate the suggested method's performance. [4]

Morteza Kanramaki et.al., has proposed. Three common citrus pests, citrus Leaf miner, Pulivinaria and Sooty Mold are identified using an intelligent deep learning algorithm. To recognize citrus pests, a deep convolutional neural network ensemble classifier is given. Three levels of variety are addressed when generating this ensemble: classifier level, feature level, and data level diversity. A dataset of citrus plant and leaf photos were used to put the proposed method to the test [5]

Muhammad Zia Ur Rehman et.al., has proposed. A new deep learning-based technique for citrus disease categorization is proposed in this research. In this study, two separate previously trained deep learning models were used. Image enhancement techniques are employed to expand the volume of citrus dataset utilized in this article. In addition, hybrid contrast stretching was used to increase image visual quality. Transfer learning is also utilized to train the previously trained models, and feature fusion is used to enhance the feature set. The Whale Optimization Technique, a meta-heuristic algorithm, is used to optimize the fused feature set (WOA). Six different citrus plant diseases are classified using the given characteristics. [6]

R. Manavalan et.al**.,** has proposed. For sustainable agriculture, health monitoring and early disease diagnosis of grains plants are critical. Early detection of many disorders can be controlled with the help of the proper selection of pest control technology to boost grain yield. [7]

Hanene Ben Yedder et.al**.,** has proposed. Signals recorded by acquisition devices are transformed into interpretable images by reconstruction algorithms. The task of reconstruction is difficult. Several enhancements are still possible, like lowering reconstruction and acquisition times to reduce patient's pain and exposure to radiation while enhancing reconstruction accuracy and clinic throughput. The adoption of bioimaging in low-power handheld devices necessitates a delicate balance of latency and accuracy. The development of accurate, rapid, and reliablereconstruction methods provides an appealing but difficult research objective. [8]

Adedamola Adedoja et.al., has proposed. This paper describes a study that used a deep learning-based strategy to identify sick plants using transfer learning and leaf pictures. The convolutional neural networks in this study are built using the NASNet architecture (CNN). The model is then trained and evaluated using a freely available PlantVillage project dataset, which includes a variety of photos of plant leaves with varying levels of infection and position of plants. [9]

Jacopo Daria, Renato Morbidelli et.al., has proposed. The goal of this research is to add to understanding of soil moisture spatial-temporal variability at the catchment scale. The key implication is obtaining soil moisture values typical of mean behavior, which can be used for rainfall-runoff modelling and remote sensing validation analysis. The data set allowed for the study of both the temporal stability and dynamics of soil moisture. It was explored how climatic environment and geomorphology affect soil moisture behavior using statistical and temporal stability techniques.[10]

Blake Richey et.al., has proposed. Plant diseases pose a significant threat to agricultural production management. Because of the economic importance of maize, a deep neural network is to be developed for disease detection. A public-domain dataset with tagged photos of leaves of maize plants with and without diseases is used to create and train a convolutional neural network. The proposed convolutional neural network is turned into a real-time mobile application for maize crop disease detection in the field. [11]

Sabah Bashir et.al., has proposes. Texture and Color characteristics are utilized to identify and distinguish various agriculture/horticulture products into normal and impacted regions. The combination of traits is particularly useful in detecting illness. The testing results show that the proposed method improves the accuracy of automatic recognition of normal and afflicted produce significantly. This research uses texture, K-means clustering, and color analysis to propose a method for detecting illnesses in Malus Domestica. [12]

Muhammad Zubair Asghar et.al., has proposed. The goal of this research is to create a fuzzy-based sentiment analysis methodologyto assess student satisfaction and feedback by assigning appropriate sentiment scores to opinion terms and polarity shifters in the input reviews. The proposed method calculates the sentiment score based on student feedback evaluations before using a fuzzy-logic module to understand and measure students' happiness on a finer scale. [13]

Utpal Barman et.al., has proposed. To prepare the real-time citrus plant and leaf dataset, a minimal cost image capture method using a smartphone is used. For real-time citrus leaf disease detection, Mobile Net CNN and SSCNN are employed and verified. The findings show that the SSCNN is accurate in detecting and classifying citrus leaf diseases. For real-time testing, the proposed approach is implemented in a Smartphone. [14]

Y. A. Nanehkaran et.al., has proposed. Plant disease symptoms first emerge on the leaves, and most illnesses can be recognised by looking at the symptoms on the leaves. As a result, this research presents a new method for detecting plant leaf diseases. Image Segmentation and Picture segmentation are the two aspects of the procedure. For disease symptom segmentation of plant disease photos an algorithm is proposed with LAB-based hybrid segmentation, hue, intensity and saturation and then deployed. The segmented images are then fed into an image categorization convolutional neural network. [15]

3. PROPOSED METHODOLOGY

A profound learning strategy utilizing the convolutional neural network is utilized as the proposed method.Gaussian Feature extraction and YOLOClassifier is utilized in the postulatedmethodology Performance assessment of the proposed model with the cutting-edge techniques give the most elevated precision. First the training picturesare given as the information then the dark scale picture is changed over, and the paired picture is additionally determined with the last result is related to the infection region is set apart with the most significant level of precision. You Only Look Once (YOLO) is a superior presentation picture-based programming bundle for cutting edge picture handling, division and representation of multi-faceted light and electron microscopy data.YOLO is uninhibitedly accessible, easy to understand programming for powerful picture handling of complex bundle that improves and works with the full use of procured information and empowers quantitative examination of morphological highlights. Its open-source climate empowers adjusting and plausibility of adding new modules to modify the program for explicit requirements of any exploration project.The proposed methodology's architecture is given in Fig.2.

The Gaussian Processes Classifier is a characterization AI algorithm. The Gaussian Processes Classifier is a non-parametric calculation that can be applied to parallel grouping tasks. Gaussian processes sum up the properties of the capacities, for example the boundaries of the capacities. In that capacity, you can consider Gaussian cycles one degree of deliberation or indirection above Gaussian capacities. The results of feature Extraction has been given in Fig.3.

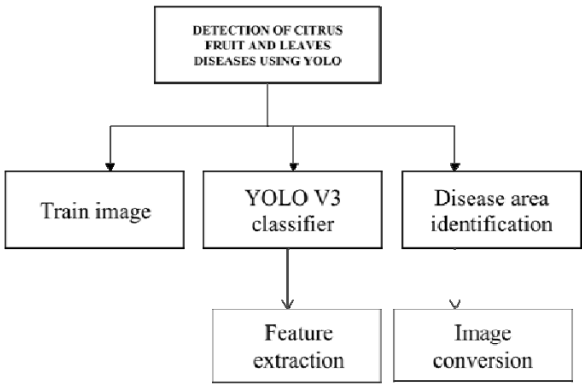

Fig 2. Architecture of Detection of Citrus Fruit and Leaves detection using YOLO

3.1 TRAIN IMAGE

In the picture preparing process utilization of preparing information and this rate might change contingent upon the necessities of the analysis. It is utilized to prepare the picture model, that attempts to gain from the preparation informational index. Both the info and the anticipated outcome are remembered for the preparation data. Picture division is the most popular means of dividing an advanced picture into various pieces in computerized picture management and PC vision (sets of pixels, otherwise called picture objects). The goal of division is to improve and transform a picture's portrayal into something more significant and easier to investigate. Picture division is a technique for locating objects and boundaries (lines, bends, and so on) in photographs.

3.2 EPOCH

The count of epochs indicates how many occurrences the learning computation will process the entire prepared dataset. Every example in the preparation dataset will receive a chance to refresh the inward model bounds after one age. At least one cluster exists in each age. The count of ages indicates how many occurrences the learning computation that handles the prepared dataset. Each sample in the preparation dataset has a chance to refresh the inner model boundaries after one age. One of thebatches at least, contains an age. The cluster angle plunge

learning method is an age with only one clump. Imagine a for-circle with each circle continuing over the preparation dataset for the number of ages. Within this for-circle, there is another established for-circle that focuses on each group of tests, with each group having the predefined "clump size" number of tests.

3.3 GREY SCALE CONVERSION

A grayscale picture has value such that each pixel is a single example addressing only a measure of light,i.e., it provides only power data in picture layout, PC produced symbols, and colorimetry. Grayscale images, which are a kind of high contrast or dim monochrome, are created using just shades of dim. The distinction is black at the most vulnerable power and white at the most anchored power. Grayscale images differ from the tiniest bit bi-apparent strongly contrasting images, which are images with only two tones in terms of PC imaging: high contrast. There are varying shades of dim in grayscale images. Grayscale images can be produced by calculating the power of light at each and every pixel using specified weighted mix of frequencies.They are monochromatic when only a single occurrence is captured. The frequencies could originate from any point on the electromagnetic spectrum.

3.4 BINARY IMAGE CLASSIFICATION

Picture binarization is stillhard, it isn't commonsense to decide the ideal edge an incentive for all cases. There are a few shortcomings and qualities of the whole picture binarization strategies. In view of this reality, in this exploration, we focus on a calculation that chooses the best binarization technique instead of a solitary edge esteem. We want to make use of the strong elements of various binarization strategies and use them at whatever point they perform well. Determining the best binarization strategy for any picture dataset in view of a few essential highlights like standard deviation, mean, max force, and so forth.

4. EXPERIMENTAL SETUP

THE proposed CNN model's exhibition to that of research, and discoveries are introduced. Notwithstanding, an exact correlation of available methodologies is dangerous for variousreasons. To start, most models were tried on varietyof datasets, making examination troublesome. Moreover, the contributing writers' articles providethe methodologies in a preoccupied way with inadequate data, making them impossible for future analysts. The use of YOLO classifier and the Gaussian based highlight extraction creates the high outcome. The accuracy values comparing the proposed methodologies with CNN techniques has been given in Fig.4.

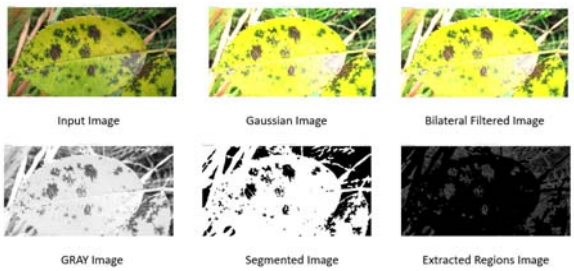

Fig 3. Feature Extraction

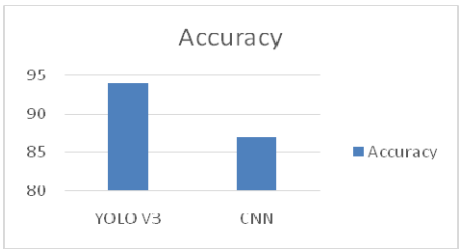

Fig 4. Accuracy of YOLO vs CNN

5. CONCLUSION

The current citrus natural product sickness discovery was ordered utilizing the YOLO CLASSIFER which creates the preferred grouping exactness over the CNN model. The fast pace of picture is effectively prepared, and the testing test creates improved outcome then the other AI techniques and the age esteem age is undeniable level so the various types of sickness can be anticipated through the parallel picture order.

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A Comparative Study on Earthquake Prediction using Machine Learning Algorithms

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Abstract

Natural Disaster is the major reason for the huge loss of property, displacement of population, damage to financial and economy of the country or a certain area, etc. This can be reduced to a lesser amount by giving prior information about the disaster to the people and making them alert and can be evacuated from that place. But some failure cases in prediction of disaster may lead to unnecessary anxiety to the people, and further induce the people in loss of confidence in the system. Therefore, this article concentrates on reducing the false prediction and provides better accuracy in prediction. This article mainly focuses on Earthquake. Machine Learning provides a better algorithm for clustering and augmentation of the data. Here we have chosen three machine learning algorithms namely Logistic regression algorithms, XGBoost(Extreme gradient boost) and Light gbm (gradient boost machine). By comparing all the three algorithms of machine learning we have concluded that light gbm has more accuracy in the result.

Keywords: Logistic regression, light gbm, Xtreme boost gradient

1. INTRODUCTION

Natural Disaster events are purely unexpected events which cause drastic changes in human lives and their properties. In addition, earthquakes cause environmental issues such as surface faulting, ground failure and may also cause tsunamis. Ground shaking caused by earthquakes lead to collapse of buildings, bridges and dams which causes severe destruction to the peoples' livelihood. Vibrations caused by earthquakes generate surface rupture and displacement of ground which produce deep ruts and steep banks. This further makes the land prone to damage. A survey says economic damage due to earthquakes includes reduction in Gross Domestic Product (GDP) per capita by 1.6%. Developing countries and low-income countries face extreme economic fall in the global market. When GDP decreases there will be decrease in the earning capacity of the people which affects development of the country. Many governmental organizations and non-governmental organizations have taken steps in predicting the disaster beforehand and forecast the people about the disaster. Failure cases of prediction have increased which is a huge challenge in the prediction system. In the city of Parkfield, at San Andreas fault, a scientist has implemented his system for the prediction of earthquakes, he sowed a region of 40 km (25 miles), with seismic sensors to detect the movement of earth surface in real time. But an earthquake was recorded on 28 September 2004 with a measurement of 6.0 on the Richter scale and this earthquake has not been predicted by his system. Likewise, the United States Geological Survey(UGSC) has predicted an earthquake event at a right location and predicted the size of the event, which is the effect of the earthquake correctly, but the time of the occurrence was false which took 11 years to happen. These failure cases in earthquake forecasting are due to rare accuracy in the result.Machine Learning algorithm is defined as the target function (f) of the input variable (x) which maps to an output variable (y): Y=f(x). In this paper, we have implemented three algorithms Logistic regression, Light gbm and XGBoost and give the comparative results.

2.LITERATURE SURVEY

In the disaster prediction field, many scientists and researchers have printed their hands and given their ideas for the prediction methods. A research paper has been found with the prediction of precipitation forecasting. In this paper the researchers, T. Tang, D. Jiao, T. Chen, and G. Gui have proposed that machine learning algorithms are very useful in the prediction field. In their research they have implemented an extreme gradient boost algorithm which is a ML algorithm used for prediction processes. In this research they have used the k-means clustering algorithm for clustering the dataset for preprocessing. SMOTE (Synthetic Minority Oversampling Technique) algorithm is used for oversampling the data set; this is the unbalanced data can be converted into the balanced data. For the prediction process, an extreme gradient boosting algorithm has been used for the prediction process and they have implemented LSTM (Long-Short Term Memory) for storing more data and for quick access. For more accuracy RF (Random Forest) algorithm has been implemented [1]. FengChen has proposed a better method for data augmentation based on self-supervisedlearning. He has integrated instances and new categories and united them to bring a new boosting framework which brings robustness and extensive effectiveness in his work. Dataset such as Market-1501, DukeMTMC-reIDand CUHK03 are used in this paper where those datasets consist of large amount of data. Hehas also used GAN (Generative Adversarial Networks) based data augmentation which is a technique in data augmentation where it has a capability to create new sample data. [2]. Likewise, another researcher has proposed his idea by giving his paper about the prediction model, in his paper he has said that the vertical movement of the mass, moment, temperature, is governed by the planetary boundary layer height [BLH], [3]. This paper is a comparison between AdaBoost, Extreme Gradient Boosting XGBoost and Logistic regression algorithm. All these algorithms are a machine learning algorithm which is essentially used for the prediction process. This paper has proposed that the Logistic regression algorithm is working better for the datasets when the data is not hardly imbalanced, compared with AdaBoost and XGboost. They have also proposed that when compared with the low rate of input that is when the input is given with less percentage in number. It is said that the accuracy rate of all these algorithms, that is the logistic regression, AdaBoost and XGboost performs poorly with the minority of the input [4]. W. Han, Y. Gan, S. Chen and X. Wang are the researchers who have worked on the prediction process of the earthquake using the supervised learning methods [5].

3. PROPOSED METHOD

To predict the result the earthquake dataset is taken, the data is preprocessed and cleansed, data is clustered using k means clustering algorithm then the output is loaded on ML models where we use Light gbm, XG Boost, and logistic regression algorithms and the comparative result is predicted. The block diagram for comparative analysis of ML algorithm is in fig 1.

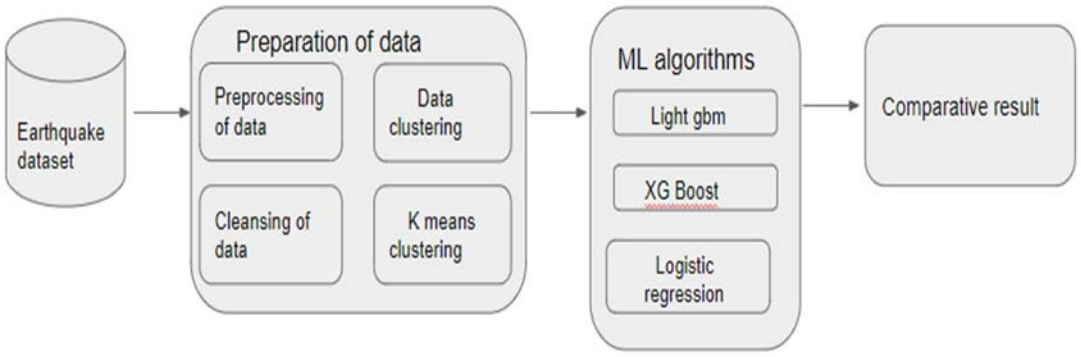

Fig 1: comparative analysis of machine learning algorithms

3.1 K-means Clustering

K-means clustering is the machine learning algorithm which is useful in clustering the data into K cluster categories. It is an unsupervised learning algorithm (i.e., it can cluster the unlabeled or unstructured data into k number of categories according to our requirement). This algorithm is very useful in solving the clustering problems. K-means clustering takes the given input data and finds the similar values or features and categorizes those values into the same group. Likewise, the given huge data will be clustered into k number of clusters as per required. The clusters categorized by the K-means clustering algorithm are named as k. This algorithm is mostly used for data mining purposes and statistics problems. The k-means algorithm initially presents the k points in the object space which represents the initial group of centroids. Centroids are nothing but the center of clusters which is represented by an imaginary or the real position. Then on k-means clustering each object will be allocated to the nearby or immediate k object in distance. On assigning the k objects, the position of k will be calculated further again and again. These steps will be processed repeatedly until the position of k remains unchanged.

3.2Data Pre-processing

Pre-processing of data is nothing but making the dataset efficient to given as an input to the model. As the data from the dataset will be raw data and in a not understandable manner, so those data will be unfitted to give as an input to a machine learning algorithm. Pre-processing of data is a very essential step before giving it as an input data to a learning algorithm. We are importing the necessary library to run the python code such as NumPy which is a python library doing any kind of mathematical operation and scientificcalculation in the program, this is a fundamental open source library for python, then import matplotlib and in that import the sub library called PyPlot, thus install matplotlib.pyplot this is used for displaying a two dimensional plotting and for displaying any kind of plots, then we are going to install pandas which is also an fundamental open source library which is useful in managing and supervising the dataset for any machine learning algorithm. Once the dataset has been imported then the next step is extracting the dataset into dependent and independent variables. Extracting the dependent variables separately and independent variables separately. Then encode the categorized data, then extract the required attributes from the dataset in our project the required attributes are date, time, longitude, latitude, magnitude, and depth. With this extracted data we can further proceed with the prediction process.

3.3Training the dataset:

Getting the dataset as input we are going to train the model. It works well with Classification and regression problems. It classifies the dataset to n number of trees and predicts output based on each tree result. If there are more trees, then the accuracy will be increased. The main advantage of random forest is that it deals well with large datasets, and it prevents overfitting of data. The next step is to predict the values and create the confusion matrix which will decide whether the predicted value is correct or not. The last step of random forest is to visualize the result in an understandable form. For earthquake prediction we need to preprocess the dataset, fit it to a random forest algorithm, make a confusion matrix and finally we should visualize the result. The main applications of random forest are that it will work accurately in regression and classification problems. For sectors like banking, medicine, land use and marketing use random forest algorithms for better accuracy.

3.4 Logistic regression

Logistic regression is the machine learning algorithm which is specialized in the prediction process. This algorithm belongs to a supervised learning algorithm (i.e., labeled data or structured data) given as input. This algorithm works for predicting the value between a dependent variable. Logistic regression algorithm is a method for statistical analysis. Logistic regression algorithm predicts the output with the dependent variable comparing it with a relationship between one or more independent variables that are existing. The outcome value is a more

straightforward result between the alternative cases. The result value will have only two possible results 0 or 1, yes or no and diseased or non-diseased. The result can be further done with feature scaling in need of more accurate results. In Logistic regression we will be fixing the logistic function in ‘S’ shape for predicting the two possible values (0,1). Logistic regression algorithm has the capability of providing probability and new data can be classified using continuous and discrete type datasets. Linear regression algorithm when plotted as a graph gives a straight line as shown in Fig.2. Logistic regression algorithm when plotted as a graph gives a curved shape ‘S’ as shown in Fig.3.

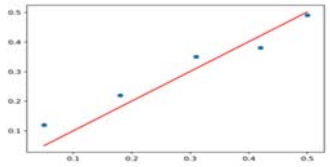

Fig2: Linear regression

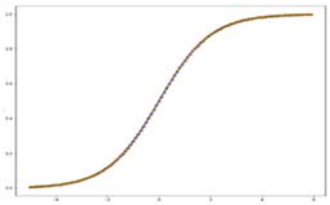

Fig3: Logistic regression

As shown in above figures, we can see the difference between linear regression and logistic regression clearly. The ‘S’ shaped curve is also called a sigmoid function. This sigmoid function will be very useful in predicting the values to the probabilities. This curve easily maps any real value to any other value between the range 0 and 1. The value cannot go beyond the value of 0 and 1, thus ‘S’ shaped curve is formed in the graphical representation. And this graphical representation is known as the sigmoid function of the Logistic regression algorithm. In a logistic regression algorithm, there is a value called threshold value which acts as a center point

3.5 Light gbm algorithm

Light gbm (gradient boost machine) is a gradient boost algorithm that follows a set of rules that's primarily basedon the decision treemodel. By means that of computation it's thought about as a powerful algorithm.They are two types of techniques such asexclusive feature bundling (EFB) and gradient based one side sampling (GOSS) and e). This algorithm helps in reducing complexity of histogram building by down sampling data using EFB and GOSS. Light gbm algorithm grows vertically while all other algorithms grow horizontally. Light gbm chooses leaf-wise with large loss to grow while other algorithms choose level-wise. As the size of the data increases day by day all other algorithms computing speed is low. But in light gbm has high computational speed. 'Light' in light gbm denotes fast. Light gbm takes less memory to run and will be able to deal with a very large amount of data. There is more than 100+ numbers of parameters in light gbm documentation.

3.6 Extreme boost algorithm

Extreme Gradient Boosting (XGBoost) is an open-source library that comes under gradient enhancement algorithm which provides effective and efficient implementation. XG Boost algorithm comes under supervised algorithm which is based on decision tree and is effective when compared to all other algorithms. Even though there are many other algorithms available in machine learning XG Boost is considered as the fastest and efficient algorithm TheXGBoost algorithm has certain features such as it is highlyflexible, awareness of sparse data, implementation on both single and distributed systems and parallelization.For bagging, we need to give a large training set as input and those samples need to be bootstrapped. After these methods those samples should be classified, and prediction should be taken by the final ensemble classifier.in boosting original data is given as input in classifier and those data are changed to weighted data. Mathematically, we can write our model in the form

$$\hat{y}_i = \sum_{k=1}^{K} f_k(x_i), f_k \epsilon \mathcal{F}$$

4. RESULT AND DISCUSSION

Machine Learning algorithms used in this paper for the prediction of the earthquake disaster are Logistic Regression, XG Boosting and Light gbm. Comparing all these machine learning algorithms, the result is that the slight Gradient Boosting is faster than the others. Algorithm compared here, and while the XG boosting algorithm is little lag in the time, but the accuracy rate will be more when comparing the machine learning algorithms such as the logistic regression and light gbm with the extreme gradient boosting algorithm. And the Logistic regression algorithm gives the output in the binary form or in discrete form.

5. CONCLUSION

By comparing the three machine learning algorithms such as light gbm (gradient boost machine) XG Boost (Extreme gradient Boost) and logistic regression proves that lightweight gbm is faster and more efficient than XG Boost and logistic regression. XG Boost does not work well in probability problem which again may leads to false prediction While using Light Gbm increases efficiency and decreases memory usage.Light gbm provides better accuracy than XG Boost and logistic regression. Lightgbm uses leaf-wise technique while all other algorithm uses level-wise technique which makes Light gbm more effective. Logistic regression gives discrete values such as 0 and 1. logistic regression helps solve the classification problem and is subject to supervised learning.XGBoost comes under unstructured data and the main advantage is that it uses memory efficiently. Light gbm and XG Boost comes under decision tree while logistic regression comes under supervised learning. Summing up all three machine learning techniques it is evident that Light gbm gives better accuracy.

6. FUTURE WORK

Many algorithms are available in machine learning for the prediction process. Further we can also compare with other advanced algorithms in machine learning. Deep Learning also contributes many algorithms for the prediction model and prediction process. Thus, Deep Learning algorithms can also be implemented for the prediction process and can be compared with these algorithms and find the final algorithm which has highest accuracy rate. Deep Learning algorithms like Convolutional Neural Networks (CNN), Long-Short Term Memory Networks (LSTM), Recurrent Neural Networks (RNN) and other algorithms are effective in prediction process. Thus, these algorithms can be compared by implemented the algorithm in prediction model and find the accuracy rate.

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Deep Neural Network Based LSTM and Hybrid CNN

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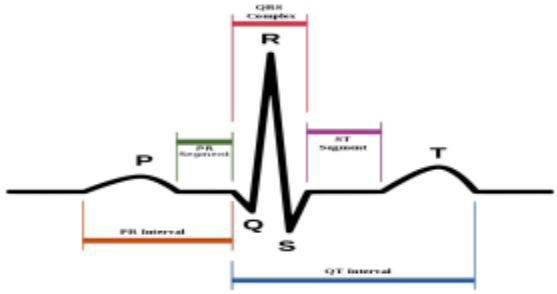
ABSTRACT

When the heart pumps, oxygen-rich blood travels via coronary arteries to the organ. Coronary artery disease is a result of atherosclerosis (CAD). Hemorrhagic atherosclerosis is a term used to describe plaque buildup in the arteries. Early non-invasive screening for a wide range of life-threatening cardiovascular illnesses is now possible thanks to the latest advancement in artificial intelligence. When these techniques have been used, there have been fewer CAD diagnoses.' Two non-specific indicators of coronary artery disease (CAD) have been used in this study to develop an effective approach for incorporating them (HRV). Using a Convolutional Neural Network (CNN), morphological ECG features can be extracted. To get a better idea of HRV, you can use an approach that combines the advantages of both LSTM and a host of custom statistical factors. As a consequence, a hybrid CNN-LSTM architecture is used to categorize CAD using the two biomarkers.Both the MIMIC II waveform data and an in-house noisy ECG sensor dataset are used to evaluate the proposed method's viability in real-world situations. Classification accuracy on the two datasets was 93% and 88%, which was better than the prior approaches.

"Keywords: Coronary Artery Disease (CAD), ECG, CNN, LSTM, Hybrid Architecture

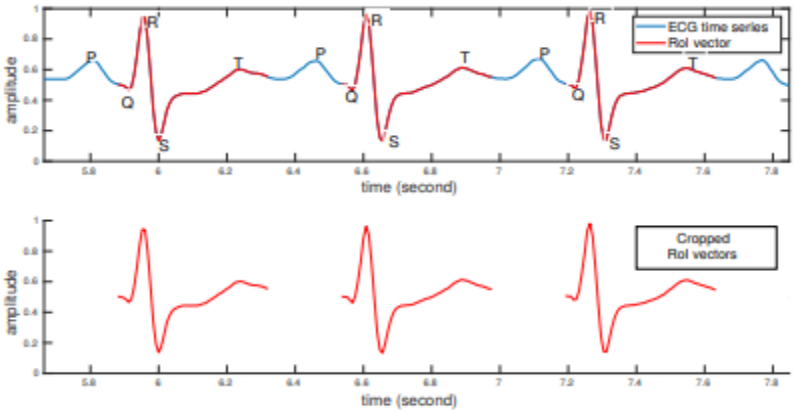
I.INTRODUCTION"

When cholesterol and other fats build up inside the coronary artery's inner walls, it results in cardiovascular disease (CAD). An embolism or cardiac arrest may arise from the restriction of blood flow via the coronary vessels as a result. The gold standard diagnosis for CAD, coronary angiography, needs an overnight hospital stay[1-5]. Many life-threatening cardiovascular illnesses (CVDs) can be prevented by early identification. Due to a worldwide shortage of doctors and patients, artificial intelligence-based screening approaches are becoming increasingly popular in both emerging and developed countries. Low-cost, non-intrusive, and clinician-involved screening technologies are needed. There is still no non-invasive way to diagnose CAD. In the early stages of the disease, CAD is frequently asymptomatic, however studies have found a number of non-specific biomarkers for the condition. An key surrogate sign for HRV (Heart Rate Variability) is largely accepted



"Figure:1.1Components of a normal ECG cycle. Source [11,12]

It is important to remember that the ECG cycle has three main components [15]. Atrial depolarization is represented by P waves; QRS complex is represented by the ventricle depolarization; whereas T wave is represented by ventricle repolarization. AV node to the sinus node, the PR interval measures how long it takes for an electrical impulse to travel between these two points in time. The ST segment measures the time it takes for the ventricles to depolarize and repolarize[11,12]. In order to calculate the heart rate, the distance between R peaks must be taken into account.



"Figure: 1.2A sample ECG signal, indicating the RoI vectors[10]

1.1 CONTRIBUTIONS OF THE PAPER

- An ECG morphological feature extraction structure based on a Convolutional Neural Network (CNN).
- An LSTM network and custom attributes are used to create a bespoke HRV vector.
- For the first time, an illness classification architecture that incorporates both CAD markers into one system is being developed.
- A method for selecting relevant handcrafted features linked to HRV using an algorithm.
- An algorithm for extracting time series from commercially available low-cost ECG sensors that produces clinically interpretable digital ECG pictures.

2.LITERATURE SURVEY

An ECG (electrocardiogram) is a device that monitors the electrical activity of the heart.An easy and painless way to check for heart problems and keep tabs on your cardiovascular health. Analysing the ECG data was a consideration. We randomly chose 80 percent of the selected corpus to be used for training and 20 percent to be used for testing. To ensure that the HRV can be accurately measured, recordings are limited to a maximum of two minutes in length. Each topic had a total of 100 non-overlapping examples picked.

C.Venkatesan et al. (2017) [1] advocated the use of SVM-based arrhythmic beat classifications and ECG signal pre-processing to distinguish between healthy and abnormal people. The pre-processed data is subjected to a discrete wavelet transform for the extraction of HRV features, and machine learning methods are employed to classify arrhythmic beats. To classify a beat, an SVM or other common classifier is employed to reduce background noise. SVM classifier outperforms all other machine learning-based classifiers, as shown by the final Results section.

HariMohan et al. (2020) [2] In order to accurately and automatically detect cardiac arrhythmias, a hybrid CNN-LSTM deep learning model was developed. The model's performance is validated using data from the MIT-BIH arrhythmias database and the PTB diagnostic database. The suggested model's input is the ECG beat time interval. With the most up-to-date assessment approach. The suggested model has an accuracy rate of 99 percent on average and 99.7 percent on average.

Khairul et al. (2014) [3] For ECG samples with abnormal cardiac conditions, we created an effective biometric extraction strategy that helped improve the identifying process for the person. The stability of the system was tested using QRS complexes. An impressive 96.7 percent accuracy for MITDB, 96.4 percent for SVDB, and 99.3 percent for DiSciRi were achieved in this studyLow-frequency ECG recordings and a larger number of ECG samples are used in the suggested strategy to enhance classification performance.

Mohamed et al. (2020) [4] A heart disease prediction system was created using the LSTM method. In the study of heart disease, LSTM and MLP approaches are being tested for accuracy and other predictive properties. Preventing and monitoring heart disease and stroke will be a significant goal of the LSTM-based intelligent system that is being developed for this project. When it comes to solving these problems, adopting LSTM instead of MLP has proven to be the most effective.

Mohammad Ayoub khan (2020) [5] presents a Modified Deep Convolutional Neural Network IoT platform for assessing heart disease more accurately (MDCNN).The patient wears a smart watch and an

electrocardiogram (ECG) monitor to keep track of their blood pressure and heart rate (ECG). According to the findings, the suggested MDCNN-based heart disease prediction system outperforms other techniques. In comparison to other classifiers, the MDCNN has a higher accuracy rate of 98.2 percent, as shown by the suggested approach.

SenthilKumar et al. (2019) [6] The suggested approach uses machine learning methods to identify important traits. Cardiovascular illness may be predicted more accurately as a consequence of this Various combinations of characteristics and recognized categorization methods are used in the model's creation. increased performance with an 88.7 percent accuracy level with the use of the hybrid random forest with a linear model to predict cardiac illness (HRFLM)

Sumeet et al. (2012) [7] When studying the HRV signals, nonlinear properties such as entropy, Shannon entropy, and approximation entropy, as well as sample entropy, were gleaned using recurrence plots, Poincare plots, and detrended fluctuations analysis (DFA) (SampEn).Principal component analysis is used to analyse this process (PCA). These methods were put through their paces in order to discover which one provided the most accurate classification of patients into the normal and CAD categories. Using our suggested strategy, the multilayer perceptron method (MLP) achieved a classification accuracy of 89.5%.

Tamanna et al.(2019) [8] presented a new ECG monitoring system based on Internet of Things technology (IoT). Patients' electrocardiogram (ECG) signals are gathered by wearable sensors and monitored often by the system, which stores the data in a database that is only accessible to authorized employees. An email is automatically sent to the users and physicians if any malformations are discovered. This low-cost IoT gadget has the potential to lower the number of people who become disabled or die as a result of cardiovascular disease.

UttamDeshpandeet al.(2017) [9] Cypress's WICED (Wireless Internet Connectivity for Embedded Devices) (IoT). Wireless transmission is used by portable ECG monitoring devices to deliver data to the Internet of Things (IoT) cloud. Protocols like CoAP/HTTP and MQTT, TLS/TCP, and OMALWM2M are used in the Internet of Things to send data.

Yuepenget al.(2020) [10] Assembled an algorithm to predict cardiac illness using random forests and long-term memory neural networks (LSTM). After LSTM, KNN, and DNN calculations were conducted to determine whether the accuracy of the prediction increased after screening, the most reliable calculation was picked to construct the cardiac sickness forecast model.

2.1 IMPLICATIONS ON LITERATURE SURVEY

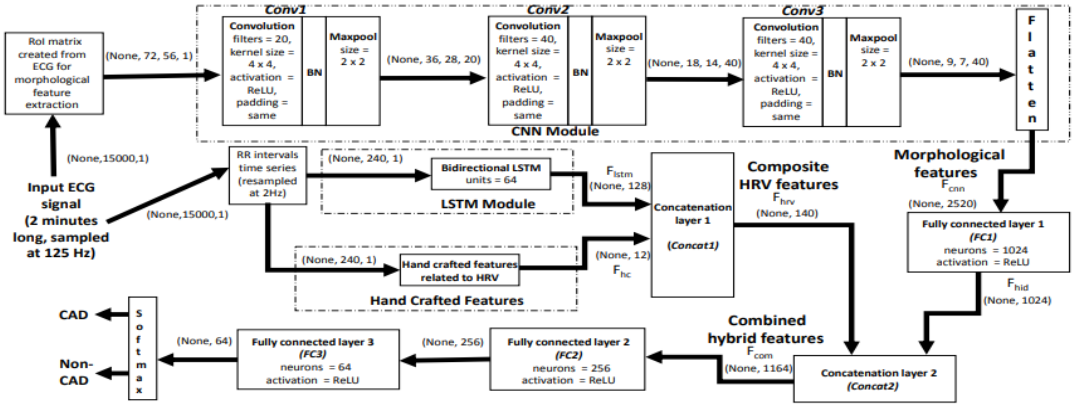
HRV seems to be the CAD method of choice for the bulk of current AI approaches, according to a literature review. Using a deep architecture to automatically extract relevant information from raw signals, deep learning applications in biomedical engineering have lately gained prominence. Arrhythmias and atrial fibrillation may be detected using these approaches when the biomarkers are well-known and conspicuous in the input. CAD has yet to have a clear biomarker that has been clinically verified [13,14]. For our work in the medical area, we have created a deep learning approach for merging two nonspecific surrogate CAD symptoms, abnormal ECG morphology and irregular heart rate variability. For example, both markers have a high level of sensitivity and are very specific. An improved screening system accuracy results.

3.PROPOSED SYSTEM

The goal is to create an LSTM-CNN hybrid neural network by combining nonspecific indications of coronary heart disease with abnormal ECG patterns. It includes a CNN module for ECG, an LST model, and an algorithmic feature set that may be used to analyse ECG morphological features. To map the CNN feature, a composite HRV vector is created by combining the LSTM output with hand-crafted features. A single classification goal is the focus of the hybrid network, which is fine-tuned throughout.

3.1 ARCHITECTURE

- Method for efficiently extracting morphological features from an ECG with Convolutionary Neural Networks
- The combination of an LSTM network with hand-crafted features results in an HRV vector that is both efficient and accurate.



"Figure: 3.1 Proposed hybrid CNN-LSTM neural network architecture for classification of CAD"

- Two distinct CAD markers may be combined into a single disease classification structure by use of a CNN-LSTM hybrid structure and hand-crafted features.
- HRV-relevant handcrafted characteristics are selected using an algorithm that uses an algorithm.
- Process for extracting therapeutically relevant time series from clinically interpretable digital ECG pictures using low-cost, commercially accessible sensors.

Mutual information for each pair of data is supplied by I, which is mutual information for the grid G for each pair of data (xy) lower than B(n) given by

$$MIC(D) = max_{xy<B(n)}\{M(D)_{x,y}\} \quad (1)$$

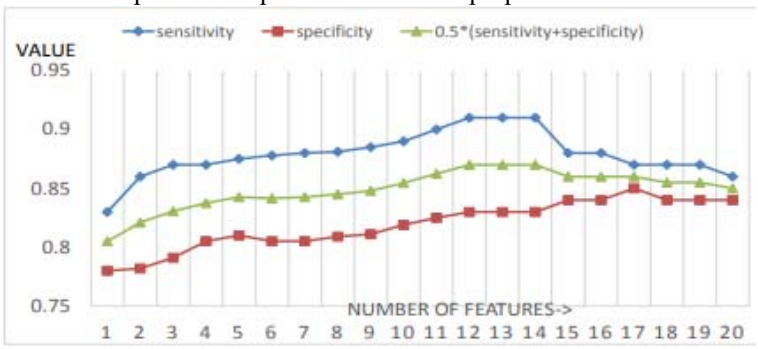
n is the sample size, and B(n) is a function of this sample size. M(D) varies depending on the distribution of G Eqn. (1).

$$M(D)_{x,y} = \frac{max\{I(D|G)\}}{\cdot \log min(x,y)} \quad (2)$$

High MIC suggests a trait that should be taken into consideration Eqn. (2). Use of subject level 5-crease cross-approval is used to choose a suitable collection of capabilities from the positioned inclusion list based on normal order execution on comparable prepared datasets

4.RESULT AND DISCUSSION

The suggested technique is tested on a variety of patient demographics, sensor devices, and overall signal quality datasets. The waveform data was taken from the MIMIC II waveform collection and consists of CAD and non-cardiac individuals. Our suggested technique for selecting appropriate hand-crafted HRV characteristics and other hyper-parameters utilized to optimize the performance of the proposed network are discussed in this part.



"Fig: 4.1Average subject level 5 fold cross validation performance on MIMIC II training data."

Network Structure	*Training* set		Test set $D1$		Test set $D2$	
	Se	*Sp*	*Se*	*Sp*	*Se*	*Sp*
CNN (for ECG morphology)	0.83 ± 0.03	0.94 ± 0.04	0.82	0.94	0.78	0.89
Bi-LSTM (for HRV)	0.94 ± 0.04	0.80 ± 0.06	0.93	0.78	0.90	0.77
Hand crafted features (for HRV)	0.91 ± 0.05	0.83 ± 0.02	0.90	0.82	0.86	0.80
Bi-LSTM + hand crafted features (for HRV)	0.96 ± 0.05	0.85 ± 0.03	0.95	0.83	0.92	0.81
CNN + Bi-LSTM + hand crafted features (ECG morphology + HRV) (proposed hybrid CNN-LSTM)	**0.94 ± 0.04**	**0.93 ± 0.03**	**0.94**	**0.92**	**0.90**	**0.85**

Table I: Performance comparison of the proposed hybrid CNN-LSTM network

Prior art	Test set $D1$		Test set $D2$	
	Se	*Sp*	*Se*	*Sp*
Dua *et al.* [5] (classical machine learning)	0.80	0.75	0.77	0.71
Acharya *et al.* [7] (classical machine learning)	0.88	0.83	0.82	0.78
Baseline 1D CNN (deep learning)	0.73	0.90	0.71	0.85
Proposed approach (hybrid CNN-LSTM)	**0.94**	**0.92**	**0.90**	**0.85**

Table II: Performance comparison with existing approaches

5.CONCLUSION AND FUTURE WORK

A key field of medical study is low-cost, non-invasive CAD screening. Using a CNN-LSTM approach, we have developed a superior screening system that incorporates two unique non-specific CAD markers into a single hybrid design. One of the datasets was collected in a more realistic context using low-cost sensors, and it was assessed on both of those datasets.Using this method, only a small percentage of patients are missed as being at risk. A person's demographics, lifestyle, and family medical history all have an indirect impact on a person's risk for coronary artery disease (CAD).

FUTURE WORK

Integration with a real-world maintenance scheduling tool in an industrial setting, testing the proposed technique in diverse industrial equipment to evaluate its applicability and components of cyber security inquiry will be included to the proposed energy analysis technique in the future.

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MEDICAL DRONE A LIFE SAVER IN EMERGENCY SITUATIONS

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Abstract
Drones are flying robots that can deliver payloads, ushering in a new era of industrial applications such as farming, environmental surveillance, public safety, product delivery, and many more. Drones, also known as unmanned aerial vehicles, have a GPS, flight controller, electronic speed controller, brushless DC motors, propellers, lipo battery, camera, transmitter, and receiver. Thousands of people die every day as a result of medication not reaching disaster-prone areas in time. For healthcare providers, drones are a game changer. They needed to develop realistic solutions to increase efficiency and serve everyone, including persons with impairments. It's difficult to get to. The primary goal of this work is to define the medical drone, which can save lives in emergency situations, and to explain how the drone arrives at the emergency scene. They allow platelets, vaccinations, contraceptives, snakebite antibodies, and other medications to be delivered to impacted areas. They can also reach sufferers in need of rapid dosing within moments, which can spell the difference between life and death in some circumstances. Drone carriers are a novel concept in the delivery of healthcare and other medical services. This technique has found new applications in a variety of sectors.

Keywords - Drone, unmanned aerial vehicles, disaster, payloads, vaccines.

1. INTRODUCTION

Drones have the potential to significantly improve healthcare capacity and efficiency methods. Uavs are defined in this study like any uavs, including fixed-wing aircraft and rotary-wing aircraft. Remotely piloted aircraft can be single or multi-copter aircraft. Incorporation of aerial drones (UAVs), sometimes unmanned aerial vehicles (uavs), with health-care systems represents a significant possibility. [1]. Rural areas, which house half of the world's population, are defined differently in different countries, but they all have a low population density and a variety of natural resources. These places are underrepresented in terms of healthcare. Until today, medical services and blood were supplied to rural, underprivileged populations via conventional methods of travel like walk, plane, or car. These options are limited, especially in places distant from area clinics, with weak or quasi ground transportation infrastructure, or with physical roadblocks like mountains. Because they may have to avoid debris or falling objects in the air, the drones must be nimble and have a quick control response. A safe working environment is created by having good agility. Radio technology is used in more modern UAVs for controlled flight [2]. Then there was the invention of the integrated circuit. This has resulted in unmanned aerial vehicles (UAVs) that can be controlled by electronic autopilots. Modern UAVs are controlled by flight controls and human controls. This enables them to perform longer, more reliable aircraft on their own supervision also while operating under the supervision of an aviator during the most difficult parts of the operation. Drones have been employed in agricultural equipment to disseminate medicines in organic fields and to perform easy and safe pesticide discharge over crops. Similarly, we have built a drone capable of delivering crucial and vital medications in locations where effective transportation is unavailable to the indigenous people. This uav can deliver prescribed medication to places where no physical vehicle, such as those used by transportation service, can reach. In any pandemic condition where human contact is prohibited and social separation is critical this unmanned drone drug delivery system has the potential to be a strong weapon in the fight against the outbreak in health management facilities. In disaster situations in which the current transportation infrastructure is inadequate has been destroyed by a flood, earthquake, or other natural disaster, this type of unmanned aircraft delivery mechanism could save important lives with substantially less effort [3]. Recent studies have revealed that many people die as a result of cardiac arrest. As a result, drones can be used to deliver critical equipment, such as a bionic manipulator that uses visual stimuli to aid a patient in heart attack while being treated [4]. The purpose of this article is to find real-world applications of drone telemedicine and related sectors. The format of the paper is outlined here: The System overview is described in Section II. Section III includes Design concept. Section IV: Conclusion.

2. SYSTEM OVERVIEW

We used the hexacopter to in reality provide an explanation for the obligations that a drone can carry out in an emergency scenario whilst imposing a Medical drone, a existence saver in emergency situations. The block diagram of the hexacopter with stay role monitoring and a surveillance digital camera is shown below in figure 1.

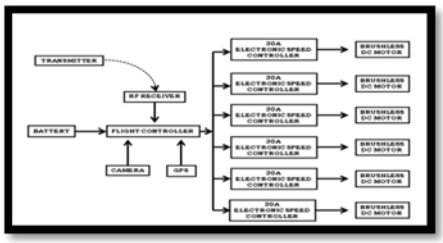

Figure 1: Block Diagram of the Hexacopter

The block diagram of hexacopter is divided into three sections, which are as follows:
A. Hexacopter
B. Global Positioning System
C. Digital camera

A.Hexacopter:

A hexacopter is a type of uav that has six propellers and six motors. Six propellers are arranged in a circle around the main body. They are separated via way of means of one hundred twenty degrees. Hexacopters are powerful, light-weight plane able to sporting huge payloads.
The hexacopter is made up of the following parts:

- Flight Controller
- Battery
- Electronic speed controllers
- Brushless DC motors
- RF receiver
- Transmitter

Flight Controller

The aircraft's brain is the flight controller KK 2.1.5. It's a PCB containing a number of sensing devices the motion of the uav as well as operator instructions. This information is then used to regulate the motor speed, causing the vehicle to move as directed [5]. The ATMEL mega 664PA, an 8-bit AVR Arm processor, is included in the KK 2.1.5 board. A mcu with 64 kilobytes of memory is utilized. Beginners will find it easy to get started. It includes firmware that has already been programmed. During the activation or deactivation process the KK 2.1.5 piezo buzzer emits an audible warning on the board. It is the most stable, with an inbuilt gyroscope and a 6050 MPU instant feature .There are eight rotor outlets and five command interfaces on this circuit board. An ISP, a Lcd screen, and a polarity-protected voltage controlled input. A six-axis accelerometer/gyroscope, a piezo output with a fuse, and a piezo output with a fuse. The user-defined signals from the K.K.board are processed by ATMEL [6].

Battery

The potential of a battery is measured in mill amperes. Mill ampere-hours vs hours If you've got a 4200 mA battery, this offers your drone one hour of 4200 mA power, or 4.2 lots of power. In theory, the bigger you're potential, the longer your drone can fly, however there's a trade-off.

Electronic speed controllers

Electronic speed controllers (ESCs) enable uav flight systems to regulate and alter the speed of the aircraft's dc motor. The flight controller sends a signal to the ESC, which causes the ESC to raise or decrease the input power as needed, allowing the propeller's rpm to change [7]. Active or regenerative braking, which is the process of transforming a motor's mechanical energy into electrical energy that may be used to replenish the drone's battery, can also be handled by Electronic Speed Controls. The motor may operate as a generator during deceleration, and the ESC manages extra current that can be sent down in to power pack. The Simonk 30A Brushless dc ESC can power motors using up to 30A of electricity. It runs on 2S–3S Rechargeable batteries. This ESC contains a charge eliminator circuit that feeds 5V and 2A to the detector, removing the need for a separate receiver battery [8].

Brushless DC motors

Motors for drones and unmanned aerial vehicles (UAVs) are most commonly used to spin the propellers of multirotor drones, allowing them to fly. Brushless motors are much more powerful for their weight than brushed motors, and they last much longer. Brushed motors are typically used in the smallest drones, whereas brushless motors are used in larger drones and UAVs because they can support the extra weight of the additional electronics. Brushless drone motors must also be powered by an electronic speed controller (ESC) [9].

RF Receiver & Transmitter

A radio frequency transmitter-receiver board receives data and wirelessly transmits it to various components via its antenna. A Uav Transmitter is an electronic appliance that wirelessly sends instructions to a receiver, which is linked to the uav being remotely piloted [10].

The specifications of all the components used in the hexacopter are discussed in table I.

Table-1: Specifications of all components

Specifications	MODEL	COLOUR	OPERATING VOLTAGE(v)	DIMENSIONS (mm)
FLIGHT CONTROLLER [10]	KK 2.1.5	GREEN	4.8-6.0	52x52x12
ELECTRONIC SPEED CONTROLLER [11]	SIMONK	YELLOW	5	34x24x9
BRUSHLESS MOTOR[12]	920KV 2212	RED	7-12	28x28x46
TRANSMITTER &RECEIVER[13]	DIGITAL RADIO TRANSMITTER	BLACK	12	189x97x295
BATTERY	ORANGE 4200/3S-35C	ORANGE	11.1	140x43x25

B. Global Positioning System

We employed a global positioning system (GPS) in our study to detect the uav's accurate position data in order to pilot the drone carrying time-sensitive products like medications to the delivery address [15]. The vehicle's position is determined via Global Positioning System, which is a fundamental component of most UAV navigation systems [16]. The UAV GPS is also utilized to calculate the actual speed and position of the vehicle [17].

C. Digital camera

A drone camera's purpose is to provide a vantage point that is impossible to see from the ground, and often in inaccessible or dangerous conditions for humans [18]. It provides the user with an aerial view of a variety of surfaces, allowing the collection of data, images, and videos for a variety of purposes. Uavs are employed to keep an eye on precise locations, chemical and biochemical risks, and epidemics. In high-risk contexts, drones have been shown to be capable of gathering information such as the number of victims in need of attention and triaging [19].

3.DESIGNCONCEPT:

A hexacopter, or uav with six rotors and six motors, is denoted by the prefix "hex." Around the main body, the propellers are arranged in a circle. They are separated via way of means of one hundred twenty degrees. Hexacopter's are powerful, light-weight plane able to sporting big payloads. A drone with six rotors is known as a hexacopter. The F550 body served as the inspiration for this hexacopter. The kk2.1.5 Flight controller microcontroller is applied on this hexacopter. The Flight controller is the drone's intellect. In our project, we constructed a far off-managed manually piloted Hexacopter. The remote delivers radio indications to a control system radio receiver. The flight controller then controls and manages the charge of DC motor vehicle by sending indications to the ESC after receiving those signals [20]. The vehicles used are vital in determining the aircraft's capacity. The leased vehicles have a maximum load of 920kV, which is suitable for delivering medications. On our drone, we have got hooked up a container to move medicines.

Based on its weight and size, a drone is developed and engineered to give steadiness, adaptability, and pace while flying. A field system controls the uav, e-signals are first delivered to the KK Control Board, which incorporates a receiver and takes information from the Gps device at the same time. Flight controller, hexaframe, which links all of the parts, is coupled to the controller. We can control and guide the Drones from the ground station [22]. It has four important hexacopter controls: throttle, altitude, and altitude hold, Pitch, yaw, and roll your hexacopter will turn left or right as you roll it. This is achieved by moving your transmitter's joystick to the left or right, and vice versa. You may change the pitch by pushing the right hand joystick on the backwards or forwards transmission. At first, Yaw looks to be a little puzzling. It turns the hexacopter either anticlockwise.. The hexacopter's rotors are overworked. There is no power to take off because of the throttle. Throughout the flight, you are constantly occupied with the throttle. The high-voltage battery was removed. In order to keep the hexacopter in the air, the throttle must be used in both of the cylinders and by calculating the difference in temperature between the sky and the Push then gradually increase the throttle (left stick) to start the propellers spinning then pause. Get to know the sharpness of the throttle. Gradually move the throttle to the ground. Set the throttle to zero and allow the a hexacopter to ground. Wireless control's most prevalent use Model frameworks were originally established in the 1940s and 1950s with only one identity equipment, followed by

commercial gear [21]. Because the current needs were minimal, the transistor technique considerably lowered the battery's demands. The model's moving parts were commonly positioned in both of the cylinders in early mosfet sets, and the put away is controlled by an electromagnetic escapement strength in an adjustable strap ring, providing basic on/off steering command (right, left, and neutral) as well as, on occasion, distinct characteristics, including motor speed [22].In this study, a medical drone is used to deliver medications to emergency regions before people can arrive. Unlike other drones, it has a distinct future. Other drones transfer cargo or objects by landing on the ground, but this medical drone will deliver medicines or emergency medications by dropping them from the air using a parachute. This will be useful in pandemic conditions or in areas where the drone cannot land.

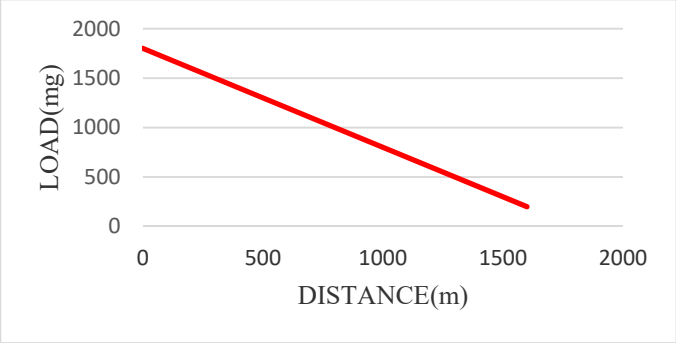

Figure 2: Load vs Distance

As the payload raises, the distance travelled by the drone decreases, as seen in Figure 2. To offset this disadvantage, a battery that can handle the load and travel distance must be employed.The table II compares the parameters of prior drones to the current drone employed in this paper as shown below.

Table II: comparing the parameters of different drones

s.no	Parameters	Drone1[18]	Drone2[19]	Drone3[Proposed]
1.	Weight(gm)	1000	1500	2500
2.	Distance(m)	800	1200	2000
3.	Speed(km/hr)	20	40	60
4.	Payload(gm)	500	1000	2000

Figure 3 : Experimental medical drone

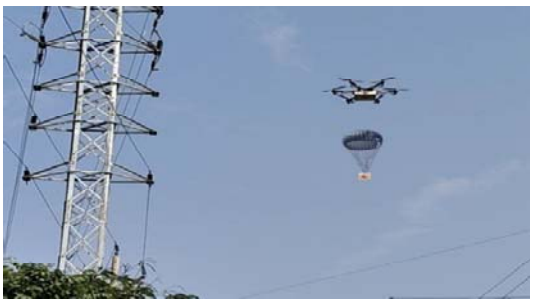

Figure 4 : Experimental medical drone delivering medicines using parachute

Figures 3 and 4 above depict our designed work; figure 3 depicts a medical drone, and figure 4 depicts a drone delivering medicine via parachute.

4. Conclusion

Drones for health reasons have substantial advantages, such as quick assistance, lowered transit less times to the patient in health problems in the wounded because of the short amount of time to seek for restoration, assistance and improved performance of fundamental operations of emergency health workgroups, and the able to attain locations unreachable by conventional forms of healthcare transit [25].This research highlights how to distribute critical medicines in areas where standard transportation services are unavailable, as well as in areas where the topography makes regular transportation techniques impossible. Second, important applications come during natural catastrophes such as floods and earthquakes, when people and doctors require crucial medicines that may be delivered swiftly utilising our medicine drone delivery system. This drone has the potential to be deployed in metropolitan settings. The growing population and the increased number of private automobiles on city streets have caused traffic congestion, making traditional delivery systems more difficult to operate. Unlike prior publications on drones, this one is beneficial for delivering medications during a pandemic without landing or touching down anywhere, or in regions where it cannot land. It will deliver with a parachute immediately.

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Interplay, Issues and Challenges of Cloud and Fog Computing

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Abstract

Cloud Computing (CC) and Fog computing (FC) are trending technologies, as everyday voluminous data and IoT devices are being added to the internet.CC provides shared resources to the users, over the internet on a pay-as-you-use and demand basis. The fog paradigm fulfills real-time requests that are received from smart or IoT devices. As the cloud involves remote servers, while fog processes requests near to/on the devices themselves, they along with owning unique characteristics, face various issues and challenges, typically related to privacy, security and performance. This paper gives a clear picture of the cloud and fog paradigm, separately and together. Cloud-fog interplay and the differences between them are also discussed. The paper goes on to highlight various issues and challenges of cloud and fog, after which it concludes.

Keywords. Cloud Computing, Fog Computing, Internet of Things (IOT), Security and Privacy, Smart device

1. INTRODUCTION

Cloud and fog architecture have computing devices that handle miscellaneous user requests. It has rippled through almost every field such as business, healthcare and has mixed their territories. In a world full of IoT devices, where data on the internet changes overtime, cloud and fog have a significant role to play. Cloud and fog, in sync, provide a variety of computational assets to fulfill dynamic user requests. The aforesaid architecture uses virtualization, which provides virtual devices to satisfy multiple clients' demands at once. Cloud overlay fog, where fog handles dire requests so that lesser data reaches the cloud and latency is reduced. With the advent of smart technologies like smart healthcare systems, smart cities, smart devices, pressure on the cloud and fog to handle requests along with needed Quality of Service (QoS) is increasing rapidly.

1.1 Cloud Computing

CC provides internet-based computing services to the users where shared resources like servers, VMs, memory, network, are provided as per the need. Clients do not physically purchase these resources. Hence, the cloud has enabled handling of everything over the internet, from development to modification of applications, where clients only pay for the services they take. Cloud has a pool of resources that provides availability and flexibility to users. Cloud has five essential characteristics, three service models, and four deployment models according to NIST [1, 2].

1.1.1 Characteristic features of Cloud Computing

- *On-demand services*: The client can avail services and resources online which are handled automatically, without any human intervention.
- *Broad network access*: With it as main pillar, services are productively utilized. Light and heavy devices of various configurations get quality services anytime and anywhere.
- *Rapid Elasticity*: It is one of distinguishing features of cloud. It makes sure that resources can be scaled up and down, without trading off QoS.
- *Measured services*: Implementing a metered capability enables the cloud to measure and administer resource usage depending on the type of service.
- *Resource pooling*: Cloud is pool of physical and virtual resources (platform, VMs, etc.) thatprovides multi tenancy. Users cannot precisely tell the physical location of devices.

1.1.2 Cloud Service Models

There are three types of cloud service models [1, 2, 3].

- *Infrastructure as a service (IaaS)*: The service provider (SP) gives the entire infrastructure to the client, on their demand, through the internet. Infrastructure may include software, bandwidth, memory, processor, VMs, etc. Client doesn't control and maintain the infrastructure, it is taken care of by the SP instead. It reduces capital cost. Google, Rackspace, Amazon web services are some example of IaaS.

- *Platform as a service (PaaS)*: SP whichis the host, offers platform, including various softwares and hardware to the clients. It facilitates development of applications, with the help of tools that the SP gives. Window Azure, Google App Engine are PaaS examples.
- *Software as a Service (SaaS)*: SP offers softwares, which run on cloud infrastructure, over the internet. Clients need not to install or execute the application on their devices. Email services is most common example. IBM, Oracle are examples of such SP.

1.1.3 Cloud Deployment Models

There are four cloud deployment models [1, 2]based on scale, access to resources and authority.

- *Public*: It is the most widely used deployment model and provides public services for the general mass. Same data or services are given by SP to all clients, which are open to all. They are mostly unpaid. Facebook, LinkedIn, Google are examples.
- *Private*: Services and resources are for asingleorganization and utilized by many users at a time. It gives good security, privacy and a private environment to client information,hence private cloud is costlier than the public. It is hosted by the organization or a third party.
- *Community*: Resources are used by several organizationsthat share a common goal (e.g. security). It can be hosted both internally and externally. Management is done either by the organization or by some third party. Cost lies in between of public and private cloud.
- *Hybrid*: Hybrid cloud is fusion of public, private and community cloud, offering more flexibility. Each entity is unique. Critical jobs are performed using private cloud, as they offer more security. While non-critical jobs are done through public. It provides cost satisfaction along with security features of private but more management is required.

1.2 Fog Computing

FC is an extension technology of CC.IoT-enabled devices send enumerable requests to cloud,which add plenteous data to network. This consequently raises issues like security and privacy threats, congestion and low QoS.Fog is positioned between cloud and IoT devices. Heterogeneous fog nodes scattered at different geo-locations collaborate to form a network, to store and process data at network edge[4]. Fog addresses requests of IoT devices' quickly and more securely than cloud. The requests are handled by fog nodes, so that cloud is not repeatedly pursued and lesser data reaches it. Features of fog, highlighted by NIST [4] that makes it a standout among peer paradigms are:

1.2.1 Characteristic features of Fog Computing

- *Location awareness and Low latency*: As fog nodes are closely located to IoT devices, processing, storage, management and fulfilment of request is done rapidly when compared to CC. Hence, better QoS are attained at network edge.
- *Large number of nodes*: Addressing of foglets require large number of dispersed fog nodes, to provide faster service in close vicinity to the data source.
- *Mobility support*: When a device moves from one physical location to other, fog services are unhindered because fog application module is transferred from one node to other. It thus provides location-based mobility to users without halting the services.
- *Wireless networks*: Wireless sensors in IoT use distributed services of fog. Fog complements IoT, as low power and energy is wasted to facilitate scalability and mobility.
- *Real-time request handling*: Real-time information is important for IoT, sofog does not process requests batch-wise.
- *Heterogeneity*: As fog is responsible for handling different types of requests arriving from heterogeneous smart devices, it itself should be heterogeneous.
- *Linkage to cloud*: Many requests need both cloud and fog for being processed. Quick handling is done at fog. Fog uses cloud for heavy processing of requests and data.

- *Big sensor network*: Large number of sensors forming big networks are used by fog monitoring IoT-related environments like Smart Grid.
- *Geo-distribution*: The nodes are geographically distributed, in order to satisfy users timely and support mobility.
- *Interoperability and federation*: Most fog services are real-time, for which various SP should collaborate. Thus, fog services and components must be joined at various levels.

2. CLOUD-FOG COMPUTING ENVIRONMENT

Cloud and fog have a complex interplay. They often work in synchronization, forming a complete architecture, along with IoT. Figure 1 shows cloud, fog and IoT system [4]. The complete architecture has three layers/ tiers viz. IoTdevice layer, fog layer and finally the cloud layer [5].

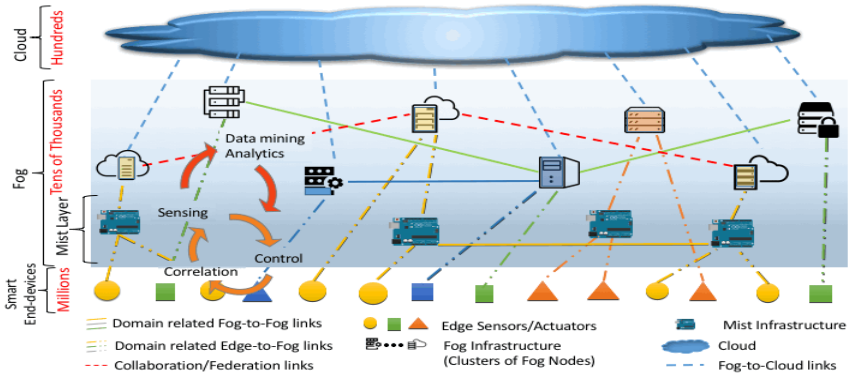

Figure 1. Cloud, Fog, and IoT System

2.1 Interdependency of Cloud and Fog Computing

Fog assists cloud and cloud assists fog. Fog is used for localization, while cloud provides global centralization[6]. FC is heterogeneous in nature. IoT devices like smart TV, smart traffic light send requests to fog nodes [7]. These fog nodes are expected to service requests urgently. The computational capacity of fog node is limited, in comparison to cloud. Fog nodes with their full processing and storage capacity, service the requests instantly. Once the services are handled, the resultant information is sent to cloud, to be analyzed and stored. Some requests may need heavy processing and storage capacity, which fog node may fail to provide. In such scenario, requests are further transmitted to the cloud. Cloud does the needful processing.

Cloud and fog consolidate each other in fulfilling users' requests, adding benefits of both the technologies. Cloud gives additional computing and storing facility to fog, to handle massive requests. On the other hand, fog reduces the amount of information and service demands that reach cloud. Fog also adds features like reduced latency and bandwidth, increased mobility, which makes it a suited choice for IoT. Hence, they both have their own roles and cannot replace one another.

2.2 Cloud Computing Vs Fog Computing

Both thetechnologies use VMs but are as much different from each other as much they are similar. The major differences between them is due to differences in the underlying hardware. Cloud has datacenters with huge capacities, while fog nodes include gateways, fog devices and fog servers, with relatively very little computational power. Higher availability with high energy consumption is provided by cloud ,whereas moderate availability with lesser energy consumption is provided by fog [8]. Also, cloud is not a good fit for services that need urgent actions by server. Table 1 marks the key differences between CC and FC [9].

Table 1. Key Differences between Cloud and Fog Computing [9]

S. No	Parameter of Comparison	Cloud Computing	Fog Computing
1	Architecture	Centralized	Decentralized

2	Latency	Very high (May take a week)	Very low (Will take few minutes at maximum)
3	Mobility	Lesser support to mobility	Total support
4	Security	Inferior to fog	Better than cloud
5	Coverage	Global	Local
6	Data storage duration	For a very long time (Even for years)	Very short time (Maximum few weeks)
7	Privacy Control	Inferior to fog	Better than cloud
8	Nodes	Few	Large number
9	Proximity to users	Multiple hop	Single hop
10	Hardware	Powerful datacenters	Relatively week fog nodes
11	Operating cost	Relatively high	Relatively low
12	Energy used	High	Low
13	Location awareness	Absent	Present
14	Vulnerability	High	Low
15	Real-time service	Supported	Highly supported
16	Last mile connectivity	Leased line	Wireless

3. ISSUES AND CHALLENGES OF CLOUD COMPUTING

Some of the important cloud issues and challenges are [10-13]:

- *Security and privacy*: Security and privacy are biggest challenges of CC. CC provides services using remote servers, on which clients' softwares and data run. Hence, cloud data is susceptible to security threats like data stealing, loss, data leak, data tampering.
- *Technical issues*: Various technical issues arise due to heavy load and requirement for high-speed internet connectivity, which makes the cloud system complex.
- *Data lock-in*: Standard APIs, if not present, hamper migration of services and applications among clouds. Data portability, migration, and vendor lock-in problems may occur.
- *Data segregation*: During multi-tenancy, when VMs are located near to each other on same server or hard disk, issues related to separating memory of users may rise.
- *Data location*: For data and information safety of the users, geographical location of data plays an important role. Rules for data varies with countries and data types. Client may get involved in legal issues without even knowing.
- *Recovery and back-up***:** Data recovery is as important as data security in cloud. Cloud must facilitate recovery of data. Data recovery process gets slower in case of disaster.
- *Cost*: Often, one of the computation, communication and integration cost suffers at the hands of other. When cloud client moves from one model to other, migration cost adds, while infrastructure cost reduces. This is more of a problem in the hybrid cloud, as in hybrid model, distribution of data is in between private, public and community clouds.
- *Service Level Agreement (SLA) related challenges*:Customer must be sure of fulfillment of various factors related to service delivery like quality, reliability, confidentiality. SLAs provide such guarantees. SLAs are written in view of meeting all client's requirements. Achieving SLA becomes a challenge when a business is moved from one model to another, as different clouds require different meta-specifications.
- *Migration related issues*: According to the survey of IDC, 2008, when organizational data migrates from one cloud to another, security and privacy issues rise. It is difficult to move from IaaS to SaaS, as only few functions are moved out, while core activities are kept in-house.
- *Anticipated and unanticipated workloads*: Processors, memory and network are virtual resources which utilize very less power than traditional datacenters. Large workloads (predictable/unpredictable) are submitted to VMs [19]. Loads may vary overtime.
- *Heterogeneous and homogeneous workloads*: Workloads maybe heterogeneous (dissimilar e.g., in terms of execution time, hardware requirement) or homogeneous (similar). Hence, cloud should be in such a way that different types of workloads should be handled by it.
- *Batch and transaction workload*: Workloads maybe of batch or transaction types. Transaction workload unlike batch, requires input from user, time to time e.g.online transactional system. Batch workloads are non-preemptive while

transaction workload is preemptive. Batch workload fluctuates but transactional workloads do not. Hence, depending upon the workload type, a suitable scheduling algorithm must be used.

- *Flexibility*: Cloud flexibility refers to its ability to handle dynamic change in resource requirements. As time increases, demand of the resources may grow, these demands must be automatically perceived by the cloud and should be accommodated. A cloud should have an efficient resource management facility.
- *Maximizing resources and minimizing cost*: Cloud should provide maximum resource utilization with least cost. Also, unhindered services should be given to clients.
- *Migration of VMs*: Migration of VMs from one host to the other, helps coping with the issue of insufficient resources. So, VM migration should be facilitated by cloud.
- *Reducing energy consumption*:Due to large number of computational resources, carbon emission is often very high. Strategies must be applied to reduce it.
- *Executing Long Running Jobs*: Some requests of cloud may require longer processing without being interrupted or failing. Cloud should employ strategies and techniques for unavailability and failure detection, in order to migrate workload to available computing resources. This should be done with minimum latency, so that interruption of services is not felt at client's end.

4. ISSUES AND CHALLENGES OF FOG COMPUTING

A major application of FC is IoT [7]. Fog's issues and challenges must be identified and resolved to utilize real time services. Several issues and challenges of cloud enabled fog are [14- 18] :

- *Performance Issue*: Performance issue is major issue of fog, as quoted by CISCO. Fog must provide good performance with good QoS, particularly in terms of latency to IoT devices. If services are not met in real time, then the whole idea of fog becomes useless. This can be resolved by using appropriate load balancing or scheduling algorithms.
- *Fog Server Placement*: Each fog server has resources present at different locations of network edge. For proper management, aspects such as range of fog servers, transmission, communication and collaboration between them are considered. Strategies for efficient fog servers' placement must be used to handle location and management of fog server and to give best services to clients.
- *Network Management challenge*: Fog environment has large number of IoT devices and sensors with different configurations such as processing power, memory, OS, etc. Management of heterogeneous smart devices is an important issue. Network security from various attacks like sniffer and jamming attacks must also be taken care of.
- *Resource Management challenge*: Smart devices require large storage and processing power. In cloud-fog system, management of devices at network edge, between cloud and fog and inside cloud must be done altogether. It becomes more challenging due to heterogeneous devices. Efficient management of the environment givesgood quality services.
- *Security Challenges*: The continuous transmission of data between smart devices and fog nodes may lead to critical security issues. So, various security measures must be taken. Security is less in fog as compared to cloud, due to distributed nodes. Cloud security and privacy mechanisms cannot be used for fog. Fog security and authentication must be developed and included.
- *Privacy /Data Leak Issues*: Primary issue of fog-IoT paradigm is privacy. Fog nodes, which are near to users, has more critical information in comparison to cloud. Various privacy algorithms are implemented between cloud and fog to overcome this issue.
- *Decentralized Data Allocation*: Unlike cloud, data processing in fog is done in fog nodes, which minimizes time. Hence, it reduces latency as servers are not overloaded. However, decentralized process leads to issues like different execution environments.
- *Mobility Management*: With the presence of network connection, fog nodes and IoT devices can move in any environment. However, mobility of IoT devices and fog nodes may break services and reduce quality. Hence, their mobility must be managed.
- *Design of Multi-objective Fog environment***:** Fog must be designed in a way that it meets various objectives (latency, power consumption, etc.) to fully utilize nodes and provide multi-level services.
- *Fog Hardware***:** Fog does not efficiently utilize the underlying hardware like routers, base stations, access points, storage devices, Wi-Fi, optical networks, gateways, hence development of specialized hardware for fog are much required.
- *Offloading of fog nodes*: A node can offload task to nearby nodesto reduce processing latency. So, fog load balancing must be intelligently implemented.
- *Malicious Attacks*: Due to distributed location, fog nodes face threat of various attacks. Existing mechanisms are not efficient in detecting attacks; therefore, innovations are needed for malicious attack proof fog paradigm.

- *Scalable Design of Fog Schemes*: Existing algorithms do not go well with exponential increase in IoT devices, hence newer or improved strategies must be implemented.
- *Access Control Management*: Measures to achieve access control are must for system security. Likewise, access control measures should be developed for fog.
- *Energy Consumption*: Fog nodes use lot of energy due to processing at network edge and promise of good QoS. Energy saving hardware, strategies and policies should be developed for cloud and fog.
- *Authentication Issues*: Authentication of fog service shareholders (cloud SP, internet SP and users) is a serious issue as fog has distributed nature. Algorithms for real-time authentication must be developed.
- *Energy aware & adaptive Fog storage*: Such storage technique not only brings user and data closer but also provides additional functions like energy saving.
- *Coupled resource management in Fog:* Cyber physical systems (CPS) with cloud features called sensor-based cloud computing can improve performance in terms of speed. Combined resource management may lead to service failure.
- *Fog based intelligent transportation system*: Intelligent transportation system (ITS) are gaining popularity for traffic system in 5G network of big data analytics. ITS devices are connected to cloud for processing using IoT. However, cloud generates massive data that ITS application can't handle. To deal with this, fog instead of cloud, is given data processing to provide speedy response and save bandwidth of network.

5. CONCLUSION

Based on the above study, it is right to say that FC is an add-on to CC. Fog is a technological breakthrough, which very well suits IoT environment. Cloud provides various services to IoT devices but with fog, QoS can be enhanced. Cloud is centralized in nature, while fog enables processing at network edge. Both cloud and fog have some peculiar characteristics which make them suitable for different environments. However, both have some issues and challenges that must be curtailed. Security and privacy are recognized as major issues of cloud, as performance is for fog.

6. FUTURE WORK

Future work includes optimization of performance of cloud and fog, considering different quality parameters.Strategies that consider improvement of performance, security and privacy must be developed to make cloud-fog system more robust. Design of multi-objective algorithms for cloud and fog environment must be focused on.

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Context Aware Load Balancing Strategy for Batch of Tasks in Cloud and Fog Computing Environment

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Abstract.
As the demand of load balancing (LB) in cloud and fog computing environment is growing, so the need for improved overall system performance. LB problem is verified to be NP-complete problem. The emerging use of heterogeneity is to process large number of intensive jobs in cloud and fog computing.In this paper, a Context Aware Load Balancing Strategy (CLBS) algorithm is proposed. The proposed LB strategy model has an intelligent scheduler like adaptive nature and this approach is used to minimize execution time of parallel jobs. CLBS works in two phases*viz.* the selection and allocation phase. In selection phase, CLBS chooses strategy for minimization of imbalanced load and makespan using fuzzy rule-based technique, while the allocation phase is carried out using minimum completion time. For the performance comparison, CLBS is compared with three existing state-of-artalgorithms from the literature. The simulation results of CLBS are showing better performance in terms of makespan and system utilization.

Keywords. Cloud Computing, Fog Computing, Load Balancing, Fuzzy rule-based technique, Intelligent Scheduler, Utilization.

1. INTRODUCTION

Cloud and fog are recent technologies which have shown drastic advancement in past few years. Cloud computing provides on-demand computational services to the users through internet where payment is based on the usage. The advantage of cloud is that it saves client's time and money that is wasted on local server's purchase and maintenance. Fog computing is descendant of cloud and services urgent requests that arrive from smart/IoT devices. Fog is new and has unique features like wireless connections, mobility support, location awareness, etc. With the increase in data of cloud and rigorous addition of smart devices to the network, cloud and fog face some serious issues like security, privacy and LB [1-3].

LB in cloud and fog computing is a method that allocates excess dynamic local workload to have ideally balanced computational machines [4-5, 19-22]. Balancing load ideally on all virtual machines (VMs) maximizes resource utilization and achieves better user satisfaction, ensuring that no VM is overloaded/underloaded, thus improving the system performance. It also helps in applying scalability,over-provisioning, fail-over, avoiding bottlenecks,minimizing response time and attaining Green Computing in cloud[6]. LB plays a vital role in cloud-cum-fog environment for the resource utilization of VMs that are globally distributed. IaaS cloud provides the resources for users' requests like execution of the tasks, storage of data, network access. Nevertheless, the capacity of resources can vary time to time for a specific user application. Due to this reason, the system performance of the IaaS can be affected. Thus, some resources get underloaded/overloaded ormay be idle for a long time, resulting in poor system performance [7]. The other issues related to it are limiting energy consumption and reducing carbon emission [8]. The main objectives of LB are - to keep the system stable and busy, increase the performance of the system, provide scope for future enhancement in the system and have a backup plan in case the system fails, even partially. The nature of adaptive LB is to help maximize overall system performance by confirming that user application requests are distributed and executed fairly over the set of computational machines.

When it comes to cloud and fog systems, there is a great deal of global uncertainty involved. Fuzzy logic concept can be used to reduce the effect of uncertainty in decision making process for LB algorithms [9]. For solving/running parallel and distributed job applications, the fuzzy logic technique for heterogeneous computing environments is intrinsically the best choice. All significant tasks are separated and distributed over numerous machines for parallel execution in this type of application. The chances of one of the machines being idle while another host has several jobs queued up can be very high for such type of system [10, 11].

1.1. Motivation

Cloud and fog receive diverse requests. Choosing the right LB strategy depends on the type of jobs that needs to be executed. For example, if the users have majority of the jobs with less amount of workloads for execution, Min-Min strategy will give better load balance and makespan as compared to SJFR-LJFR, LJFR-SJFR and Max-Min strategies. Similarly, if majority of jobs with great amount of workloads arrive, Max-Min strategy will give better load balance and makespan than Min-Min, SJFR-LJFR and LJFR-SJFR. Moreover, if the users have both some jobs with great amount of workloads and some with less amount of workloads, then strategy is chosen depending on type of jobs which are greater in number, for instance, if more heavy jobs with great amount of workloads arrive, then Max-Min will be better choice to balance the load with reduced makespan. This requires cloud and fog systems to use CLBS which is adaptive and depends on job specifications. Or else, one or more backend VMscan possibly become overloaded, whereas others will be underutilized.

1.2. Contribution

The contributions of the paper are summarized as follows: we are combining two recent works : ITSLB [12] and LBSM [13]. In this paper, adaptive natured scheduler is proposed named as CLBS to process an independent batch of tasks (BoT) in cloud and fog computing, having the objectives of optimizing load balance, makespan and system utilization. The proposed CLBS is a combination of both the strategies. CLBS model is developed for recognizing task pattern and best optimization strategies (i.e. Min-Min, Max-Min, SJFR-LJFR, LJFR-SJFR) to give best performance in terms of reduced tasks' finish time and load imbalance in cloud data center using fuzzy rule-based technique. In simulation results, CLBS is compared with LBSM, ITSLB and OLB. Results are reported consequently.

The rest of the paper is organized as follows: the next section is a summary of the related work that has been published in the literature. The design ideas, system overview, and problem description with parameter estimation are all covered in Section 3.

Section 4 describes the suggested Context aware Load Balancing Strategy (CLBS) algorithm and its version and Section 5 presents the simulation study and result analysis. The study concludes with final observations in Section 6. Section 7 suggests the future work.

2. RELATED WORK

An appropriate LB strategy helps in optimal resource utilization, thus reducing its consumption. Static and Dynamic LB are the two techniques of balancing load. Static LB strategy distributes work to all the resources before the actual execution of algorithm. Dynamic LB strategy is more complex and distributes work to all the resources during the execution. There are various independent static task scheduling algorithms such as Max-Min [15],Min-Min [14], Minimum Execution Time (MET) [15], Opportunistic Load Balancing (OLB) [15-16], Minimum Completion Time (MCT) [17], Longest Job in the Fastest Resource-Shortest Job in the Fastest Resource (LJFR-SJFR) [18], Independent Task Scheduling with Load Balancing (ITSLB) [12], Load Balancing Strategy with Migration Cost (LBSM) [13],etc.

MET [15] algorithm assigns tasks with minimum expected execution timeto the resourceswithout considering resource availability . Performance achieved is good as task is given to the fastest resource. It doesn't balance load well and does not fully support heterogeneous environment. The OLB [15-16]does random allocation of tasks to resources that can be available, so as to keep them busy to get maximum resource utilization. As it does not take into account the expected time to compute during task allocation, it may increase makespan.The purpose of MCT [17] is to assign task to the available resource which takes minimum expected completion time. The tasks which do not have MCT are also given resources. Thus, it combines benefits of OLB and MET with improved overall performance.In Min-Min [14], task related information is already available. It begins with set of unallocated tasks. It has two stages. The first stage finds MCT of all the tasks. While the second stage selects the task with minimum expected completion time (ECT) and a suitable resource is given to this task. This task is further removed from metatask once completed. The process loops until all the tasks complete.Min-Min is one of the simplest strategy for task assignment to the resources. The drawback is that the tasks with largest completion time will not be allocated for long time. It may not very well balance the load as few resources may remain idle and resultantly makespan may increase. Max-Min [15] starts with group of unallocated tasks. Max-Min also works in two stages. In first stage, it finds maximum completion time of task . It further calculates maximum ETC for each task. In stage two, task with maximum completion time is chosen and given suitable resource. This task is removed from metataskonce its completed. This process repeats until all the tasks are completed. Max-Min maps task with longer execution time on faster computational node, then task having shorter execution time are executed. So, overall mapping of task is better than Min-Min. Thus, Max-Min provides better LB as well as makespan.LJFR-SJFR [18]starts with group of unmapped task. It finds the MCT value from which task with least MCT called SJFR is selected. The task with maximum completion time from all the tasks is treated as LJFR.In LJFR-SJFR, alternate allocation of longest and shortest tasks is done to best resources. SJFR-LJFR allocates shortest and longest tasks to the best resources, alternatively.ITSLB [12] algorithm uses two variants namely ITSLB(Min-Max) andITSLB(Max-Max). In ITSLB (Max-Max), the load with greatest ETC value istransferred from maximum overloaded computational node (MOL) to maximum underloaded computational node (MUL). In ITSLB(Min-Max) strategy, migration of task will take place from MOL to MUL but here minimum to maximum ETC value of tasks are chosen for transfer . LBSM [13] algorithm uses two approaches for migration of tasks namely LBSM(LSTS) and LBSM(STS). In LBSM(LSTS) approach, firstly largest task is selected and transferred from MOL to MUL then smallest task is selected. They will be transferred alternatively from MOL to MUL and so on. When smallest task from MOL is transferred to MUL, it is referred to LBSM (STS). A brief comparative study has been shown in Table 1.

TABLE 1. A COMPRATIVE STUDY OF REALTED WORK

Techniques	Methodology	Advantages	Disadvantages
MET	Task is given to machine having MET	Overall low execution time of the system	Not good for LB
OLB	Task randomly given to machine expected to be available next	Keeps machine busy	Poor makespan
MCT	Task is mapped to machinewith MCT	Combines benefits of OLB and MET	Considers one task at one time
Min-Min	Task with MCT is given to machine with MET	Low makespan when majority of tasks are small. Lowers waiting time of small jobs	Poor resource utilization. Increased average waiting time of larger tasks
Max-Min	Task with maximum completion time given to machine with MET	Low makespan and good resource utilization. Lowers waiting time of large jobs	Increased average waiting time of smaller tasks
LJFR-SJFR	Alternate allocation of longest and shortest job to fastest machines	Does not let longer or shorter jobs starve	Inferior to Min-Min in makespan
ITSLB	Load is migrated based on the basis of expected time to compute usingmax ETC (Max-Max) and min to max ETC value (Min-Max)	Reduced load imbalance factor	Applied only to FCC network
LBSM	Task are migrated from overloaded to underloaded machines based on two strategies which are LSTS and STS	Minimizes load imbalance	Connection is needed for migration of task

3. BACKGROUND AND PROBLEM FORMULATION

The Context Aware Load BalancingStrategy (CLBS) is designed for independent BoT allocation on heterogeneous VMs in cloud-cum-fog environment to optimize the makespan and resource utilization. This section describes various components related to proposed strategy such as cloud and fog system overview, problem description and parameter estimation.

3.1. System Overview

The recent real time and scientific applications such as smart city, processors, chips, health monitoring systems and many more have extended the use of cloud and the emerging fog computing technology. The current trend is hosting real time and scientific applications in the cloud cum fog environment. Therefore, in this paper, we consider the scheduler model for the proposed approach in cloud-fog environment. Cloud and fog computing environment is a collection of resources, where each resource contributes to solve complex users' problems. The heterogeneous structure is made up of a number of organization, each of which has a set of resources. Our suggested system is based on a centralized architecture, with independent batch of tasks being sent to any VM andthe eventual dispatch of the independent BoT based on the appraisal of a VM's fitness for a given workload. The present state of the system is maintained by our proposed strategy using the following information:

- The time of processing, the number of VMs from various domains available.
- Clock frequency of the VMs.
- The VMs' ready time reflecting the current load status on each VM in the scheduler.

3.2. Problem Description and Parameter Estimation

Consider the following scenario: the scheduler model under consideration comprises VMs with variable speed capacities. Let the set of VMs $K = \{V_j: j = 1, 2,\ldots,n\}$ and batch of m independent task $T = \{T_i : i = 1, 2,\ldots,m\}$.The problem is finding the mapping $(\mathcal{M})$ for batch of independent tasks T assigned on the set of VMs K

$$\mathcal{M} : T \rightarrow K \qquad (1)$$

After generation of workload, the Expected Time to Compute (ETC) matrix model can be calculated in the following way:

$$ETC_{i,j} = \frac{WL_i}{CC_j} \qquad (2)$$

The capacity of task will be calculated in Millions of Instructions(MIs) and VM capability in MIPS. The average ETC is computed as:

$$\bar{E} = \frac{\sum_{j=1}^{n} ETC_{ij}}{n} \qquad (3)$$

After computation of E matrix and , CLBS recognizes the pattern of workload and using fuzzy based rule determines which optimization strategy will be suitable for this particular type of independent tasks. The fuzzy rule-based technique is shown in section 4. Now, for each allocation of task, the completion time (CT_{ij}) of T_i on V_j is required. Therefore, it is computed by using equation (4) as follows:

$$CT_{ij} = RT_j + ETC_{ij} \qquad (4)$$

whereRT_j is the ready time of V_j. Because makespan (Ms) is a crucial parameter for task execution, a decrease in makespan is regarded as an enhancement in system performance. The shorter the makespan, the better the task schedule, meaning that all of the allocated tasks are completed in less time. It is possible to calculate the makespan as follows:

$$Ms = \max_{1 \le j \le n} \left(\sum_{\forall k \leftarrow \forall T_i} CT_{ij} \right) \qquad (5)$$

For the owner's perspective, average resource usage (U_g) is an important optimization criteria for improving the performance of the IaaS system. For a given allocation, the U_g of heterogeneous VMs for an independent BoT can be computed as:

$$U_g = \frac{\sum_{j=1}^{n} CT_j}{n \times Ms} \qquad (6)$$

4. PROPOSED MODEL

This section presents the Context Aware Load Balancing Strategy (CLBS) to optimize the makespan and resource utilization in cloud-cum-fog computing environmentwhile analysing its various features. The strategy is categorized in two major phases: *selection* and *allocation phase*.The first phaseisused for determining the best optimization strategy on the basis of tasks' workload pattern while *allocation phase* is as per completion time of each task.

The various scheduling algorithms are available for this work such as Max-Min, Min-Min, SJFR-LJFRand LJFR-SJFR. The Min-Min approach gives better result when the majority of task has minimum workload. Similarly, Max-Min strategy works better when majority of task has maximum workload. The proposed CLBS works as an intelligent system using fuzzy rule-based techniques. The proposed CLBS is itself dynamic and adaptivein nature, as optimization strategy is not predetermined and rather chosen according to the workload pattern of majority of tasks arriving (i.e. on the basis of context). After generation of workload of tasks, CLBS model determines minimum workload value which is subtracted from all workload

values. After subtracting, from the resultant values, CLBS determines maximum workload value which divides all workload values. Thus, all tasks' workload values are converted in the range of 0 and 1. The range of these workloads is categorized into two parts, such as 0 to less than 0.5 called as *minimum workload value* and greater than or equal to 0.5 to less than or equal to 1 which is called *maximum workload value*. The percentage of workloads belonging in this categorizationis calculated and used in four fuzzy membership functions, such as low, moderately low, moderately high and high workload values, as depicted in Fig 1.

For computation of fuzzy membership function,equation (7) is considered. After computing these membership functions, if the percentage of minimum workload value lies between 0 to 20% that means 20% tasks are of minimum workload value and rest are of the maximum workload value. In this condition, CLBS model will use Max-Min strategy for allocation of tasks. Similarly, if minimum workload value lies in between 20% to 40%, 40% to 60%, 60% to 80% and 80% to 100% then CLBS model will use Max-Min, LJFR-SJFR, SJFR-LJFR and Min-Min strategies for task allocation, respectively.

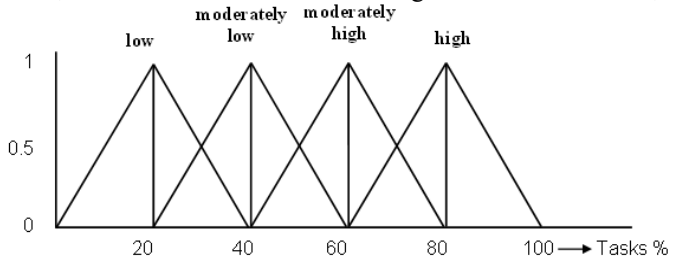

Fig. 1. Fuzzification for optimization strategy

The fuzzy rule-based technique is as follows:

$$\mu_{low} = \begin{cases} \frac{20-x}{20-0}, if\ x < 20 \\ 1,\ if x = 20 \\ \frac{x-40}{40-20}, if\ 20 < x < 40 \end{cases}$$

$$\mu_{moderatelylow} = \begin{cases} \frac{40-x}{40-20}, if\ 20 < x < 40 \\ 1,\ if x = 40 \\ \frac{x-40}{60-40}, if\ 40 < x < 60 \end{cases} \quad \mu_{moderatelyhigh} = \begin{cases} \frac{60-x}{60-40}, if\ 40 < x < 60 \\ 1,\ if x = 60 \\ \frac{x-60}{80-60}, 60 < x < 80 \end{cases} \quad \mu_{high} = \begin{cases} \frac{80-x}{80-60}, if\ 60 < x < 80 \\ 1,\ if x = 80 \\ \frac{x-80}{100-80}, 80 < x \leq 100 \end{cases}$$

(7)

Where x represents the percentage of minimumworkload value.Once CLBS model will recognize best optimization strategy by using equation (7). Then allocation will begin according to completion time of each task as per equation (4). The average ETC is the threshold for the level of load balance. If because of assigning a task, that machine exceeds the average ETC, then those tasks will be assigned to another machine, which fits best. The pseudo code of CLBS is as follows:

CLBS ( )

Input: *m*, *n*, $\mathcal{WL}_t$,$\mathcal{CC}_j$

Output: Schedule, *Ms and* U_g

Begin

1. Generate random $\mathcal{WL}_t$
2. Determine optimization strategy as per eq. (7)
3. Compute *ETC* matrices and $\bar{E}$ as per eq. (2) and (3)
4. Sort *ETC* in ascending order
5. ***while*(*T* != ∅)**
6. ***for*** $\forall T_i \in T$
7. ***For*** $\forall V_j \in K$
8. Compute CT_{ij} as per eq. (4)
9. ***end for***
10. ***end for***
11. ***end while***
12. Assign the task to machine $V_j$that offers least completion time
13. Repeat steps 6 -10 until the set of tasks becomes empty
14. Compute *Ms* and U_g as per eq. (5) and (6)

5. SIMULATION RESULTS

By observing the allocation of the independent BoT in IaaS cloud-cum-fog computing for varied input parameters, simulation results were used to evaluate the proposed study. On an Intel CORE i5 processor with 8 GB RAM, simulations were done using MATLAB 2015. For modelling of heterogeneous VM environments with processing capacity within a specific range, the parameters related to cloud-cum-fog computing were taken into account. IndependentBoT is randomly generated having a specified range of tasks m = 100-5000, n = 8-64, CC_j = 10-30 (MIPS), RT_j = 20-1000ms, and WL_i = 1000-10000 (MIs).

The experimental results are evaluated by using independent BoT varying in VMs and number of tasks using ITSLB(Min-Max), ITSLB(Max-Max), LBSM(STS), LBSM(LSTS) and OLB algorithms. The purpose of the experimental study was to compare the performance of the techniques using performance indicators like makespanand average resource utilization. Experiments are carried out by: (1) Observing *Ms* and of the BoT on VMs while keeping the number of VMs same but varying the BoT size and (2) Observing the *Ms* and of the BoT on VMs while keeping the size of BoT same but varying the number of the VMs.

5.1. Varying BoT

In this section, considered parameters makespan and resource utilization is observed while keeping the number of VMs same and varyingBoT's size on VMs.The input parameters for these experiments are number of VMs, $n = 16$ and m =100-5000

- Fig. 2 clearly shows that when number of task increases, makespan also increases. It is also evident that proposed CLBS outperforms other algorithms, considering the makespan. CLBS has least makespan and OLB has most. LBSM(LSTS), LBSM(STS), ITSLB(Min-Max) and ITSLB(Max-Max) has almost equal makespan. The performance gain of CLBS is 24% (approx.).
- Fig.3 depicts that CLBS has best resource utilization than peer algorithms and OLB has worst, while LBSM(LSTS), LBSM(STS), ITSLB(Min-Max) and ITSLB(Max-Max) has almost similar utilization. The performance gain of CLBS is 15% (approx.) over existing work.

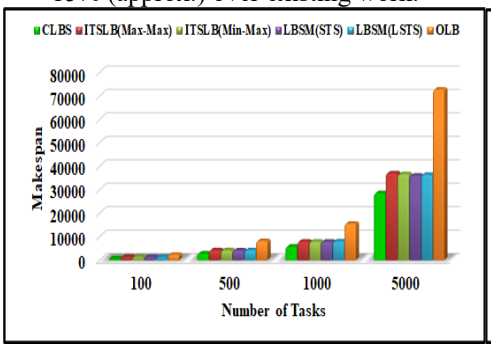

Fig. 2. Number of tasks vs. makespan

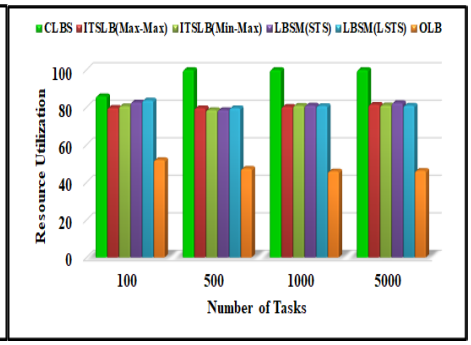

Fig. 3. Number of tasks vs. resource utilization

5.2. Varying VMs

In this section, considered parameters, makespan and resource utilization for the BoT are observed on VMs by varying number of VMs and keeping size of BoT same. The input parameters for these experiments are number of VMs, n = 8- 64 and$m$ = 5000.

- From fig. 4, it can clearly be seen that makespan reduces as the number of VMs (n) increases from 8 to 64. It is also observed that CLBS has minimum makespan and OLB has maximum, while LBSM(LSTS), LBSM(STS), ITSLB(Min-Max) and ITSLB(Max-Max) gives almost equal makespan in every single case. The performance gain of CLBS is 22% (approx.) over existing work.
- From fig. 5, it can be determined that CLBS has best resource utilization while OLB has worstfor every case of VM. Peer algorithms like LBSM(LSTS), LBSM(STS), ITSLB(Min-Max) and ITSLB(Max-Max) gives almost similar results.The performance gain of CLBS is 18% (approx.).

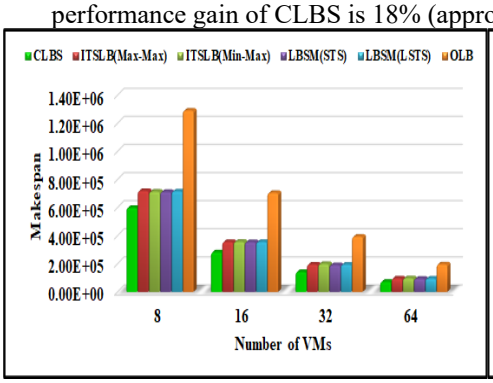

Fig. 4. Number of VMs vs. makespan

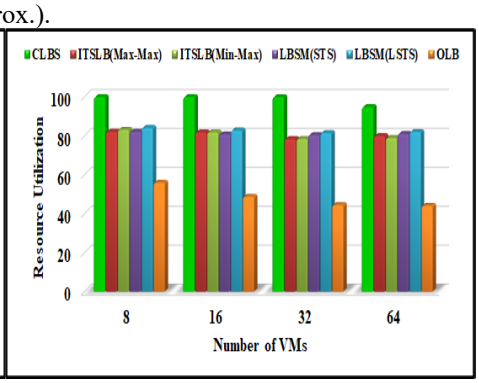

Fig. 5. Number of VMs vs. resource utilization

6. CONCLUSION

In this paper, a Context Aware Load Balancing Strategy (CLBS) isproposed to optimize the makespan and resource utilization in cloud-cum-fog environment. The CLBS is an intelligent scheduler like adaptive in nature which selects the optimization strategy using fuzzy rule-based technique. The experimental results showedthat CLBS outperformed ITSLB, LBSM and OLB strategies in terms of makespan and resource utilization.

7. FUTURE WORK

Performance of CLBS can be enhanced by taking more Quality of Serviceparameters under consideration and improving them. Strategies focused on improving multiple metrics at once can be developed to improve overall load balancing in cloud and fog computing.

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Biographies

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A Hybrid Framework using Hierarchical Analysis for Classification of Mental Health Information

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Abstract.

Social media has become one of the most important platforms to share the experiences of users. Reddit, A famous social networking site has facilities to express mental health problems. It can assist with medical decisions, public health policies, and improving health care. In a recent study, using Hierarchical approach mental health Reddit posts were evaluated and grouped into 11 disorder themes with Attention mechanisms in a recurrent neural network[24]. However, some posts were misclassified as existing approaches did not give importance to sequential characteristics of the text. In this paper, proposed a hybrid framework of hierarchical attention neural network to accurately classify the posts and to maintain the positional information in the sequence using attention mechanisms such as Multi head with global attention, Directional Self-attention. The results of the proposed system is evaluated using the PubMed medical abstracts and Reddit posts. The comparative analysis is done against other neural networks with Attention mechanism and each approach is evaluated using F- Measure.

Keywords. Hierarchical Attention network (HAN), Multi-head attention, Directional Self Attention, mentalhealth,hierarchicalapproach

1. INTRODUCTION

Text in the form of unstructured data is present everywhere like email, reviews, etc. But extracting the information from it is difficult due to its unstructured nature. The knowledge extracted from that large amount of data is useful for many applications and text classification helps to achieve that by classifying the problems into its predefined categories. It is one of the most significant jobs in Natural Language Processing (NLP), with applications in sentiment analysis, subject labelling, spam detection, and many other areas. Machine learning-based text classification learns to make classification decisions based on previous observations. The algorithm used the labelled dataset to train and based on that it will predict the label for particular unseen input.

Recent research in deep learning and machine learning provide solutions for a large dataset of health information. The approach not only used the data available from the medical organization such as Electronic Health Records (EHR) but also used the patient-generated text available on social media sites such as Twitter, Reddit, etc[17][18]. Mostly patient reports for health problem identification or drug suggestion and any user-generated reviews are used to classify in the healthcare field so it will be in document format. To classify the long sequence of text, existing approach lack accuracy and efficiency as it will not consider the overall characteristics of the sequence.

In this paper, how to categorize mental health-related reddit posts as well as medical abstracts is discussed. For a short sequence of text, a convolutional neural network and a recurrent neural network already exhibited good performance [16]. Moreover, to capture the long sequence of text Long Short Term Memory (LSTM) and Hierarchical approach used with attention mechanisms as attention helps to get the important words related to the sentence [9]. This approach works well for many sentences/document, but some misclassification occurs and computation speed is decreased. Also, the word order in the sentence is important to find the correct classification so positional information is added into this hierarchical network and parallel computation also utilized to improve the performance.

We apply a hierarchical attention network with two types of attention:

- Multi-head global attention to enhance computation performance by incorporating multiple heads.
- Directional Self Attention to capture positional information.

2. RELATED WORK

In this section, most of the traditional approach used for multiclass text classification in healthcare and other, as well as new research in hierarchical attention networks and their disadvantages, are described in this section.

2.1 The Traditional approach for multiclass text classification

The majority of previous text categorization research used a variety of machine learning classifiers, including logistic regression, Support Vector Machines (SVM) (Cortex and Vapnik, 1995), Nave Bayes, and Random Forest,Rule-based and many other approaches with different typesof features (eg: bag of words, TF-IDF, Topicmodeling (LDA) (Resnik et.al, 2015; Rumshinsky et.al).However, the accuracy in predicting the predefined categories isnot efficient. For the small dataset, thetraditional approach works well. As the size of the datasetincreases, then it will not be able to work well and alsoconsume more time while executing thealgorithm.

2.2 By applying Deep Learning Techniques

Convolutional neural network (CNN)generally used for computer vision (images), however, theyhave recently been applied to various NLP tasks (YoonKim, 2014)[21]in themedical domain. Recurrent neural network for shorttext developed to maintain the order of the describedevents for some time step. But the drawbacks in RNN is thatitcannot have the memory to storelong-

range dependencies in the text as sequential characteristicsof text is important in predicting the classfor document/sentence classification and it also hasa vanishing gradient or exploding gradient problem.Long Short Time Memory (LSTM) networks [1] are a type of RNN extension that allows the RNN to retain its inputs for a longer length of time while using more memory. Gated Recurrent Units (GRU)[2] overcome the memory inefficiency problem in LSTM as well as the vanishing gradient problem to reach state-of-the-art performance in deep learning applications such as speech recognition, speech synthesis, natural language understanding, and so on. These above techniques can use the one hot encoder to get theinteger representation and feed into any of the above neural networks or any types of embeddingtechniques (Word2vec[3], Glove[4], fasttext[5], Universal sentenceencoder[6], Elmo[7] and ULMfit[8]) can be incorporated intoit.Furthermore, the attention mechanism [22] developed forthe above architecture to interpret the relevantinformation based on the context and this attention layer used on top of the neural network layers (CNN, LSTM, GRU,etc.)

2.3 By applying the Hierarchical approach

Initially, attention mechanism developed for machine translation then it is also used for image caption generation to focus only in the relevant region of the image (Xu et.al, 2015). In NLP, it is incorporated with RNN/CNN based architectures in text classification [22] to predict words which contribute more importance to the sentence. The approach done in a sequentialmanner for document classification consumes moretimeand accuracy in predicting the classes tendstodecrease significantly. Hierarchical approach captures the accurate information because of thehierarchical structure from word level to sentenceleveland then to document[9] shownin Figure 1. The attention mechanism is added on topof the word level and sentence level to focus only onthe relevant information. So thehierarchical classification methods not only increaseaccuracy but also increase greater understanding ofthe document from word and sentencelevel. Hierarchical network used for food recommendations [20] to find the similar users tend to eat and learning user preferences in various recipes. Multi head Attention mechanism with residual gated recurrent unit [19] to capture contextual information within long range and positional embedding is added to know the sequence of text. Bullying detection using hierarchical network [10] to find the representation of comments in instagram.

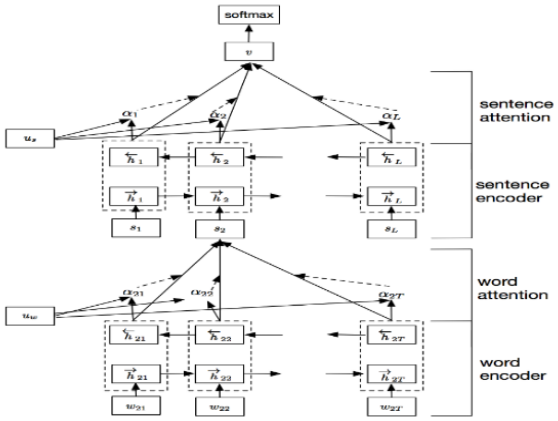

Figure 1. Hierarchical Attention Network [9]

3. PROPOSED METHODOLOGY

Apply the base diagram [1] the proposed changes are done asindicated in Figure 2. The dataset is preprocessed and convertedtointeger representation, then the hierarchicalnetwork approach is used along withattention mechanisms. The classification is done to getthe predefined categories. Each module inthe diagram is explained below.

3.1 Preprocessing

Dataset from different sources oruser-written text is not in standard format to process that text. To improve the data quality, the dataset needstobe preprocessed. So, the first thing to do is to remove the special characters and convert tolowercase letters. The algorithm should learn thestructure of the text as the machine cannot understand words. So, it is represented in numerical form. This can be done by using the kerastokenizer function. The function splitsthe sentence into words and keeps themost occurring words in the text corpus. Then the tokenizer also keeps an index of words whichcanbe accessed by the tokenizer. word_index to specify the maximum number of words. Themaxlen parameter should be specified so that eachsentence will be of the samelength.

3.2 Embedding

To represent each word with its similar context, embedding should be performed for the input sentence. In this approach, we have used Glove and fastText Pre-trained vectors. Glove embedding learns by creating a co-occurrence matrix (words X context) that counts the number of times a word appears in a context. It is trained on the Wikipedia corpus with a dimension of 300 and length of this dictionary is around billion, fastText[11] is an extension of word2vec model. It represents each word in input sentence as n-gram of characters. Pre-trained word vectors are generated by training with 2 million word vectors from common crawl. We match these two pre-trained word vectors with input sentence and extracted only the embedding of words that are in our word index and created an embedding matrix. We have compared the performance of two vectors in this approach.

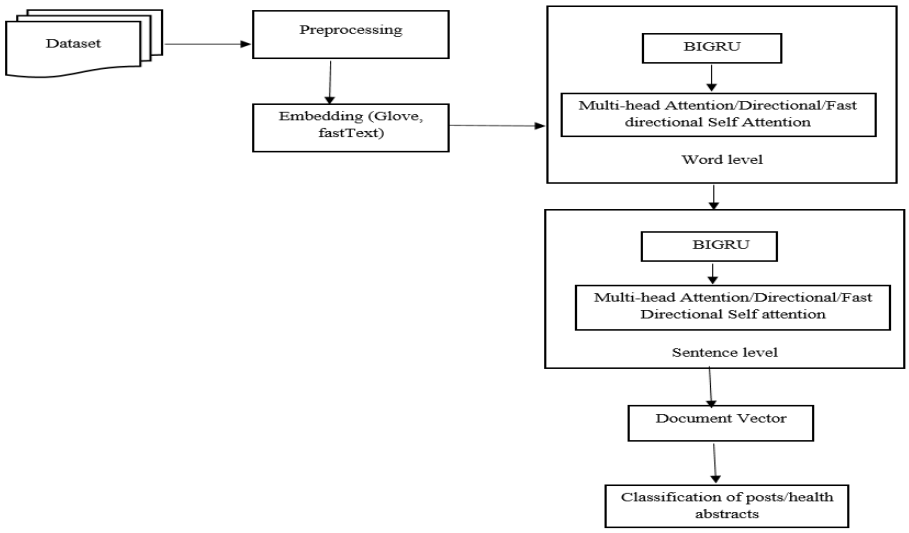

Figure 2. System design for the proposed method

3.3 Word Encoder

3.3.1 Bidirectional Gated Recurrent Unit (BI GRU)

In this step, the output obtained from the previous module is passedi.e) embedding word vectors in the embedding matrix.Then, to gather both forward and backward information, we employed bidirectional Gated Recurrent Units (BIGRU) and attention processes, as well as a gating mechanism to recall the sequences. Reset gate rt and update gate ztdetermine the data that should be transmitted to the output referred from [9].

3.3.2 Attention Mechanisms

The attention mechanism is important to focus only on the relevant information in the sentence. The information from the preceding layer (BIGRU) is transmitted to word-level attention mechanisms including multi-head and directional self-attention and combine the representations of those words to get a sentence vector. The traditional attention mechanism used cannot exploit the positional information of the input sentence. (Ex: I like dogs more than cats and I like cats more than dogs, here both looks similar but here the sentence compares two different entities). To solve this problem proposed attention mechanism used instead of traditional attention mechanisms.

3.3.2.1 Multi-head Attention

The multi-head attention [12] method repeats the standard attention process many times in parallel to increase the computation speed. It then separated into several heads, each of which executes parallel computations. Each head's attention outputs are simply added together and linearly translated into the required dimensions. It enables the overall context of the sentence to be derived from information from several representations at various points.

3.3.2.2 Directional Self Attention

Directional Self-attention[13], the input sentence is transformed into hidden state and then the multidimensional token2token [13] self-attention is used to compute the dependence between x_i and x_j for all elements in the input sentence to handle the diversity of contexts surrounding the same word.Then, positional masks is employed to attention distribution in both directions, i.e. forward mask and backward mask, to encode earlier structural knowledge, such as temporal order and dependency parsing. Thisdesign overcomes the disadvantage in traditional attention mechanism by modeling order information and takes full advantage ofparallel computing. Thearchitecture of Directional self- attention have a fewer parameters,less computation and easier parallelization.

3.4 Sentence Encoder

The sentence vector obtained from theword encoder is given as an input. We canget the document vector in a similar way by applying the attention that was applied in the wordencoder toobtaintherelevantinformationinsentence level. The sentence level attention in HAN is calculated by[9],

$$u_i = \tanh(W_s h_i + b_s) \quad (1)$$

$$\alpha_i = \frac{\exp(u_i^T u_s)}{\sum_i \exp(u_i^T u_s)} \quad (2)$$

$$v = \sum_i \alpha_i h_i \quad (3)$$

Where U_s is the context vector obtained by (1) and overall sentence level attention $\alpha_i$obtained by (2) and v the document vector, which encapsulates all of the data from sentence to document.

3.5 Classification

The output from the sentence encoder v, ie) the document vector with a representation of the document can be used as a feature to the softmax classifier to get theprobability and normalize the value to get the classification labelfor thedocument

4. Experiments

4.1. Dataset

We have used two datasets: 1) Socialmedia Reddit posts, 2) Pubmed medical abstracts. Theuser posted their problem or suggestion in reddit undera particular subreddit. i.e topic-specificcommunity within the platform. Total file of posts around24GB JSON data is publicly available. We havedownloaded the data and then extract only the health-relatedposts that are relevant to the 10 categories mentioned in Table 1. After retrieving,the dataset consists of 96147 posts. Then another datasetof PubMed medical abstracts is downloaded[2]. Itconsists of 210176 medical abstracts with attributes, labeland text.

Table 1. Number of rows in each subreddit

Total Categories:10	
Subreddit	**No ofrows**
Anxiety	11304
BPD	2970
Addiction	341
Autism	1573
Bipolar	9622
cripplingalcoholi	11758
Depression	25909
Opiates	28154
Schizophrenia	1919
Selfharm	1414

4.2 Training the model

The dataset is preprocessed and convertedinto integer representation and it is passed as an input intothe word encoder and then the sentence vector passed tothe sentence encoder and it outputs the document vectorand the classification is done using softmax classifier.We have used keras toolkit for the implementation.The hierarchical attention network architecture [9] is implemented. The dataset is split into two parts: 80 percent training and 20 percent testing. The input vocabulary was set to 30k, the maximum sentence length was set to 15, and the maximum number of words in a sentence was set to 100. The glove pre-trained vectors were used to construct the embedding matrix with a dimension of 100 and were trained using our data set (40000-word vectors with 100 dimensions). We train the model for 15 epochsand utilised early stopping to establish the halting condition for the iteration (epoch). Usually, loss tends todecrease after each epoch and accuracy get an increase. When val_loss tends to rise in some epochs and stays in the same condition for a long period of time, the training will come to an end. By using this we can find the correct number of epochs to train the model.We used Adam optimizer because it works best comparedtoother optimizers. We have used categorical cross entropy to output the probability for multipleclass.

5. RESULT AND ANALYSIS

We implemented the hierarchicalattention network with the attention mechanism such asmulti-head attention and directionalself-attention.Theevaluationisdoneforbothredditpostsand PubMed medicalabstractsandcompares theresultswiththe traditionalneuralnetworkapproach. Theresultsarepresentedin Table2 and Table 3.Theexperimental resultsforredditdataset with Glove word vectorsshows thatmulti-headwithGRU/LSTMlayerachieves 0.68Precision (PR)morethantheexistingHANapproach becauseofmultipleheadsincorporated into the hierarchicalstructurei.e)each headperforms computation inparallel.ButwithoutusingtheGRU/ LSTMlayer inthehierarchicalstructureyieldsless performance becausethefeaturesarenotcaptured effectively.Whileapplyingdirectionalself-attentionto thehierarchical structure,itachievescomparable performancewith existingapproachesbecauseof maintainingtheorder informationinthesentence..TheresultforPubMed datasetachieves0.83 precision inmulti-headattention andwhileapplying directionalself-attention tothisdatasetachieves0.82 precisionanditperformsfastercomputation thanthe multi-headattention.Misclassificationofthepostcan occurbecausesomepostmayfallundertwocategories, butinourapproach,itisreducedbetweenthecategories Another Word embedding used for the same attention mechanism i.e) fastText word vectors. The fastText embedding with simple BIGRU layer produced 0.60 precision for reddit dataset and 0.77 precision for pubmed medical abstracts. Multi-head with GRU/LSTM layer achieved 0.79 precision for pubmed abstracts higher than Reddit dataset. fastText word vectors with directional self- attention achieved 0.58 precision for both datasets. Comparing both word vectors Glove with different attention mechanism achieved higher performance for both datasets.

Approach	**Precision**	**Recall**	**F1-Score**	**Accuracy**
Convolutional Neural Network	0.82	0.82	0.82	0.82
Recurrent Neural Network	0.84	0.84	0.84	0.84
Hierarchical Attention Network with GRU	0.8	0.8	0.8	0.8
Hierarchical Attention Network with LSTM	0.81	0.82	0.82	0.81

Table 2. Result of Reddit Dataset

Approach	**Precision**	**Recall**	**F1-Score**	**Accuracy**
Convolutional Neural Network	0.55	0.53	0.52	0.53
Recurrent Neural Network	0.61	0.6	0.58	0.6
Hierarchical Attention Network with GRU	0.61	0.61	0.59	0.58
Hierarchical Attention Network with LSTM	0.61	0.61	0.59	0.58
Multi-head Attention in HAN with GRU /LSTM	0.68	0.64	0.64	0.64
Multi-head Attention in HAN without GRU /LSTM	0.59	0.59`	0.58	0.58
Directional self-attention Network with RNN	0.6	0.6	0.6	0.6
Directional self-attention Network with HAN (GRU)	0.6	0.6	0.6	0.6
Directional self-attention Network with HAN (LSTM)	0.6	0,6	0.59	0.58

.**Table 3.** Result of Pubmed Dataset

Multi-head Attention in HAN with GRU /LSTM	0.83	0.82	0.83	0.83
Multi-head Attention in HAN without GRU /LSTM	0.8	0.8	0.8	0.8
Directional self-attention Network with RNN	0.83	0.83	0.83	0.83
Directional self-attention Network in HAN with GRU/LSTM	0.82	0,82	0.82	0.82

6. CONCLUSION

Textcategorization isanimportanttaskinNatural LanguageProcessing (NLP)since it allows to classifytheproblems basedonthepredefinedcategories. The most difficult aspect of multiclass text classification is properly predicting the categories and having positional information in the sentence.Theattentionmechanism isincorporatedtofocusonlyontherelevantwords withinthewordleveltobepassedtothesentence level andpredict thecategories. Togetthe positionalinformation andtoimprove the computationefficiencymulti-headwith global attention anddirectional/fast directionalself- attention isimplementedwiththehierarchical approach. Theproposedapproachachieves comparative performancewith theexisting approach. In future, directional attention mechanism performance needs to be improved for reddit dataset. Fastdirectionalself-attention and otherdifferenttypesofattentionmechanismcan beusedalongwiththehierarchicalstructure and compared with the existing approaches.To reduce dependability on the balance of training data, background knowledge extracted from external corpus can be used in hierarchical attention network

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SEWAGE BLOCK DETECTION SYSTEM

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ABSTRACT

The main objective of this project is to safeguard the front line workers from the dreadful toxic gas emitting from the sewage by alerting them that the toxic gas present in it through SMS alert. Additionally in our project the sewage block is also detected with the help of ultrasonic sensors and report is automatically sent to the corporation office where the sewage block has been occurred through the SMS alert. In the SMS alert message the unique URL is sent stating that where the sewage block has been occurred in the Google Map. By pin pointing the sewage block location in google map we can easily determine the location of sewage blockage and send the rescue team for sewage block removal easily.

I. INTRODUCTION TO SEWAGE BLOCK DETECTION

Sewage is nothing by the wastes from the industries, residential area and other buildings in the form of grey water. Sewage consists of solid and liquid wastes that travel from one area to another through sewage tunnels. Mostly sewage tunnels are dig underground and buried inside the earth crust and hence the wastes from the buildings are sent through the sewage tunnels through inclined pipelines. Mostly the sewage blocks are occurred due to solid wastes and hence once the blocks occur in sewage, there exists the overflow of sewage through manholes which has to be noted manually and to rescue the sewage blocks one by one. The above mentioned process of finding the sewage blocks manually and rectifying it is a time consuming process and this will spill the sewage all over and hence there exists the high risk of disease spreading due to contamination.

II. EXISTING SYSTEM

In the existing system, the sewage blocks are determined manually and hence it is the time consuming process and within the block identification and rectification process, the sewage spills all over the man hole areas and hence there exists the high risk of disease spread due to contamination.

III. PROPOSED SYSTEM

In the proposed system the sewage blocks are determined automatically and the alert message is sent to the corporation office regarding the sewage blockage through SMS. Also in the automatic message the sewage block location is sent through Google map encoded unique URL. By clicking the URL the corporation office front line workers can easily find out the sewage blockage location and reach the exact destination easily through Google map guidance. Additionally, in our project we have also included the facility of determining the toxic gas present in the sewage and report the frontline workers. By this system of approach will save guard the frontline workers valuable life from toxic gas by enabling them to approach the sewage blockage with prevention equipments.

IV. BLOCK DIAGRAM

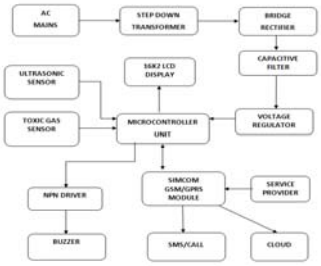

Figure 1: Block Diagram

The above figure represents the systematic block diagram of this project “SEWAGE BLOCK DETECTION SYTEM”. As shown in the block diagram, AC mains are described in order to fetch the power from the AC main source and which is further step downed by the step down transformer in order to get the low voltage AC signal from the high voltage Ac signal. Thus obtained AC signal is processed through bridge rectifier in order to extract the DC voltage which is required to operate the microcontroller. Thus the obtained DC source is an unregulated and rippled DC power source, the capacitive filter and voltage regulator like 7805 are used to obtain regulated DC power source for the microcontroller operation.

As shown in the block diagram, the microcontroller unit forms the brain of all the operation and the microcontroller used here is Atmega328 under the Arduino Platform. The Arduino UNO can be programmed with the help of Arduino IDE using Embedded C program. And hence the overall operation of the Arduino Microcontroller unit is programmed and embedded in the microcontroller unit for its operation.

The 16x2 LCD display is used in our project in order to display over all functionality of the project and the status of the project step by step. This kind of LCD displays are the alphanumeric display which is capable of displaying 32 character at the same time. Each row can be able to display 16 characters and it has 2 rows and hence it is named as 16x2 LCD display.

The ultrasonic sensors are used in our project in order to detect the sewage levels in the tunnels. The ultrasonic sensors mainly works based on the ultrasonic sound waves. It has one ultrasonic transmitter and one ultrasonic receiver and hence the ultrasonic transmitter transmits the ultrasonic waves to the sewage level and the ultrasonic wave that gets reflected from the sewage is captured by the ultrasonic receiver section. By calculating the transmitting and receiving time of ultrasonic waves we can easily calculate the sewage distance from the top of the sewage level.

The MQ02 gas sensor module is used in our project in order to sense the presence of toxic gas in the sewage. The MQ02 sensor will return the digital output to the microcontroller unit when there exists the toxic in the sewage.

The SIMCOM GSM modem used in our project to send the triggered SMS alert when the sewage gets filled or when the sewage block occurs. The GSM modem will send the SMS to the predefined number with the help of AT commands from the microcontroller unit through serial pins.

V. DESIGN METHODOLOGY

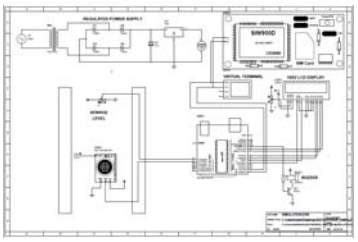

Figure 2: Circuit Diagram

The above design describes the entire circuit diagram of this project “SEWAGE BLOCK DETECTION SYSTEM”

VI. SIMULATION RESULTS

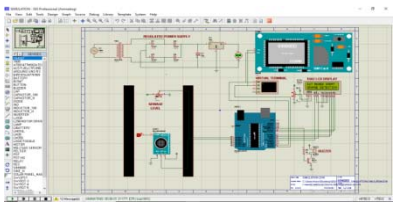

Figure 3: Overall Simulation Result

The above figure represents the overall simulation result of our project which is displaying the project name in the 16x2 LCD Display

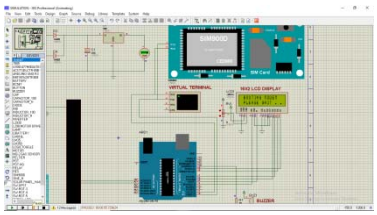

Figure 4: Booting up Modem

The above figure represents the booting of SIMCOM GSM modem in order to establish the network connectivity with the service provider inserted in the SIM slot.

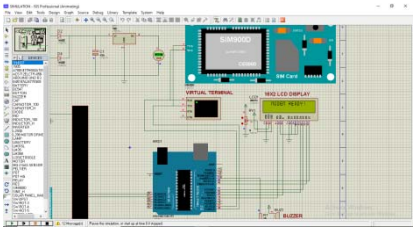

Figure 5: Modem Ready

Once the system connected with the network the SIMCOM GSM modem achieves the tower signal from the substation and hence the acknowledgement signal is displayed in the 16X2 LCD display.

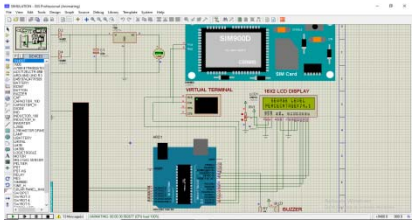

Figure 6: Sewage Level

The above figure represents the sewage level in terms of percentage in 16x2 LCD display.

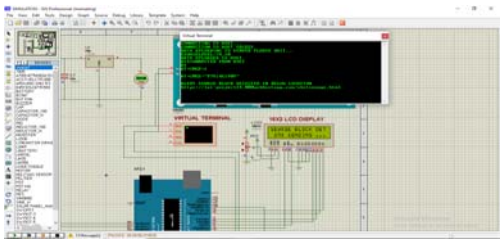

Figure 8: Sewage Block SMS sending

In the above figure the SMS sending is displayed in the 16x2 LCD display when there exists the sewage blockage. In the SMS, the URL is sent in order to make the frontline workers to reach the correct destination where the sewage block has been occurred imeediately.

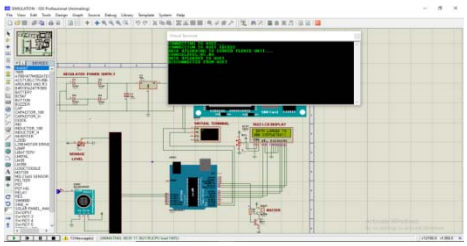

Figure 8: Data logging to web server

The above figure represents the continuous data logging to webserver regarding the sewage level through TCP/IP protocol..

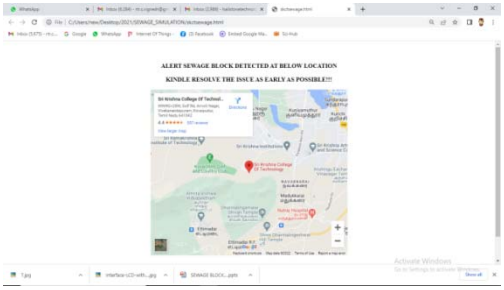

Figure 8: Sewage Blockage displaying in Google map

The above figure represents the sewage blockage in the website through googlemap link. This google map link is sent to the front line workers in order to reach the destination immediately.

VII. CONCLUSION

Thus by implementing this project we can easily rectify the sewage blockage by identifying the sewage blockage automatically and sending the triggered SMS alert to the desired persons. Additionally the valuable life of front line workers is guarded from toxic gas present in the sewage by alerting them earlier regarding the presence of toxic gas in the sewage block.

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ANALYZING MENTAL HEALTH BETWEEN VARIOUS PROFESSIONS USING MACHINE LEARNING AND NLP MODEL

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Abstract

A mental illness is a mental health condition that come to possession in the way of thinking, relating to others, and day-to-day routine. Abundance of mental illnesses have been identified and elucidated. Society, work pressure, family, and other factors may all play a vital role in why a person is in a particular circumstance. The main concept of this research is to forecast such illnesses by determining what the person is going through mentally by collecting data containing questionnaires through survey by focusing mainly two professions such as IT jobs and Teaching (Professors). Target groups used for this process are HOD, Associate professor, Assistant Professor, Professor, HR, Manager, TL, AE. Many individuals who are working in IT are affecting mentally due to stress and some other factors. Nowadays, the teaching profession is also become one of the toughest fields to handle, which involves both physical and mental efforts in dealing with work and students. So, using Logistic Regression, Decision Tree, K- Nearest Neighbor, Random Forest, and Natural language processing algorithms for creating ensemble models and further comparing the models. Gathered data from professors to get accurate statistics. The highest accuracy that obtained is 83% from decision Tree by processing IT professionals and 96% from Decision Tree for real-time data by processing teaching professionals.

Keywords. Mental Health, Machine Learning, Natural Language Process, IT Employees, Professors, Real-Time data.

1. INTRODUCTION

In this human era, the impact of mental health plays a major role in today's lifestyle. A poor state of mental health leads to various side effects which destroys the entire life of a common individual.[6] Many factors are involved in affecting one's mental health like work environment, family, society, overthinking, traumas etc. Now-a-days people are stressed out in the work place due to peer pressure, work load, lack of confidence. Occupational ill health, poor productivity, and human mistake are all linked to work-related stress. This translates to more sick days, high staff turnover, and poor organizational effectiveness, as well as an increase in accidents owing to human error. Workplace stress can cause heart disease, back pain, headaches, gastrointestinal disorders, or a variety of minor ailments, as well as psychological impacts including anxiety and despair, lack of attention, and poor decision-making. [4] This project is main focus on analysing the impact of mental health issues for working individuals. People in every profession[1] will experience a stress/anxiety in certain point.

Here for the analysis [2] two set of people who is working in two different streams which is IT profession and teaching profession are considered. Currently these two fields are becoming more demand and the growth of technology as made it more competitive. So, there may be a high chance for people to be affected by stress and unstable mental health.

Currently people are more affected in balancing both physical and mental health because of making things smooth in personal and work life. Monitoring and maintaining the mental health help a person to lead a happy life. [7] Thus, an analysis for mental condition of the working people is made by implementing Random Forest, Decision Tree, KNN and logical regression in machine learning and NLP and predicted the accuracy. Also made an visualization for easy understanding between the attributes which has more impact on the analysis.

1.1. Literature Survey

This [5]research paper has examined the state of mental health in a target group using Decision Trees, SVM, Naive Bayes Classifier, Logistic Regression, and KNN Classifier. [3] A support vector machine and Naive-Bayes classifier is implemented in the study. This paper aims to use natural language processing on Twitter feeds to do depressive emotion analysis. The key contribution is the creation of an experimental paradigm for successfully creating stress at numerous levels, as well as a framework for identifying stress at various levels using EEG data analysis. The [11] employed algorithms are Decision Trees (DT), K-NN, Nave Bayes (NB), Random Forest Trees (RFT), and Support Vector Machines in the study (SVM). The Depression, Anxiety, and Stress Scale questionnaire was used to collect data from working and unemployed people from many cultures and communities [15]. The main goal of this systematic review was to summarise and characterise these strategies in methodological and technical terms, as well as to examine the potential utility in mental health clinical practise. The employed Machine Learning, Depression, Anxiety, Support Vector Machines, Convolutional Neural Networks, Linear Regression, K Nearest Neighbor Classifiers, and Linear Discriminant Analysis in this study. The goal of [7] study is to present a system that uses machine learning algorithms to identify depression and anxiety disorders. To determine the best algorithm for detecting the severity of anxiety or depression, the performance metrics of each algorithm were evaluated. Support vector machines, decision trees, naive bayes classifier, K-nearest neighbor classifier, and logistic regression were employed in [12] study. The purpose of this study is to propose using Machine Learning algorithms to identify the condition of mental health in a target population such as high school kids, college students, and working professionals. Random Forest Classifier, Random Forest Regression, Naive Bayes, and K Neighbor Classifier were examined in [9]study. The purpose of this study is to find out which sources of stress are associated with stress-related symptoms in people by looking at age, monthly income, gender, occupation, children, city, prior employment, marital status, and current job satisfaction level.

2. METHODOLOGY

To compare and predict the mental health issues between the Tech people and the professors using different machine learning algorithms and Natural language processing. A real time dataset has been collected by taking survey from the professors in the respected institution and also from nearby colleges for teaching professionals. For IT professionals the dataset has been taken from Kaggle. In both the data has been collected by asking some questionnaires about the work environment, family history and mental condition. Here the target attribute is taken has treatment and predicted the accuracy.

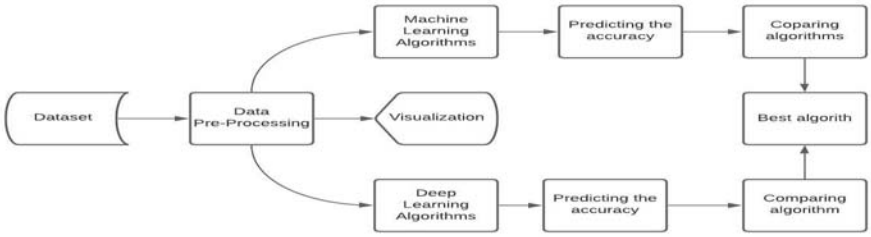


Fig.1.Process Flow Diagram

The above figure, 1 shows the process flow of the project. Initially the dataset is taken from the Kaggle and data pre-processing has been done by using python then after that implemented the Ml and Dl technique and obtained the accuracy. Finally graphical representation of the mental health data has been performed along with the performance analysis.

2.1. Data Pre-processing

For real-time data acquired from teaching professionals and data collected from individuals working in the IT area, data pre-processing is carried out using Python. It entails locating missing values and substituting mean values instead of it. Also, feature selection was used to suit the data. The data is then divided into train and test models for ease of algorithm implementation. The degree of variables in the dataset should be discovered and computed, as this information is useful for better data preparation to match the expectations of machine learning algorithms.

2.2. Implementation of Ml and NLP Algorithm for IT profession

Using the accuracy _score, Precision, Random Forest Regressor, linear Regressor, AUC Score, Cross-validated AUC from the sklearn package. Following the import of these libraries, chosen the appropriate features like family history, work culture, work balance etc., from the data to perform the algorithms and obtain accurate results. Improved the accuracy of the existing machine learning algorithm using logistic regression, from 79 % to 83.05 %, and implemented other algorithms such as Decision tree regression (83.05%), Random Forest (81.25%), and k Nearest Neighbor (81.25%). Among this the decision tree, which maps an observation item to its target value, is the most accurate. Leaves indicate categories, and branches reflect feature combinations that lead to those classifications in these tree topologies. The decision tree is straightforward to grasp and analyses, and data preparation is minimal. Otherwise, it is capable of reliably handling both numerical and categorical data. For the same Mental Health data, a deep learning Natural Language Processing (NLP) algorithm was used, with an accuracy of 85%. Finally, a performance analysis graph has been implemented by taking, the X-axis as the ML algorithms and Y-axis as the accuracy which has been predicted. This helps for better understanding.

Fig.2: Analysis of IT Employee and Professors

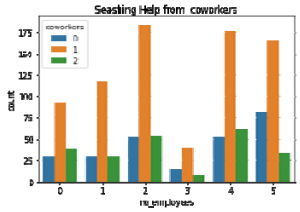
2.3. Implementing Ml Algorithm for Teaching Professors

Using the libraries accuracy score, mean squared error, Random Forest Regressor, svm, linear Regressor, and r2 score from the sklearn package. Following the import of these libraries, choose the appropriate features from the data to implement the algorithms for correct results here target variable(x) is Age, Gender, Family_history, Benefits, Care_options, Anonymity, Leave and work_interface then defendant variable(y) also called as output is feature_cols. Professors data was pre-processed in the same way, by finding mean values and substitute it with the missing values. After that, the data is separated into trained and tested categories. The machine learning methods were then implemented, and the accuracy was attained. Logistic regression (96 %), K-Nearest Neighbor (53.57 %), decision tree (96.42 %), and random forest are the ML algorithms that were implemented and predicted the accuracy (85.71 %) The decision tree has the highest accuracy here as well.

2.4. Experimental Analysis and Result

The accuracy analysis of IT employee and professor is demonstrated using the proposed method. Thus, acquired a high degree accuracy of 96% using real time data that is collected from the college by linear regression and other algorithms such as Decision tree, Random Forest, K- Nearest Neighbor, and Natural Language Processing for employees and attributes with age, gender, mental health issue at work, work experience, and role.

2.5. Data Visualization



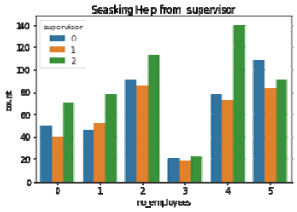
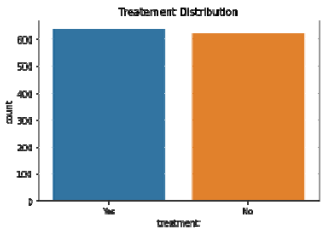


Fig.3: Seeking Help from Co-workers Fig.4:Seeking Help from Supervisor

From the above figure 3&4, the bar graph is implemented between the total number of counts and the number of employees for seeking help from co-workers and supervisor [8] Here the inputs are maybe, yes, no which are received from the IT professionals for seeking help from the co-workers for getting support for mental health issues. That is converted into 0, 1, and 2 for easy processing using python. Thus the output shows that the preference is YES by most of the people



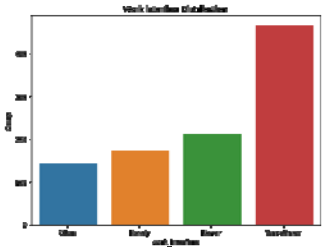


Fig.5: Treatment Distribution Fig.6: Work Interfere Distribution

From the above fig 5, shows the number of people who prefers to take treatment for mental health impacts like stress, depression, anxiety. The attributes here taken for x-axis is treatment and total count for y-axis. The result shows that highest percent preference is yes. This has made to understand that maximum number of people is affected mentally from the work.From figure 6, the x-index indicates the

work_interfere rate like often, rarely, never, sometimes and y-index indicates the total count. The graph shows that most of the IT people has answered sometimes for interfering mental health with the work life.

3. CONCLUSION

As depression, stress, anxiety which all comes under the mental health issues are recognized as a severe burden on healthcare systems all around the world. The key challenge is predicting whether or not someone has a mental illness. With one-on-one physical encounters, psychologists can examine and treat the patients**.** For IT employees and professors, the proposed idea is for analysing mental health conditions. K-Nearest Neighbor, Decision Tree, Random Forest, and Natural Language Processing were utilized to process those data. The most accurate method is Decision Tree, which had a 96 percent accuracy rate for IT professionals and 83 percent for Professors. And also did a graphical illustration of the stress prediction analysis for the two occupations. Machine learning and natural language processing methods may provide numerous viewpoints in research studies, but it should also be viewed as clinical practice support tools. Availability of more medical related data for mentally affected persons may help the future work with more accuracy rate. As a result, doubling the volume of treatment can lower one's stress levels.

4. FUTURE SCOPE

Mental health affects everyone in different ways, but haven't always been allowed to talk about it at work. Not just these two professionals are at the biggest risk of generating mental health problems. People of all ages are being influenced mentally in today's generation as a result of technological advancements and behaviour modification, whether they are aware of it or not. In the future, this will aid in the analysis and prediction of a more accurate cause for this illness by taking into account other attributes such as affected people's behaviour that differs from that of a healthy person, what measures people are taking to overcome this issue, how a mentally impacted person should be treated, and so on. Employers, for the most part, play an important role in supporting employees' mental health. This might take the shape of benefits, but it also means ensuring that staffs have the resources they need to complete their tasks and avoid burnout.

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Tracking And Monitoring System For Students In Elementary and Secondary Schools Using IoT

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Abstract.

Every school should provide a safe, dependable transportation service for pupils. It helps schools manage their bus fleet and reduce mistakes. This is when vehicle tracking kicks in. The proposed system offers real-time information regarding the vehicle's numerous properties, such as location, temperature, obstacle detection, alcohol detection, and so on. The device also allows parents is being notified when their children board or disembark from the bus. We use RFID and GPS technologies in this system, and we use a microcontroller to connect it to a remote server. GPS determines the vehicle's location. An RFID scanner reads each student's RFID tag as they board or leave the vehicle. ESP8266 uploads database data to a web server. Parents and school administrators may use a smartphone app to monitor their children. The software alerts the administration about crises.

Keywords. IoT Bus monitoring, Global Positioning system, Sensors, RFID

1. INTRODUCTION

Parents' concerns over their children's safety on the route to and from school have never gone away. Students regularly get on the incorrect busses and exit at the erroneous stations due to their lack of attention. Bus drivers may not always be able to identify all of the children, and they will not be aware of any missing students in a timely manner if they are unable to do so. The parents will not have a reliable means of determining whether or not their children are secure until the school bus returns in the evening. Number of schools using GPS bus monitoring system, this does not mean that these schools are able to ensure students' entire safety [1]. It is not uncommon for some of these gadgets to fail to provide data in a timely manner, while others are prohibitively pricey. A technique of monitoring that does not recognize particular pupils may potentially cause parents and guardians to become complacent [2]. Comprehensive monitoring technology for school buses that keeps tabs on their location, speed, number of people on board, adherence to routes and schedules, and any other data that is relevant to school transportation. Students are able to spend more time participating in activities thanks to the real-time bus monitoring system, rather than waiting for a bus that is running late, and the warning system assures that each student's individual safety. Furthermore, educational bodies such as the CBSE have begun to advocate for the use of school bus monitoring systems, making a cost-effective and dependable solution a must[3]. The microcontroller is used to receive the geographic coordinates from the GPS module and then transmit them to a database that is stored on a distant server via Wi-Fi. This allows the bus to be followed.

Parents, bus drivers, and school administrators may access this information using a smartphone application that shows the database's position on a map. Alerts are sent to caregivers when the RFID tag with their child's id is scanned by the reader. This triggers the arduino to run a client application, which then notifies the carregiver's phone through text message and push notification. Because of this, both the bus and the children who are travelling on it will be under constant surveillance during the voyage [4]. This system encompasses a moderate price school bus display that monitors a variety of variables, including the location, speed, number of students on board, adherence to the route and schedule, and other info that is required by the institution as well as the parents. The notification system aids in ensuring individual ward safety as well as reducing time wastage while students wait for delayed buses. This system uses real-time observation to enable students self-address their concerns. Furthermore, educational boards such as the CBSE have begun to advocate for the installation of university bus observation systems[5]. The GPS module searches for the bus's geographical coordinates, which are then transferred to a distant server via Wi-Fi. This data is then available by parents, bus drivers, and school administrators via a database that may be accessed via a mobile application. A system that equips each school bus with sensors that collect data on the bus's status and transmit it in real time to a server via the telecommunications infrastructure. This data on each bus is then examined, and reports are made for both the school and the Ministry of Education on a variety of topics such as the environment, time, and safety. The method of monitoring the condition of a school bus is known as a school bus monitoring system.

This paper focuses on the usage of an IoT-based system to monitor students on school buses. Parents and guardians will be able to keep an eye on their children at all times because to the invention's emphasis on providing a system that can be used at home or at work. The paper is organised as follows. Part II contains related works. Section III outlines the approach. Section IV presents the experimental data, and Section V wraps up.

2. RELATED WORKS

There are numerous bus monitoring systems are developed by researchers. The bus's location is tracked by the tracking technology and displayed on Google Maps. Those using uniform bar phones may access the site even without internet [6]. In [7], parents were advised to use SMS to follow their children in real time. A GPS module and RFID card are used to monitor the child's location and movements. The tracking of buses' position, speed, list of people on board, and route, together with continually altering this data in a chart using the Google Maps API, helps management, parents, and drivers monitor the school bus and the students on board. When students board or exit the bus, the system will recognize them and send notifications to their close relatives' phones with the event's time and location [8]. In [9], Prototype campus bus tracking system constructed and deployed for UiTM students utilising their smartphone application to locate and estimate the arrival time of the bus they have selected. The GPS-enabled mode of conveyance. By configuring the Arduino UNO to send commands to the Wi-Fi component for setup, connecting to the router, and obtaining an IP address, the tracing system remains operational. The Arduino begins the process of preparing GPS for the purpose of obtaining coordinates. Creating school bus monitoring system that can provide useful services using upcoming technologies such as the Internet of Things (Iota). In addition to tracking, an arrival prediction system is included. Parents may use an Android application to track the bus route and predict when the bus will arrive [10].

There are two primary bus tracking systems on the market now, both based on the existing technique. Geo-coordinates are returned in response to a query. Text messaging is used, which effectively spams the inbox. There is no real-time data available. WIFI-enabled Raspberry Pi systems. These are costly, while being efficient and real-time. Parents do not have consent to track pupils, and none of these have student identity in the database. No database is kept up to date. In this paper, the above mentioned drawbacks are taken into considerations.

3. PROPOSED METHOD

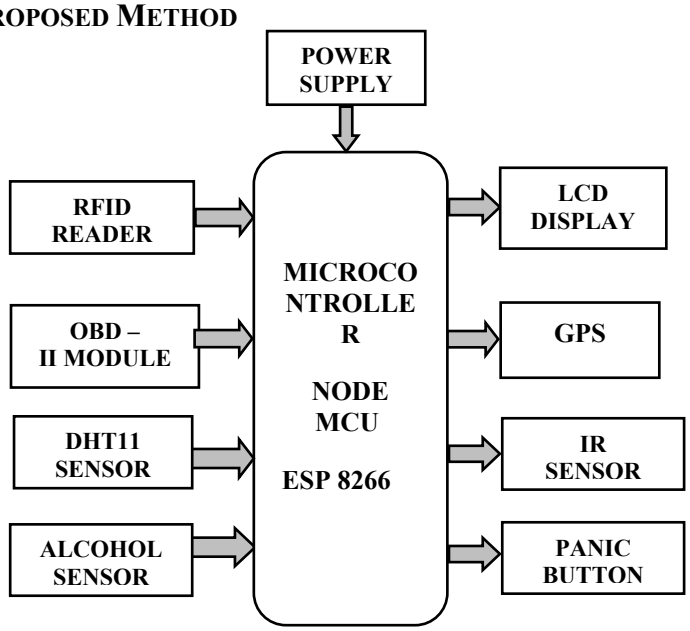

Figure 3.1. Proposed System

The block diagram of the proposed system is presented in Figure 3.1. Node MCU, RFID Reader, OBD II Module, DHT11 Sensor, Alcohol Sensor, Humidity Sensor, GPS, IR Sensor, LCD Display are all part of the proposed system. The temperature of the car is monitored using a DHT11 sensor. When this system detects excessive heat, it will alert the driver through an LCD display to come to a complete stop. The Alcohol Sensor detects whether or not the motorist is inebriated. Humidity sensor that measures the moisture content of the air within the school bus where it is installed. When an illegal person tries to open the vehicle door, the IR sensors sense it and alerts the school administration. The OBD-II module gathers data from the vehicle's network of sensors, which the system can utilize to manage auto systems or notify the driver to problems. RFID (Radio Frequency Identification Module) is a technology that allows pupils to be identified when the school bus door is opened. If there is an emergency on the school bus, the buzzer will go off, and the panic button will be hit. The main advantages of this systems are easy operation, simple and reliable design and more efficiency in real time monitoring.

3.1 Arduino Uno

Arduino UNO uses the Microchip ATmega328P CPU (Figure 3.2). The board's input and output (I/O) pins let it connect to shields and circuits. Programming the board's 14 digital and 6 analogue pins requires the Arduino IDE and a USB type B connection. This may be powered by USB or a 9-volt battery and handles 7 to 20 volts.There are ATMEGA328P microcontrollers used in this project. As input is received, it regulates the whole system and sends out output in accordance therewith.

Figure 3.2. Arduino Uno

3.2 RFID Reader

The RID reader is given in Figure 3.3. student's unique ID number is read from their ID card using an MFRC522 RFID reader. Each student's ID card has an RFID tag placed in it. As students enter and depart the car, an RFID reader detects their individual identification numbers.

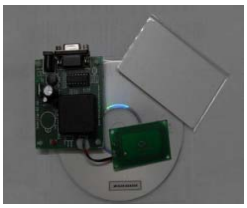

Figure 3.3.RFID Reader

3.3 Temperature Sensor – DHT-11

The DHT11 is shown in Figure 3.4. It is a low-cost, entry-level digital thermometer/humidity sensor combo. It uses a thermistor and a capacitive humidity sensor to gauge the temperature and humidity of the surrounding air, and then generates a digital signal pin. To use, it's a breeze, but timing is everything. This temperature sensor measures the vehicle's interior temperature. The system sounds a warning if the temperature rises over the usual threshold. In this project it is used to monitor the condition of th bus.

Figure 3.4. Temperature Sensor

3.4 Humidity Sensor

Humidity refers to the amount of water in the atmosphere. Numerous industrial production processes and human comfort are both affected by the quantity of water vapour present in the air.In industries, humidity measurement is crucial because it can effect the product's commercial cost as well as the workers' health and safety. As a result, humidity detection is critical, particularly in industrial control systems and human comfort. Humidity control and monitoring are critical in a variety of industrial and home applications. Relative Humidity, Dew/Frost Point, and Parts Per Million are the most regularly utilied humidity measuring measures (PPM). Humidity sensor (Figure 3.5) is used to detect the atmosphere humidity. It measures the moisture of air in surrounding inside school bus.

Figure 3.5. Humidity Sensor

3.5 Alcohol Sensor

The alcohol sensor is given in Figure 3.6. This module was built using the MQ3 Alcohol Gas Sensor. A $1 semiconductor sensor can detect alcohol gas concentrations from 0.05 to 10 mg/L. SnO2, the sensing material, has a lower conductivity in pure air than Sn. The higher the concentration of alcohol gases, the more conductivity they have. It's susceptible to alcohol yet resists smoke, vapour, and gasoline. Module outputs are digital and analogue. MQ3 alcohol sensors may be communicated with microcontrollers, Arduino boards, Raspberry Pi, and other devices. This avoids an accident by detecting whether the driver has been drinking.

Figure 3.6. Alcohol Sensor

3.6 OBD-II

Fiure 3.7. OBD-II

It is an automobile electronic system that enables repair workers to analyse and report on their cars using on-board diagnostics (OBD), and it is given in Figure 3.7.When it comes to the fuel monitor, engine temperature, emission requirements, and so on, this gadget is critical. The OBD-II module gathers data from the vehicle's network of sensors, which the system can utilize to manage auto systems or notify the driver to problems.

3.7 IR Sensor

An IR sensor is one among the most fundamental and extensively utilised sensor modules in an electrical device. It is given in Fiure 3.8. There are several real-time uses for this sensor that mimic a human's visionary senses, including identifying boundaries. This circuit consists of the following components: IR transmitter and receiver pair LM358 IC Two kilo ohm resistors are needed. The resistance of a circuit may be altered by using a variable resistor. LED (Light Emitting Dio (Light Emitting Diode). The school administration gets alerted when an unauthorised individual attempts to access the car door using the IR sensor.

Figure 3.8. IR Sensor

3.8 Panic Button

A panic alarm is an electrical device that alerts people or property to danger in an emergency. Usually, a panic alarm is activated by a secret button. These buttons may be linked to a monitoring centre or a local bell/siren. The alarm may call security, police, or emergency services.

3.9 NODEMCU

The WiFi equivalent of an ethernet module is the NodeMCU, it is given in Figure 3.9. It combines WiFi access point, station, and microcontroller functionality. These properties make NodeMCU a powerful WiFi networking tool. It may work as an access point, station, web server, and internet connection to download or upload data. ESP8266 uploads database data to web servers.

Figure 3.9. NODEMCU

4. EXPERIMENTAL RESULTS

In Figure 4.1, Node MCU acts as the master collects all data and sends to the database through WiFi provided by the school management.MQ3 senses the ethanol level of the driver and permit him to drive the vehicle. When bus is close to the Student's pickup location our system sends notification to the Parents. After scanning RFID concern student is noted as present, then allow to get inside the bus with alert from buzzer for driver.

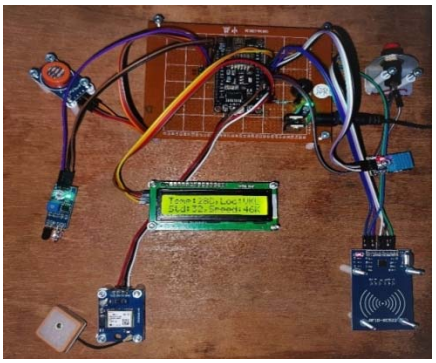

Figure 4.1. Hardware Kit

In the database, the whole voyage will be recorded. The temperature and humidity within the bus are monitored by a DHT11 Sensor, while security is provided by an IR Sensor. Speed, temperature, and brake failure may all be monitored via the OBD-II module. Using the Panic Switch in the event of an emergency alerts the school administration, parents, and the relevant government authorities with the mapping location.

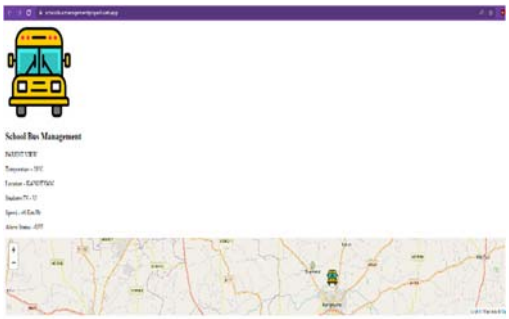

Figure 4.2.Simulated Output

Simulated Output is shown in Figure 4.2. As the result our project works well in all aspects. From the beginning of the Student's journey RFID identifies the students, GPS gives accurate Geo-location of the bus, DHT-11 gives humidity and temperature of the bus, IR ensures the safety, MQ-3 tests the alcohol level, OBD-II gives engine status. These data's are processed by Node MCU and Google Firebase acts as the database through MQTT protocol.

5. CONCLUSION

Improved safety for children on their way to and from school is the objective of this paper. Children who do not board or disembark the bus are flagged by the system's technology and parents are notified. The data will also be forwarded to management. It allows parents to monitor their children while also allowing school administration to maintain tabs on them. The Smart School Bus Management System for Live Location has been proposed and analyzed in this research. The main focus of the proposed study was on a Smart Security and Tracking System for Students. The simulation and prototype findings were thoroughly discussed. The proposed system could benefit both school administration and parents by allowing them to track students in real time using GPS and monitor them using RF and DTH11 sensors.

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Smart Online Voting System Using Facial Recognition Based On IoT and Image Processing

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Abstract.
All through the course of an election, the electoral commission faces a variety of difficulties. The electoral commission's most common problem is improper confirmation of the order of casting ballots, as well as duplicate or illegal voting. To improve the present voting system, a new and secure voting system is being designed in this paper. The suggested approach creates an automated voting mechanism that does not require human intervention. This system comprises a camera for photographing voters, and the photographs are saved in a database for analysis. On the database, data analysis will take place. All of the label pictures are trained using a convolutional neural network to anticipate the output by categorizing the photos in this technique. The vote will be counted immediately, making the voting process efficient, quick, and secure. As a result, the number of proxies used in the election or voting method can be reduced, allowing the correct candidates to be elected as rulers. Through IOT, all of the details were updated to email.

Keywords. Convolutional Neural Network, Feature Extraction, Voting System, IoT, Image recognition

1. INTRODUCTION

For a democratic nation, elections are the backbone. Elections are carried out from the ancient times, where the king is elected by the people in several ways like raising hands, taking a colored stick and so on. As the elections evolved, the loopholes also evolved in it, and also in the name of election the resources are being exploited. In the name of election the resources are being spend like water, For keeping the voter machine after voted needs a high level protection and it requires a lot of money, army people are being used to safeguard the voting machine. The loopholes like faking the count, making a fake vote using other voter id, and so on. These are all the problems which are being seen in the existing method, to overcome these problems we are proposing a new system.

Democracy is intended to allow people to vote freely, and every citizen of a democratic country has the right to vote. The democratic government is dependent on the election results. Over the last several decades, the voting system has seen numerous significant modifications, from traditional paper ballot voting to electronic voting, and now to internet voting. Every system seeks to close the gaps left by the preceding one. This paper's main purpose is to compare and contrast the traditional voting method with the recently proposed voting systems. We take voter photos as input and train a facial recognition model using this dataset to ensure the security of the voting system. Voters' faces are recognized by the trained model, which ensures that they only vote once. The primary goal of this system is to guarantee that elections are conducted in an ethical way.

2. RELATED WORKS

In every democratic country, the voting system is used to determine the government. Democracy is intended to allow people to vote freely, and voting is a right that every citizen of a democratic society has. The democratic government is dependent on the election results. Many different types of voting systems have been utilized all throughout the world. In early days, paper ballot voting system was used. It is an ancient and insecure voting technology that allows several votes from the same individual to be cast. It rushes to cast a ballot using a ballot paper and a stamp. Over the last few decades, the voting system has seen many successful modifications, from conventional paper ballot voting to computerized voting and now to internet voting [3]. Every system attempts to close the loopholes left by the preceding method. In [4,] the voting system includes three levels of security. There are three stages to the verification process: face recognition, Election ID (EID) verification, and One-Time-Password (OTP) confirmation utlizing the registered mobile phone number of the user. An electronic voting system based on facial recognition has been presented in [5]. Image classification relies on both Local Binary Pattern (LBP) and chi-square distribution for facial feature characterisation in texture format. Face learning and verification modules are being developed in tandem in two systems based on mobile and web apps. Person ID is used first, followed by face verification as a second layer of protection in the system under consideration. This solution has been tested with two open-source databases. Using a Convolutional Neural Network (CNN) as a voting mechanism has been suggested in [6]. Because it relies on human operations, this system is time intensive and difficult to keep up with. It contains a camera for recording photos of electors, which would be stored in the database for further analysis. The database will be analysed for data. In [7], a blockchain-based decentralised national e-voting system was created. It has an admin interface that allows you to schedule voting, manage candidates, and announce the results. You may vote by entering in your Aadhar card ID (text input) and your picture at the moment you cast your ballot through the web app. The voter's eligibility would be verified when they provide their Aadhar card number. The One Time Password will be used to verify the phone numbers of all eligible voters (OTP). Individual voters will be deemed eligible to vote once their identities have been verified by an independent third-party agency. A webcam/front camera will be used to keep tabs on voters as they vote. Because the votes will be kept on a block-chain, any tampering with them will be obvious. On-line voting system [8-11] has been built to make the voting process as simple as possible. In this paper also, online voting system using voter id and CNN has been proposed.

3. PROPOSED SYSTEM

The block diagram of the proposed system is given in figure 3.1. In this system, individuals above the age of 18 will have their information obtained from the Aadhar. Before the voting procedure, voters will be provided an Id and password via the registered email address in the first phase. The second part involves confirming the user using facial data and once validated, the person will be able to vote. As part of the third phase, the information will be removed after casting, removing the opportunity to vote again.

In this suggested method, we are giving the voters an opportunity to vote using their smart phones, personal computers, tablets, laptops and so on. The database is maintained in the cloud, which comprises the images of the voter along with his voter ID. So thus we are training the image of the voter with his unique voter ID. The high priority is given to the system security. Hence we are storing 1000 unique images (Technically templates) of the voter. Which in turn produces accurate results. The exact match of a voter with the database allows the voter to cast his vote in the next step.

The language used is python with stable version 3.8. While creating the database, the script will use the camera to take a series of 1000 images of the voter. Then it matches the 1000 images of the voter with his unique voter ID. Now the system is trained by the technique known as CNN, which is the class of Artificial Neural Network (ANN). CNN is used for processing the image of the voter. When the voter enters into the website to cast his vote, it prompts the voter to enter his voter ID and takes the live image of the voter to verify, whether the voter is the one valid voter or he/she has already voted. If the voter is a valid voter and hasn't casted his/her vote till now, then he/she is allowed to cast his vote. The casted vote is immediately stored in the cloud. Then the website's current page will disappear after casting the vote of that user. After casting the vote, if the same voter tries for a duplicate vote, the system will identify the voter as already voted and not allow the voter to enter into the final voting page. Hence duplicate votes are prohibited and not allowed in our proposed system.

The input dataset consists of photographs of 30 voters, which was used to gather the data for the portraits. To train the model, the dataset acts as its basis. Using an OpenCV module file and python scripting, create a dataset that includes the name and picture of a certain individual. The dataset for persons is built in this module using OpenCV-python. One thousand images were gathered from all peoples.

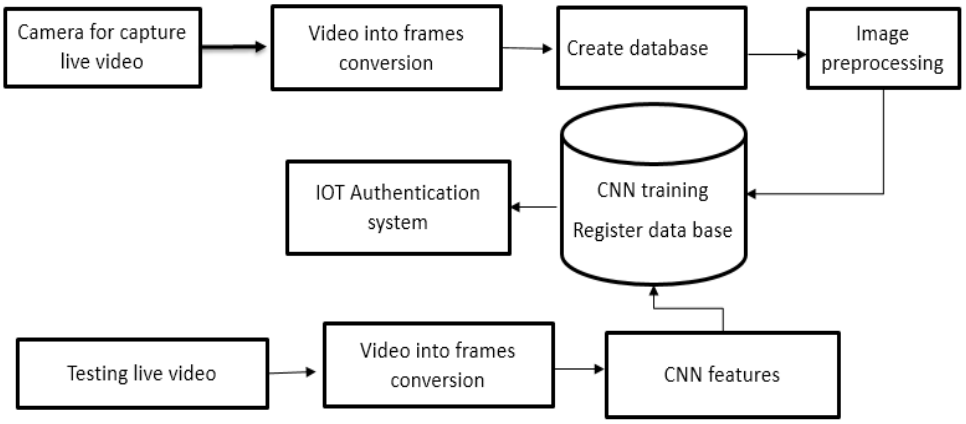

Figure 3.1 Proposed System

Image object recognition is required. This method will most likely begin with noise reduction, followed by feature filtering to detect lines, regions, and textures. Consider these forms as a whole. AI has difficulty seeing an item from different viewpoints or illumination. Image alteration techniques are used. Binary images in two dimensions. Each pixel has one bit (0 or 1). Binary images are often black and white, although they may be any two colours. Image in grayscale - A black-and-white digital picture in which the sole data is intensity and each pixel represents a single sample. The range of strength is 0-255. The lowest value is 0 and the highest is 255. A colour image is a computer picture with red, green, and blue pixel values. The colour intensity scale runs from 0 to 255. Developed model is deployed on the face detection code to monitor the voting. The essential information given to the algorithm to differentiate eligible voters is the voters' facial traits. These duties are frequently performed unconsciously by the human visual system, but for a computer to approach human performance, extremely skillful programming and a wide spectrum of processing capacity are required.

IoT is a network of reticulated computer devices, mechanical and digital equipment with unique IDs that may communicate across a network without requiring human-to-human or human-to-machine contact. Time-series analytics, machine learning, artifact sensors, and embedded systems all came together to form the internet of things notion. The internet of things has evolved thanks for embedded systems, wireless device networks, management systems, animation, and a range of other businesses. The Internet of Things' main security aims are to enable proper identity authentication techniques and to protect information and other associated data.

4. SIMULATION RESULTS

Developed model is deployed on the face detection code to monitor the voting. The essential information given to the algorithm to differentiate eligible voters is the voters' facial traits. These duties are frequently performed unconsciously by the human visual system, but for a computer to approach human performance, extremely skillful programming and a wide spectrum of processing capacity are required.

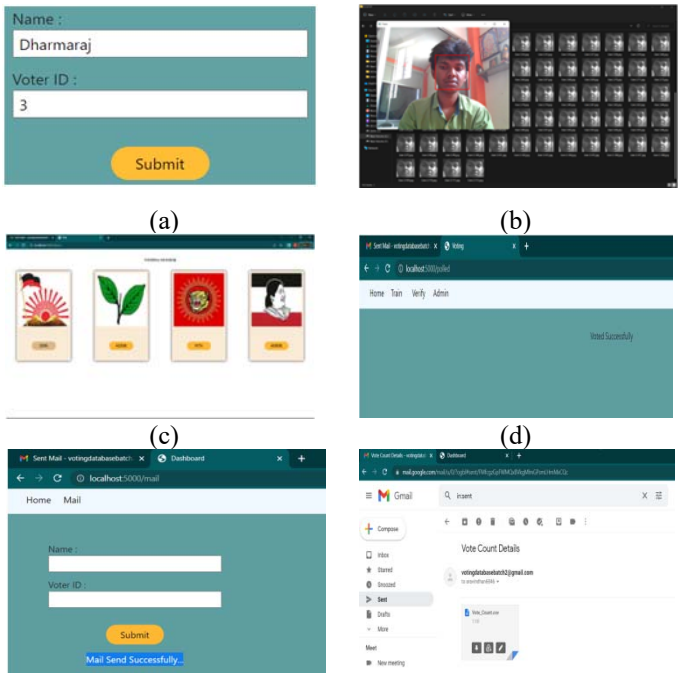

Figure 4.1 Simulation Results of Proposed System

The simulation results of proposed system is given in figure 4.1. The proposed method is simulated using python. Initially, the user has to enter into the home screen and they have to login using their name and voter-id, which is given in figure 4.1 (a). Then face verification process is performed as shown in figure 4.1(b). Once the face verification has been done, then the voter is allowed to post their vote. If the face is not verifies with the database, then the voter is not allowed to post his/her vote. In such a way, the security of the voting system is improved. After face verification, voting area where the vote needed to be voted will be displayed (figure 4.1(c))and after making his vote then a message will be thrown that voted successfully, which is shown in figure 4.1(d), figure 4.1(e) and figure 4.1(f). The details about the voter that have been provided by him and these details will not be shown to any one because its back-ended.

The main advantage of the proposed system is, the voting count also performed easily. This system contains the data of voting count but it does not contain any details of voter. In this manner the security of the voting system is improved. In this system, after casting vote, the leader positions are disabled. The votes that made by user that is saved on the excel sheet, and the count is completed after the election. The address for the election is provided on the government forum. When compared to current approach, count for result is relatively simple then task are simple. The suggested method is very secure and which cannot be accessed very easily, it's because it contains some of security system, the system designed is totally based on web, which is relatively economical to current methods; if sufficient robust high security is supplied to the forum, very little staff will be required.

5. CONCLUSION

Automatic voting using convolutional neural networks reduces the amount of human involvement in the process. The manual voting process would be replaced by this Automated Voting technology. This device creates new data at a rate of one million bytes per minute. To put it another way, it needs less money and personnel. Newly registered voters and deceased voters must be added and removed from the database every year or before an election, respectively. Election officials, paper ballots, and electronic voting machines aren't necessary with this method; all that's needed is a camera.

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Analysis of Power in WSN Using Energy Harvesting Sources

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Abstract.
There are various studies on Energy Harvesting Wireless Sensor networks in which solar powered nodes are used for communication. In this paper we are looking forward to analyse power in various scenarios by regulating the solar powered nodes in different positions and different protocols. Also, the concept of wireless power transfer is discussed and simulated at length with the help of a simulation tool, Network Simulator 2(NS2)

Keywords. Wireless Sensor Network, LEACH, Internal Power Transfer, NS2.

1. INTRODUCTION

This paper focuses mainly on clustering-based protocol i.e., LEACH C. Energy efficiency and lifetime are two major parameters in the field of Wireless Sensor Network. The Low Energy Adaptive Clustering Hierarchy(LEACH) and Low-Energy Adaptive Clustering Hierarchy-centralized(LEACH-C) are conventional algorithms that partition sensor nodes into clusters and send merged data to the base station(BS). Traditional networks have sufficient energy, and their routing techniques do not take into account the peculiarities of wireless sensor networks. Therefore, they are not suitable for WSN. Low-Energy Adaptive Clustering Hierarchy (LEACH) that employs the technique of clustering nodes in WSN has been proposed. Sensor nodes self-organize into clusters in LEACH, and each cluster chooses a ClusterHead(CH). LEACH-C is a protocol based on clusters in which base stations are randomly selected for cluster heads.
Wireless energy transfer, also known as wireless power transfer, is the capacity to transfer electrical energy without the use of plugs or wires from a source storage to a destination storage. Wireless power transfer has resurfaced with widespread acceptance, with commercial uses such as electric toothbrushes and mobile phone wireless charging(Apple iPhone, Samsung, and others). Near field coupling has been used to facilitate wireless power transfer in applications such as RFID and medical implants.

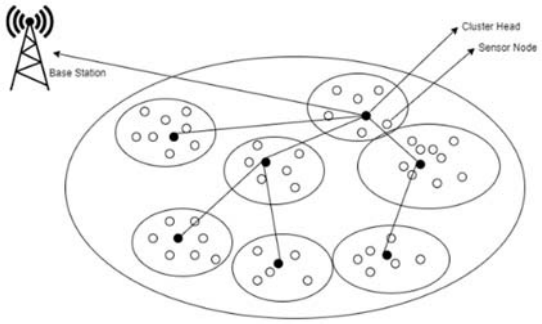

Fig. 1.LEACH C protocol

Inductive coupling, electromagnetic radiation, and magnetic resonant coupling are the three primary categories of wireless power transmission systems.

The restricted energy supply has reduced the longevity of a sensor network, which is powered by wireless sensor nodes. This has been a long-standing and fundamental issue for sensor networks built for long-term operation. To solve the issue, solutions such as energy conservation, environmental energy harvesting, incremental deployment, and battery replacement have been proposed. Energy conservation techniques, on the other hand, can only reduce consumption and not compensate for energy depletion. The availability of environmental energy sources such as solar, wind, and vibration is sometimes unmanageable by humans. Because deserted nodes might damage the environment, the incremental deployment technique may not be eco-friendly.

In this paper we will be proposing a WSN system with Solar Internal Power Transfer (IPT) and compare results by changing the position of Solar Nodes (SNs) in different routing protocols.

2. RELATED WORKS/LITERATURE SURVEY

Energy-Harvesting Wireless Sensor Networks (EH-WSNs): A Review[1] - There are some unique features of energy harvesting wireless sensor nodes. This paper also gives a complete overview on how energy harvesting can be done using various sources of energy. Energy Harvesting in Wireless Sensor Networks: A Survey[2] - Energy harvesting for long-term wireless sensor nodes has been discussed, as well as some of the early solar harvesting pioneers in WSN. Also, it focuses on managing the energy transfer and buffer switching. Based on smart grid applications, a hybrid energy harvesting framework for energy efficiency in wireless sensor networks[3]: This research investigates the effects of reduced sensor node energy consumption while adopting a hybrid energy harvesting technique with a MIP framework that uses transmission power regulation to counteract the harsh environmental conditions of SGs. Maximization of wireless sensor network lifetime using solar energy harvesting for smart agriculture monitoring[4]: This research provides a framework for smart agricultural monitoring applications that has an unlimited life-time SEH-WSN. Design of energy harvesting wireless sensors using magnetic phase transition: This research

provides conceptual designs for energy harvesting temperature sensors centred on the magnetic material's Curie temperature. Renewable energy harvesting schemes in wireless sensor networks: A Survey[5]: This study discusses alternative energy management and renewable energy collecting strategies for wireless sensor networks.Comprehensive optimized hybrid energy storage system for long-life solar-powered wireless sensor network nodes[6]: For solar-powered WSN, a new two-port hybrid diode topology is presented. The battery lifetime of a hybrid energy storage system is at least three times that of existing hybrid energy storage systems. Distributed on-demand clustering algorithm for lifetime optimization in wireless sensor networks[7]: This work presents a dynamic cluster head selection-based on-demand clustering algorithm. Reliable and Energy-Efficient Multi-Hop LEACH-Based Clustering Protocol for Wireless Sensor Network[8]: The effectiveness of the low-energy adaptive clustering hierarchy (LEACH) and LEACH-based protocols in extending the lifetime of energy-constrained WSNs is investigated in this study. Enhance multi-hop LEACH, an improved LEACH clustering technique, is proposed to minimise and balance energy consumption in WSNs, allowing for increased packet delivery and network longevity.By using different routing protocols, network lifetime can be extended up somewhat. Regardless, the use of essentialness harvesting techniques lessens the energy utilization use of a particular sensor node by customary aggregate [9]. Many routing strategies are being proposed which uses sun based energy to power up the sensor node like sLEACH, A-sLEACH, IS-LEACH, modified s-LEACH, etc. The issue with the sun aware LEACH[10], advanced sun aware LEACH[11], and IS-LEACH[12] is that they are not in view of real-time sunlight based data. So in modified sun aware LEACH[13], real-time sun oriented data is considered by using a sunlight based charger for voltage and current accounts to ascertain sun based power. While the weather conditions forecast site is there to give us ongoing data about the climate. With respect to, the UV-list information is accessible on the weather conditions forecast. In UV-index based LEACH[14], Author considered these hourly UV-index information for the computation of sun oriented power. To take the advantages of other reaping sources, a wind energy based wLEACH was presented[15]. Wind energy is calculated by considering the real time wind speed data and appropriate wind turbine. Further network lifetime of the network can be extended using the hybrid harvesting sources like solar and wind energy. In[16], Author presented HEH-LEACH where both solar and wind energy is used based on their availability to power up the sensor nodes. With this network lifetime is improved with reduced energy consumption.

3. METHODOLOGY

3.1. Algorithm

The Base station selects CHs from the sensor nodes in the field during the Setup phase (Fig. 2) depending on certain factors (for example, node energy level and the number of times this node has been selected as CH before).A particular CH sends an advertisement message to all other nodes. All nodes that are left out are associated with the CHs closest to them.During the contention period, all nodes in the Steady state phase (Fig. 3) keep their radios active. The cluster-head creates a TDMA schedule and distributes it to all cluster nodes.Within the TDMA time slot already given to them, data is sent from each node to their appropriate CH. The acquired data at each CH is passed forward to the sink during the data transmission to sink phase. Coming to the Internal transfer of Power, the power transfer happens in the steady state phase. The SNs being a part of a cluster continuously transfers power to the cluster head, further the CH makes use of the harvested power in Data collection and Data transmission phase.

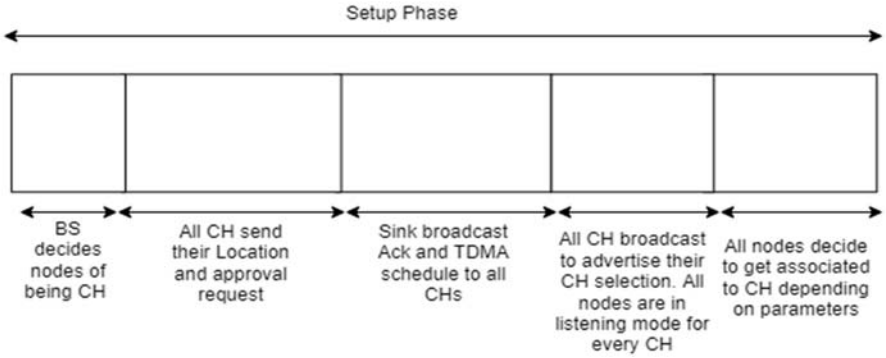

Fig 2. Setup Phase

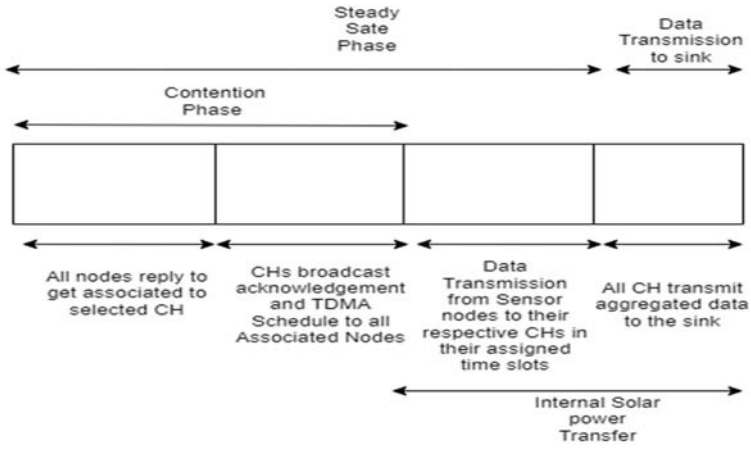

Fig 3. Steady State Phase

3.2. Simulation network scenarios and parameters

Table 1. Steady State Phase

Sr. No	Parameter	Value
1	Number of solar nodes	5
2	Number of Non solar nodes	47
3	Field size	1500 X 1150
4	Routing Protocol	LEACH and Multihop
5	Packet Size	1024 mb

3.3. Simulation setup

a. Scenario 1: Solar Coordinated node network (LEACH)

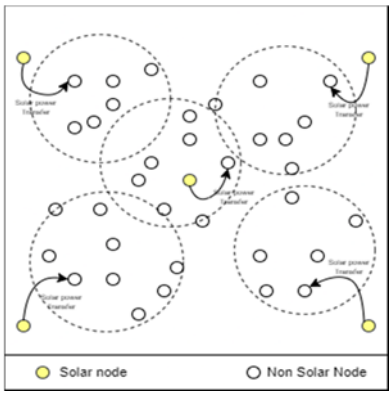

Fig 4. Illustration for Solar Coordinated node network

In this scenario(see fig. 5), namely Coordinated LEACH there are 5 Solar powered nodes from which 4 solar nodes are placed in the corner and 1 solar node is placed in the center. They will be simulated with non-solar powered nodes using LEACH C. Further the solar powered nodes will Internally transfer power to a nearby non solar node preferably a cluster head. As we can observe in the above figure, the yellow circles are solar powered co-ordinated nodes which will transfer the energy to a nearby non-solar node (i.e. white circles) which is highlighted using the pointing arrows. The dotted circles are basically clusters which are formed in the initial phase.

b. Scenario 2: Solar Random node network (LEACH)

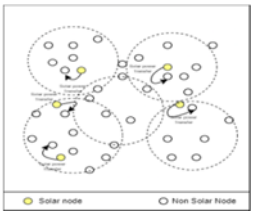

Fig 5. Illustration for Solar Random node network

In this scenario(see fig. 6) there are 5 Solar powered nodes from which all nodes including 5 solar powered nodes are randomly placed. They will be simulated with non-solar powered nodes using LEACH C. Further the solar powered nodes will do internal power transfer to nearby non solar nodes preferably a cluster head. We can observe in the above figure, the yellow circles are solar powered nodes which will transfer the energy to the nearby non-solar nodes (i.e. white circles) where the arrow is pointing. The dotted circles are basically clusters.

c. Scenario 3: Solar Random node network (Multi-hop)

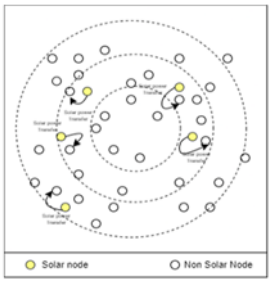

Fig 6. Illustration for Solar Random Multihop node network

In this scenario(see fig. 7) there are 5 Solar powered nodes from which all nodes including 5 solar powered nodes are randomly placed. In multihop the packet travels from source to destination using more than one networking device (i.e. nodes). Further the solar powered nodes will do internal power transfer to nearby non solar nodes. The dotted circles are basically the different hop zone layers.

d. Scenario 4: Non-Solarnode network (LEACH)

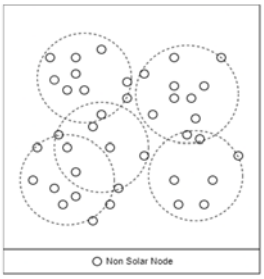

Fig 7. Illustration for Non-Solar LEACH node network

This(see fig. 8) is the basic LEACH C protocol where the cluster heads are formed by the Base Station depending on the basis of the available energy levels of every particular node.

4. RESULTS AND DISCUSSION

4.1 Throughput

Time	LEACH Coordinated	LEACH Random	Multihop	Leach Initial
1	1000	7500	4999	0
50	61200	58700	56200	713
100	112400	76767	107400	4438
150	163600	161100	158600	10663
200	214800	212300	209800	19388
250	266000	187942	261000	30613
300	317200	314700	312200	44338

Table 2. Data packets received w.r.t time in LEACH coordinated with IPT

Time	LEACH Coordinated without IPT	LEACH Random without IPT	Multihop without IPT
1	0	0	0
50	1225	2509	49975
100	4950	5974	64317
150	11175	12199	142425

200	19900	20924	184900
250	31125	32149	149317
300	44850	45874	262350

Table 3. Data packets received w.r.t time in LEACH coordinated without IPT

The Table 2 shows how the LEACH coordinated simulation is working here data packets are linearly Increasing with time while data packets of LEACH coordinated without internal power transfer (IPT) are increasing gradually.

While data packets being received are fluctuating in the LEACH random while data packets of leach random without internal power transfer (IPT) are increasing gradually (Table 3).

Lastly, In the Multihop protocol, data packets are linearly increasing with time while in LEACHInitial, data packets are exponentially increasing with time but as we can see in Table 3, the magnitude of packets being received is very low due to the fact that Solar IPT is not being used here.

4.2 Energy Consumption

Time	**LEACH Coordinated**	**LEACH Random**	**Multihop**	**Leach Initial**
1	1024	0	0	0
50	2453	440	2777	99
100	7635	2454	10489	231
150	15777	5998	27993	359
200	29985	11954	54543	491
250	48625	19680	91637	653
300	75107	29668	137653	803

Table 4. Energy Consumption (J) in Sensor network with IPT

Time	**LEACH Coordinated without IPT**	**LEACH Random without IPT**	**Multihop without IPT**
1	0	0	0
50	1074	49	2176
100	1128	99	9216
150	1196	149	18322
200	1298	199	46626
250	1340	249	73986
300	1420	299	109602

Table 5. Energy Consumption (J) in Sensor network without IPT

The Table 4 shows how the LEACH coordinated simulation is working here. Energy consumption is exponentially Increasing with time while energy consumption of LEACH coordinated without internal power transfer (IPT) is not consumingas much power comparatively due to absence of solar power(Table 5). While, we can observe how the simulation of LEACH random is performing in energy consumption aspect. Energy consumption is exponentially Increasing with time while energy consumption of LEACH random without Solar IPT is changing insignificantly.

Energy consumption of Multihop as well as Multi hop without IPTare exponentially increasing but energy consumption of multihop without communication is slightly less than normal multihop.

As Expected, Energy consumption in LEACH Initialis linearly increasing with time but at a very low magnitude comparatively.

4.3 Efficiency

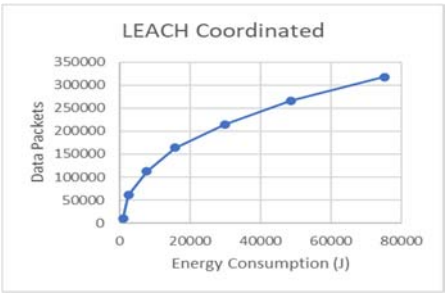

Fig 8. Efficiency of LEACH coordinated

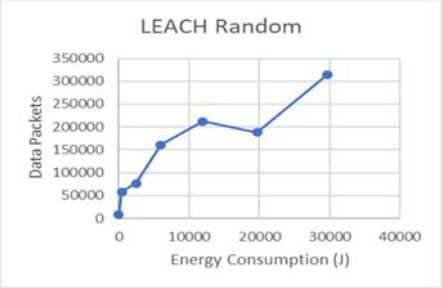

Fig 9. Efficiency of LEACHRandom

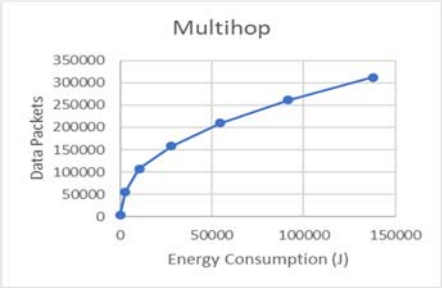

Fig 10. Efficiency of Multihop

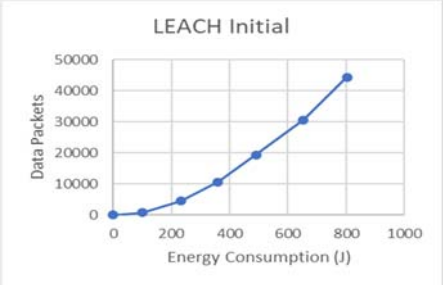

Fig 11. Efficiency of LEACH initial

From the previous Simulation results we were able to conclude the efficiency of the proposed WSN networks. In LEACH coordinated (Fig. 8), The drop in efficiency is stable while in LEACH random the drop is very sharp and fluctuating. On the other side, Multihop solar network (Fig. 10) seems to be very inefficient with high energy consumption. Lastly in LEACH Initial, the efficiency of the system is very stable and growing but is not able to match the magnitude of the proposed network system.

5. CONCLUSION

This research's success will provide a model for effective energy redistribution between nodes, ensuring that nodes do not die, rendering the network unreliable, and therefore resulting in a dependable Wireless Sensor Network (WSN). The proposed models were simulated using the NS-2 simulator through which we compared the effectiveness of the proposed solution in respect to factors like Energy consumption and data throughput. We conclude that Solar Coordinated WSN network is better for data transmission throughout the day while Solar Random WSN network will work efficiently with long sleep cycles or in a system where data transmission is needed after regular intervals.

Simulations are also carried out to evaluate the performance of the proposed system without the use of Solar Internal Power Transfer (IPT) in order to compare the results. The results show that the suggested approach can greatly extend the sensor network's lifetime.

6. FUTURE SCOPE

In our project we simulated the proposed protocol with 5 solar nodes over a small wireless network using solar energy which was transferred wirelessly internally. The proposed simulation being very small in magnitude gave positive results as to how the efficiency as well as the lifetime of a network can be improved. In future this technology can be modified and used in developing smart cities for faster data transmission using clean and renewable energy. Hardware implementation of this project remains to be a challenge right now due to very few options regarding wireless energy transfer but we believe in near future it can be achieved and implemented successfully. Lastly, more such simulations need to be conducted in order to understand proper positioning of solar nodes as per case by case situations.

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Simulation Of Fuzzy Logic Controller for The Speed Control Of BLDC Motor

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ABSTRACT

The design of a three-phase brushless DC (BLDC) motor drive employing fuzzy logic for feedback and control (FLC). The PWM that powers the inverter and, in turn, the BLDC motor is generated by a Fuzzy Logic Controller. As a result, the BLDC motor is connected to the inverter. The appropriate winding may be energised if a Hall sensor is employed to determine the rotor's position. The rotor's magnetic flux is created by the rotor magnets, which increases efficiency in BLDC motors. This technique may be used to dynamic systems since it produces a steady state response speed control of a brushless DC motor. This research shows closed-loop speed control of a brushless DC motor (BLDC), as well as a Fuzzy logic Controller with a quicker rising time and a MATLAB Simulink-based software architecture.

Keywords:*BLDCmotor,FLC,Hall Sensor.*

I. INTRODUCTION

Given the steering angle and the EV's speed, we compute the Ackermann-Jeantand steering model by calculating the reference speed for each of the EV's front wheels while turning. The Fuzzy Logic Controller (FLC) regulates the speed of each motor separately to achieve the desired velocity. The switching signals for each switch device in the power inverter are generated by a hysteresis current controller. [1]. The speed of an electric automobile is controlled in this research using an ATMEGA328P low-cost, high-performance microcontroller in combination with a four-switch, three-phase inverter. The vehicle's speed might be boosted if the energy efficiency of an electric motor is maximised. Engines work together to optimally distribute available power [2]. The simulation results for the proposed model for BLDC motor driving are presented in this work. This model generates a sine-like wave with low total harmonic distortion using the LTSpice, MATLAB, and Proteus softwares[3]. We compared the results of a conventional DTC with those of a modified adaptive DTC with a PID controller and the results of an Artificial Neural Network based DTC technique using MATLAB simulation [4]. A battery-powered automobile with independent rear-wheel-drive systems was shown in this study. The rear wheels were driven by two brushless DC motors (BLDCMs) with a fuzzy logic speed controller regulating the speed (FLSC). In the electronic differential, the AckermannJeantaud steering model [5] was used.

II. WORKING

A brushless DC motor and a feedback logic controller are used in the proposed design to manage the motor's speed. The PWM for the inverter is created using a Fuzzy Logic Controller, which is then utilised to power the BLDC motor. We can control the pace at which something responds while keeping a steady state by using a Fuzzy Logic Controller. Figure 1 depicts the block diagram.

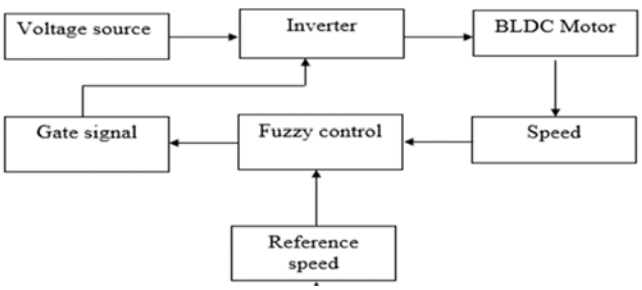


Fig 1 Block Diagram

A.BLDC MOTOR

Brushless DC motors are widely used in industries across the world. You may pick between DC and AC motors, as well as brushed and brushless motors, at the most basic level. Brushless direct current (DC) motors are precisely what their name implies: motors without brushes. Brush DC motors were in use for many years before brushless DC motors were commonly available, so it's generally helpful to explain how the former works first. A brushed DC motor has permanent magnets on the outside and an armature within that spins. Externally fixed permanent magnets are represented by the stator. The rotor is the armature that houses the electromagnet and rotates.

When power is applied to the armature of a brushed DC motor, the rotor rotates 180 degrees. The poles of the electromagnet must swap locations in order to go ahead. Because the brushes make contact with the stator and change the magnetic field, the rotor may rotate 360 degrees. Brushes are not required for reversing direction in a brushless DC motor since the electromagnetic field is successfully reversed. Permanent magnets on the rotor and electromagnets on the stator are used in brushless DC motors. Because the computer charges the electromagnets in the stator, the rotor spins indefinitely.

The use of an electric switch circuit rather than a mechanical commutator is the primary design difference between brushed and brushless motors. Because the magnetic fields formed by the stator and rotor revolve at the same frequency, a BLDC motor is a synchronous motor. Brushless motors are available in single phase, two phase, and three phase configurations. The most popular kind is the three-phase BLDC. The figure below shows the cross-section of a BLDC motor.

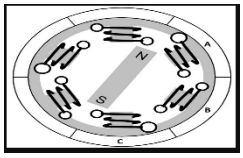


Fig 2 Cross section ob BLDC motor

B.INVERTER

Inverters (also known as dc to ac converters) are classed as either voltage source inverters (VSIs) or current source inverters (CSIs) depending on the kind of supply source and the power circuit architecture (CSIs). This group of devices is made up of three-phase iterations of half- and full-bridge voltage source inverters. Single-phase VSIs are used in low-power applications, whereas three-phase VSIs are used in medium- and high-power applications. The fundamental goal of these topologies is to provide a three-phase voltage source that can be regulated in terms of amplitude, phase, and frequency. Motor drives, active filters, unified power flow controllers, and uninterrupted power supplies all require three-phase dc/ac voltage source inverters, which use the pulse width modulation technique to deliver variable frequency and ac voltage magnitudes.

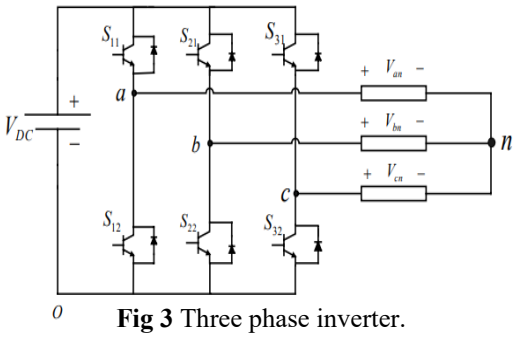


Fig 3 Three phase inverter.

C.FUZZY LOGICCONTROLLER

First, there are seven fuzzy sets, one for each of the inputs and outputs, for a total of seven fuzzy sets.

Expanding second-order fuzziness across the infinite conversational universe

For connotation, we utilise Mamdani's min operator.

Fourth, we use the centroid defuzzification approach.

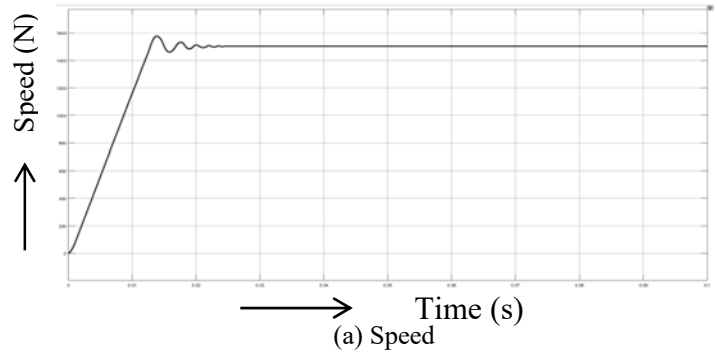
The FLC accepts error (e) and change in error (ce) as inputs and outputs an active current component. The FLC's inputs and outputs are shown in Table 1. Both 'e' and 'ce' use the same set of seven membership functions to transform continuous data to fuzzy data. Triangle membership functions are often used because they are straightforward to create. The symbols 'NB' (Negative Big), 'NM' (Negative Medium), 'NS' (Negative Small), 'ZE' (Zero), 'PS' (Positive Small), 'PM' (Positive Medium), and 'PB' (Positive Big) are used to represent the seven membership functions (Positive Big). The use of discrete intervals of 'e' and 'ce' values distinguishes membership functions. The tabular data is used to determine the fuzzy logic controller's output. For each input, 49 rules will be constructed, totaling seven inputs and outputs. Table 1 shows the results for valid input values. Fuzzification, a technique that employs seven fuzzy sets to translate numerical input and output variables into language variables, is used because Fuzzy Logic Computing depends on domain experience rather than accurate mathematical modelling. The rules of the system are made up of a combination of fuzzy sets of error and changes in error. These rules make up the system's rule base, which is given in Table III. The system's output is the outcome of an inference made using fuzzy knowledge. A BLDC model was created using FLC in the simulation programme MATLAB Simulink utilising the aforementioned lookup table as inspiration.

e/ce	PB	PM	PS	ZE	NS	NM	NB
PB	PB	PB	PB	PB	PM	PS	PS
PM	PB	PM	PM	PM	PS	PS	NS
PS	PB	PM	PS	PS	PS	NS	NM
ZE	PB	PM	PS	ZE	NS	NM	NB
NS	PM	PS	NS	NS	NS	NM	NB
NM	PS	NS	NS	NM	NM	NM	NB
NB	NS	NS	NM	NB	NB	NB	NB

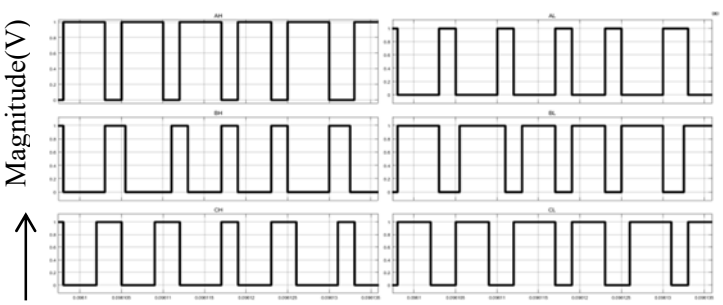
Table 1 Truth table for fuzzy logic

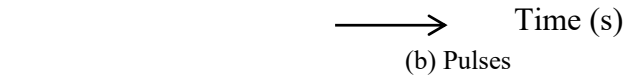
III SIMULATION RESULTS

In this section, the speed,pulses, stator current and inverter output current are evaluated through simulations.

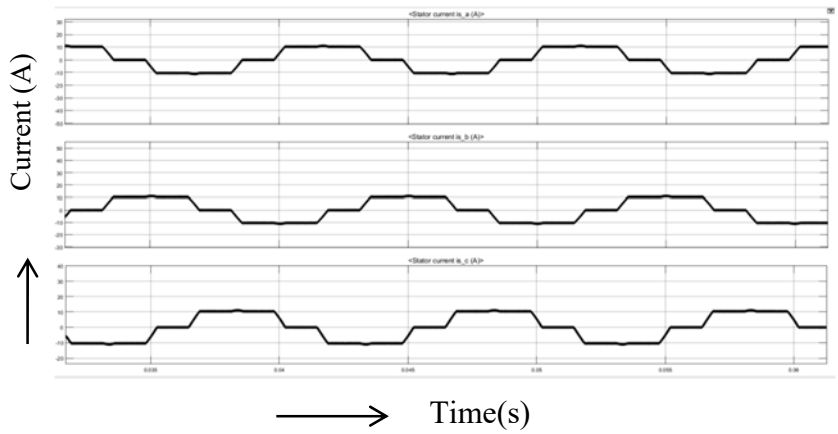


(a) Speed

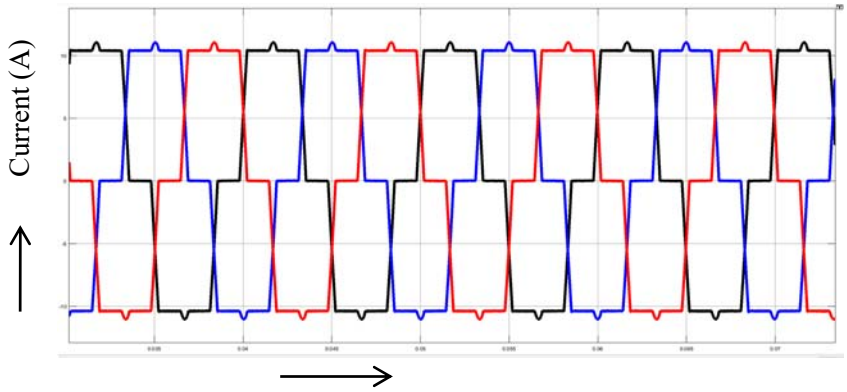




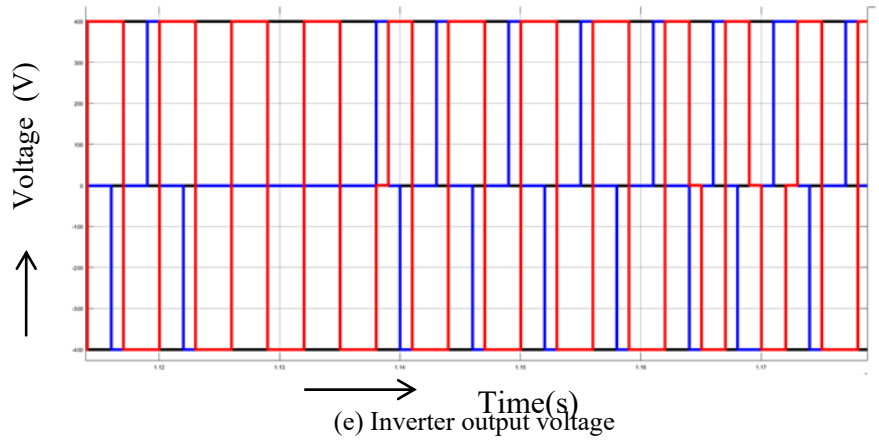
(b) Pulses



(c) Stator current



(d) Inverter output current



(e) Inverter output voltage

IV CONCLUSION

A Fuzzy Logic Controller is used to control the rotational velocity of a BLDC motor. The Fuzzy Logic Controller analyses the measured and goal velocities, calculates the divergence from the ideal, and then produces the appropriate pulses to obtain the desired result. The inverter changes the motor's speed based on the switching pulses received from the FLC. The FLC's initial acceleration and ultimate plateau are both much shorter. MATLAB simulation is used to assess the efficiency of the proposed strategy.

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Design and Analysis of Dual (Twin) Axis Solar Tracker System with the Improvement of Photovoltaic Efficiency

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Abstract

Now-a-days, there is a significant demand in power generation therefore the usage of both renewable and non-renewable resources has increased rapidly. In general, the solar panel power system is immobile this means; the solar panel will not always be facing towards the orientation of the sun, due to which the intensity of sunlight absorbed by the panel is not maximum thus reducing the efficiency of the solar photovoltaic system. In order to overcome this imperfection "Dual Axis Solar Tracking Systems" are proposed. The annual energy efficacy of dual (twin) axis solar tracking system is of about 36.504% which is high when compared with single axis solar tracking system. The proposed model comprises Arduino UNO to control the entire system, Light Dependent Resistors (LDR) to detect the intensity of light and transmit the data to the Arduino UNO and DC motors to mobilize the solar panel. The solar tracker continuously monitors the suns orientation and modify the position in line with suns position to increase the output power.The surface of the solar photovoltaic panel should be cleaned periodically to prevent the system from getting damaged and also to improve its efficiency. This can be done by using wiper control mechanism. The proposed cleaning system operates by spraying an amount of water on the surface of the photovoltaic panel and then actuating the wiper using a DC motor. This design is highly effective in improving the efficiency ofthe photovoltaic system.

Keywords: Dual Axis Solar Tracking System,Solar Panel, DC Drives

1. INTRODUCTION

These days, there is a significant demand in power generation therefore the usage of both renewable and non-renewableresourceshasincreasedrapidly.Theexhaustionof thefossilfuelsandconcernovertheenvironmentalproblems has brought the generation of electric power using solar photovoltaicsystemsintolimelight.Currently,thereisahigh requirementofthesolarphotovoltaicsystemsassolarenergy is a renewable resource. UV region of suns radiation fall on the surface of solar panel. The radiation from the sun will be absorbed with the help of using solar panels which is used to transform solar radiation into electric power. Solar photovoltaic panels are fixed to towards the sun to get more absorption. For feasible solar energy generation, it is mandatory to increase the conversion efficiency which results in emerging of various solar tracking methods which helps to improve the way of tracking of suns direction.There are two major radiations in sunlight. They are the direct beam (beam radiation) and diffuse beam (diffused radiation). Direct beam radiation is the suns radiation which will not be scattered. This radiation carries almost 90% of the solar energy to the earth. The remaining 10% energy is carried to the earth surface by the diffuse sunlight. [1][2].Theaddition of beam radiation, diffused radiation and reflected radiation aremeasured as global radiation in the earth surface. In order to get maximum energy form the solar panel, it is mandatory to track the direct beam radiation continuously.

Due to the development in the technology, the efficiency of the solar cell has been increased and automatic solar tracking system was evolved which overcomes the traditional fixed solar PV system. In the conventional solar PV system, the solar panels are fixed to a constant position towards the north-south direction. In solar PV tracking system, based on the azimuthal angle and the geometrical capacity, the position of the solar panels are continuously changed with help of electro-mechanical system in order to get maximum exposure to the sun light [3]. In this research in order to increase the efficacy of solar photovoltaic panel, the system is designed to follow the sun's movement. In general, the sun's rays are upright to the solar PV panel. Here the stationary photo module was fixed at an angle of 23.5º to the optimal connection of the land and photovoltaic module with a tracking system[4].In the year 1962, C. Finster invented the first solar tracking system based on the mechanical arrangements. Initially, this results in less improvement of energy gains. But over a period of time, modern technology leads different way for the improvement of solar tracking system with high efficiency [5]. For a developing country like India, there is vast need of electrical energy. So the renewable resources are used for energy generation. This will leads to the implementation of solar powered electricity generation for the public sector and commercial buildings. With the use of dual axis tracker, these solar panels are tracked regularly to increase the efficiency.

2. PROPOSED SYSTEM

Asolartrackerhashugeapplicationsinpowergeneration but, the solar photovoltaic systems have few drawbacks. The first one is that the energy conversion rate of solar PV system is about 12% to 42%. The second drawback is the solar power produced by the solar cell is based on non-linear conditions like solar irradiation, partial shading conditions, change in temperature level, and charging infrastructures. In this regard, the solar power generated from photovoltaic cells depends on various non-linear parameters, so this made it mandatory to track the solar power incident on the panel to get the maximum efficiency. The aim of this proposed work is to make sure that the radiations from the sun is to fall perpendicularly on the solar PV panel. This arrangement makes the system to absorb more solar energy and convert into electric energy with maximum efficiency. In order to increase the energy conversion efficacy, it is proposed to track the relative motion of the sun by dual axis system to maximize the output power[6]. Dual axis solar tracker circuit diagram as shown in below figure.1.

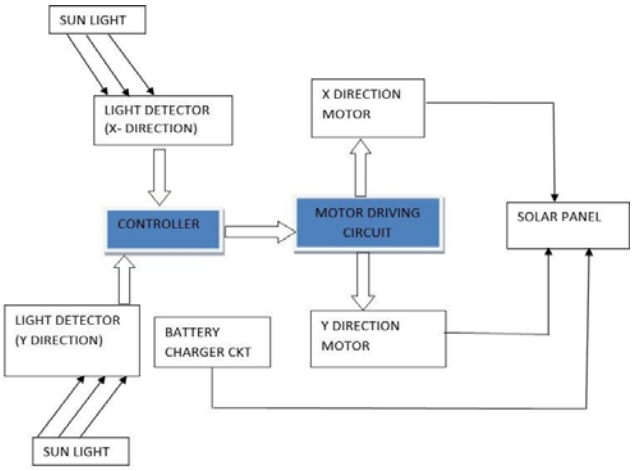

Figure 1:Dual Axis Solar Tracking System Block Diagram

The tracking operation of suns radiation is performed by using DC motors. DC motors and stepper motors are used in this operation. The suns linearity is tracked by using DC motor in the upper PV panel holder. The parabolic displacement of the sun is tracked by using stepper motor at the base of the PV panel. These DC motors are along with the sensors are interconnected to the controller. The controller gives the tracking signal to the DC motors based on the inputs from the sensors[7]. The light energy from the sun is sensed by using LDR and it send signal to the controller. The Arduino gets the signals from LDR and based on that the turning of the DC motor is decided. From the block diagram, it is clear that LDR forwards the signal to controller after sensing the light energy. Suppose the sun changes its location from eastern to western direction, itwill made the light-intensity to be dissimilar in first sensor when likened with the additional sensor. Depending on the change in light intensities of the sensors, the controller gives the control signal to the driver circuits of DC motor[8]. As the outcome, the proposed method will be able to absorb high amount of suns radiation which in turn improves the solar energy conversionefficiency of the system[9].

3. LIST OF COMPONENTS AND SPECIFICATIONS

The proposed prototype consists of photovoltaic panels, microcontroller, comparator, motor driver, gear motor and other components. The components and their description are as follows;

3.1 PhotovoltiacPanels

Thephotovoltaicpanelsaremadeupofphotovoltaiccells that are connected together. The solar panel absorbs the sun's radiation and to convert it into electrical energy. The electric power generated from the solar PV panels is most widely used for domestic and commercial equipment's.

3.2 Arduino Uno

The Arduino UNO is one of the type of microcontroller circuit. It contains digital and analog input and output pins which canbeinterfacedto externalcircuits.Itcomprisesof14 digital I/O pins and six analog I/O pins. The Arduino IDEsoftware is used to programme the Arduino UNO.

3.3 MotorDriver

The DC motors requires high current signal to operate tracking system. This high current signal is obtained from the motor driver circuit which amplifies the small current signal from the controller board. In this system, L293N is used to drive the DC motors which can be able to drive two DC motors in parallel.

3.4 GearMotor

The speed of the motor is adjusted by the principle of the gear motor which leads the motor to operate at a certain speed. As the gear head functions as a torque multiplier and allows small motors to generate higher speeds, the gear motor has the ability to deliver high torque at low speeds.

3.5 Light DependentResistor

A Light Dependent Resistor (LDR) will becalled as photo-resistor or a cadmium Sulfide (CdS) cell or a photo conductor. LDR is known as photocell which is based on the working principle of photo-conductivity. The value of resistance of the Light Dependent Resistors decreases when the intensity of light decreases.

Table 1: List of Components and Specifications with Estimated Cost

S. No	Name of the Component	Specifications	Quantity	Cost (Rs)
1	Photovoltaic panel	20W	1	300
2	Arduino	UNO	1	300
3	Motor Driver	IC L293N	2	40
5	Gear Motor	60RPM,12 V DC,6MM	2	400
6	Light Dependent Resistors	-	4	10
7	Resistors	10k ohms	4	20
8	Resistors	1k ohms	4	8
9	Power Supply	12 V	1	250
10	Jumper wires	M-M	20	20

4.PROTOTYPE MODEL

The dual axis solar tracker consists of two parts, one is the sensing part and the other one is the comparing part. In the proposed system, the prototype model consists of four LDRs, two stepper motors, solar panel, motor driver and Arduino[10]. The intensity of the light absorbed is sensed by the LDR and the signal is given to the Arduino as shown in Figure 2. The LDR output signal is observed when the sun light is perpendicular to any LDR. The LDR output signal compares with the reference voltage and output is given to the IC L293N motor driver[11].

The gear motor is connected with the controller asshown inFig2.Inthis,theL293Nisusedasthe motordriver,based on the signals received by the LDR; the comparator selects the rotational direction of the gear motors. In order to rotate the stepper motors; C language program is implemented and executed using Arduino IDE Software. The controller sends the control signal to the driver circuit of DC motor which enables the gear motor to move in respective track[12] [13].

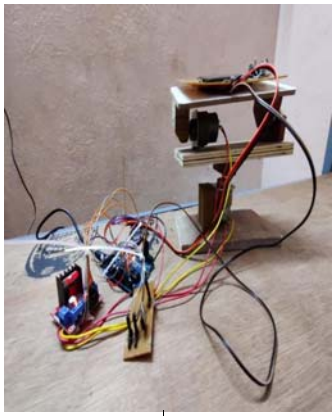

Figure 2.

The light intensity depends on incident angle of the sun to the surface of solar PV panel. During morning and evening sessions the angle of incidence is nearly 0°. In this angle, the light absorption ability of the solar panel will essentially be zero resulting in no output[14]. At noon, the angle of incidence approaches to 90 degree which results in steady increase until maximum power is achieved. In order to receive maximum output from the panel the angle of incidence should be maintained to be nearly 90 degree. This can be achieved by tilting the solar panel to continuously face the sun[15].

4.1 Flowchart

The program flow chart is shown below;

- ✓ The intensity of the light is first sensed by the LDR.
- ✓ The signal is converted from analog to digital.
- ✓ The signal is then sent to the comparator and then it compares it with the reference voltage.
- ✓ The resistance of LDR1 is higher than that of LDR2, if LDR2 has more light intensity than LDR1. This makes the voltage at CH-1 is lower than that of CH-2 which results to rotate the gear motor of solar PV panel in the forwarddirection[12].
- ✓ If light intensity of LDR1 and LDR2 are equal then a stable position is obtained.

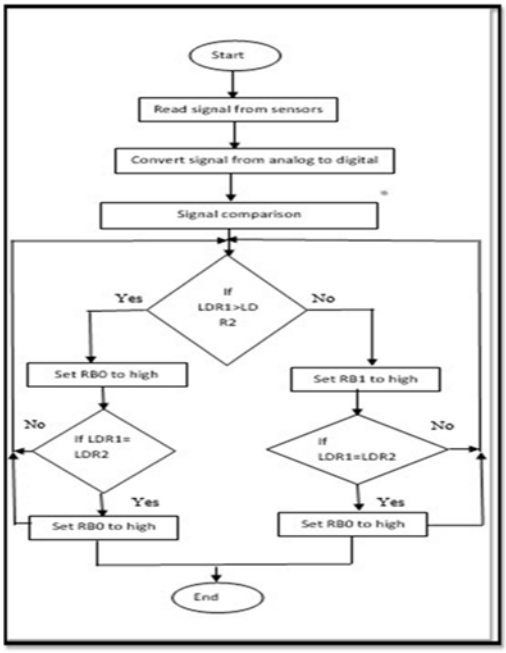

Figure 3. Program Flow Chart

5 RESULTS AND DISCUSSIONS

The solar power absorbed by the twin (dual) axis solar tracking system is maximum when the entire trackingperiod of timeand it alsoimproves the solar energy transformationinto electric power output. The output voltage is 1.8 to 2V has been generated by the proposed prototype model. The proposed system is cost effective. This prototype model will increase the energy by about 40%.

The twin (dual) axis solar tracking system perfectly tracking the direction of the light energy from the sunwith high competent way and gives the maximum output power. It improves 40% of additional power from each solar PV panel. While to achieve the same output power by using single axis solar panel tracking requires more number of panels and frames. On the other side, we may use the same number of panels and generate 40% more electricity and revenue with the same number of panels. The use of gears rather than linear actuators improves the overall tracker's efficiency.

6 CONCLUSION AND FUTURE SCOPE

The direction of the sun has been traced by the proposed prototype due to which the intensity of the sunlight absorbed by the panel is maximum. Therefore, this implemented design has confirmed to be highly effective in increasing the conversion efficiency of the photovoltaic systems. At present this type of energy generation is being used as secondary source, but in the foreseeable future solar tracking systems might become

the main source for energy generation. In future, using high powerful motors to tracking the solar radiation with maximum capability and also lifespan shall be improved, but comparatively at higher cost. Dual-axis solar trackers will helpful to accomplish the optimum solar energy level for implementing this technique. In forthcoming this twin axissolar collector tilting techniques can also be implemented in the huge solar plants and it can be functioned spontaneously.

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A Survey on Enhancement of Energy Efficiency in Wireless Video Sensor Networks

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Abstract: In the fast growing image application, the regular sensor networks will provide the text data. In the monitoring applications the video data provide the better information than the text data. Therefore it is necessary to receive video and image data. Thus Wireless video sensor networks are used to implement in a remote geographical areas for monitoring forests, mountains, deserts, border areas where the other networks do not exist. Even though the sensor networks limited by battery, memory, computing power and bandwidth. In order to satisfy the requirements proposed a few methods to overcome these limitations like video compression method, path planning, data aggregations. Video transmission via WSN is difficult because video data is inherently enormous in size, and transmission of video data necessitates a greater bandwidth, as well as additional memory and power for processing. This paper reviews the three parameters in different directions and figure out the more challenges in this research area.

Keywords: WMSN, Energy Efficiency, H.264

I. INTRODUCTION

In the networking field the wireless sensor network plays important role of grouping of sensor, data sharing, and data transmission. The Wireless sensor networks are infrastructure fewer networks in which deployed randomly in the entire environment based on the requirement of the application. The nodes are attached with sensor, processor, and power unit. In addition the fast development of sensor application capturing the real time image data is necessary rather than the raw data. As a part of this requirement, Wireless Multimedia Sensor Network (WMSN) is introduced and the sensor nodes are connected with cameras, microphones using these two devices can able to provide the live video streaming.

Sensor nodes with several sensing units make up Wireless Multimedia Sensor Networks (WMSNs). WMSNs, unlike standard wireless sensor networks, gather multimedia data including video and images. Data aggregation is a crucial enabling technology for WMSN, as it is required for it to be reusable and cost-effective. The process of collecting and aggregating meaningful data is known as data aggregation. Data aggregation is a good technique to preserve limited resources in the WSN. The main objective of aggregation of data algorithms is to capture and assemble data in an efficient manner in order to increase network lifetime. Figure 1 illustrates the process of aggregating the sensor dat. The method then aggregates sensor data from sensor nodes using aggregation algorithms such as the centralised approach, LEACH (Low Energy Adaptive Clustering Hierarchy), TAG (Tiny Aggregation), and so on.

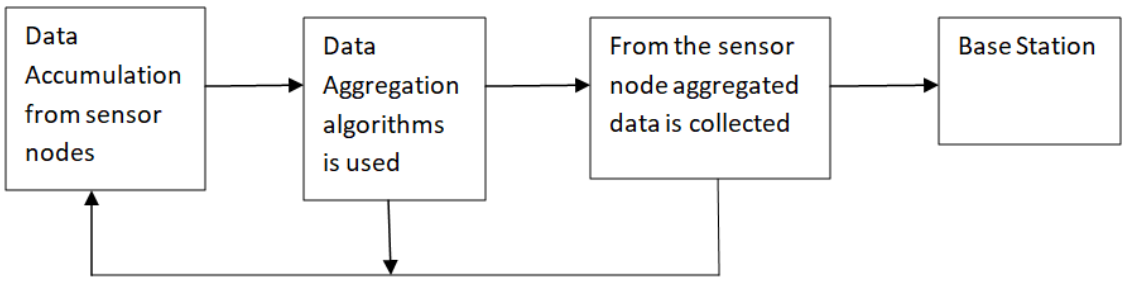

Figure 1: Architecture Diagram for Process of Data Aggregation

II. Strategies for Data Aggregation in Wireless Sensor Networks:

The data aggregation features employed in this work, such as energy efficiency and data aggregation rate, are listed below:

Energy Efficiency: In an ideal circumstance, every sensor in a Wireless Sensor Network should spend the same amount of energy throughout each data collection round. In practice, however, sensor nodes use varying amounts of energy during data transmission. In Wireless Video Sensor Networks, we can consider a data aggregation strategy to be energy efficient if it gives the most functionality with the least amount of energy usage. The ratio of the amount of data

successfully conveyed in a wireless sensor network to the total energy consumed to transfer those data is known as energy efficiency. Equation 1 is used to compute the energy efficiency.

$$\sum_{n=1} \frac{\text{In a sensor network, the amount of data that has been successfully sent}}{\text{The total amount of energy used to transport those data}} \quad \text{- - - - - Eq.1}$$

Data Aggregation Rate: Data aggregation is the technique for acquiring and aggregating key information in a specific region of interest in Wireless Video Sensor Networks. The primary method for reducing energy usage and consuming limited resources is data aggregation. The data aggregation rate is defined as the ratio of the volume of data successfully aggregated to the total amount of data detected as (Equation. 2).

$$\text{Data Aggregation Rate} = \frac{\text{Ratio of the volume of data successfully aggregated}}{\text{Total amount of information gathered}} \quad \text{- - - - - Eq.2}$$

Different Energy-Efficient Data Aggregation Techniques:

Secure Data Aggregation Using Polynomial Regression:

Polynomial Regression Based Secure Data Aggregation is a system in which sensor nodes describe their perceived data using polynomial functions. This method is used to ensure that the data being aggregated remains private. It's a new data aggregation system that uses polynomial regression on sensor data to achieve data privacy. The basic idea behind this protocol is to do data aggregation utilizing sensor data represented by polynomial coefficients.

Aggregation Tree with Clustering Based Lifetime Maximization:

The major goal of this algorithm, which is used to generate aggregation trees, is to reduce energy consumption by minimizing the cost of energy consumption and lowering the distance covered. The node with the most energy is regarded the parent node in the Clustering Based Lifetime Maximizing Aggregation Tree. The goal is to create the best aggregation tree feasible while minimizing energy consumption, lowering costs, and so maximizing network Data Aggregation in Wireless Sensor Networks. The aggregation tree that is derived utilizing the above-mentioned parameters shows to be the best for extending the network lifetime.

III. Compression Techniques:

The notable coding efficiency of Advanced Video Coding (MPEG-4 AVC), H.264 or MPEG-4 Part 10, the technology used for video compression opens a wide range of new applications over a variety of media for streaming video. It is a block-oriented motion-compensation-based video compression standard.

The H.264 standard provides optimized algorithms to estimate the motion, transforms, inter-prediction and spatial intra prediction. The H.264 standard supports motion estimation on blocks from 16×16 to 4×4 pixels. The H.264 uses multiple reference frames, smaller macro blocks and wider search ranges when compared with its predecessors to estimate the motion .The video transport over IP will be facilitated easily by H.264 standard and furnishes a hefty compression ratio.

Encoder processes:

The video in a compressed format is acquired by encoder and a decoder is used to get the uncompressed format by recouping the compressed video. The macro blocks are individual blocks of 16pixels by 16 lines that was obtained by breaking down the video consists of a stream of individual pictures. At each stage in the compression algorithm this process makes the operation very simple which needs to be done. In order to identify and remove the temporal redundancies the motion estimation is used that appears between individual pictures. When searching for a picture which is motion relative to a previous picture is encoded as “P-picture”. The B-picture is one which searches a previous picture and a future picture. The current block is calculated by predicting surrounding pixels from adjacent blocks in a well-defined range of directions. After then, the difference between the actual and predicted blocks is coded. The methods used for prediction in H.264 are more pliable when compared with other standards provides excellent video compression and accurate predictions.

A block of transform coefficients, nothing but the transformed output is **quantized**, i.e. Dividing the individual coefficient by an integer value. The precision of the transform coefficients is reduced by the quantization process, according to a quantization parameter (QP). The end output is a block with few non-zero coefficients and most or all of the coefficients being zero. The high compression is achieved by setting a high value to the quantization parameter at the outlay of poor decoded image quality this means most of the coefficients are set to zero. The low compression is achieved by setting the quantization parameter to a low value at the outlay of better decoded image quantity this means after quantization more non –zero coefficients remain.

Decoder processes

Bit stream decoding

On the other end, the video decoder obtains the compressed H.264 bit stream and extracts the information specified above by decoding each of the syntactic elements (quantized transform coefficients, prediction information, etc). This information is utilised to reproduce the video images in sequence and reverse the coding process.

Reconstruction

The decoder creates a prediction for each macro block that is comparable to the one made by the encoder. The decoder adds the prediction to the decoded residual to reconstruct a decoded macro block, which can subsequently be presented as part of a video frame.

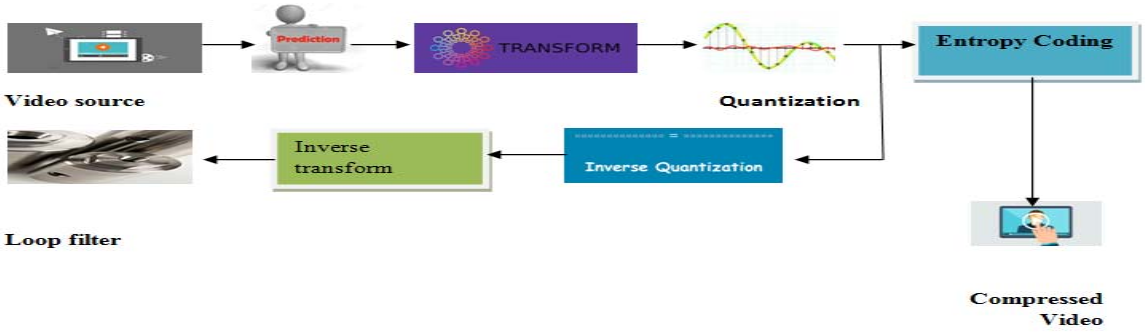

Figure 2: H.264 compression

The video is transformed and quantized at the encoder side and the uncompressed video is obtained at the receiver side by applying inverse transform.

The WMSN consist of nodes, it is interconnected to the base station. There are two types of architecture in sensor networks such as layered network architecture and clustered architecture. In the layered architecture where the entire design is divided into small portion and lower layer will provide the services to higher layer. In this clustered architecture the nodes are forms as group, the group of nodes transmit the data to the nodes which is selected as head and head cluster finally transmit the data to the base station. By this network architecture it shows layouts and how the nodes connected together.

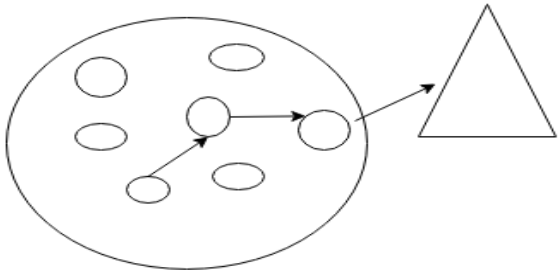

Figure 3: Layered Architecture

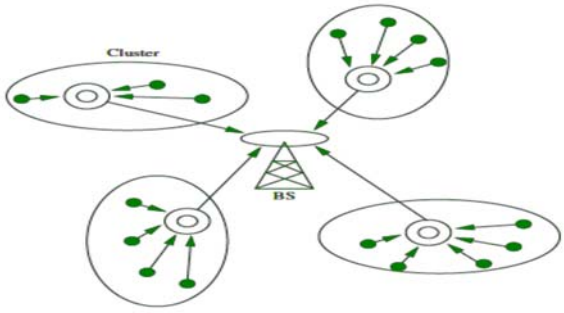

Figure 4: Clustered Architecture

The Fig: 3 shows the deployment of sensor node without any architecture and Fig: 4 shows the clustered architecture where data transmission done by cluster head. According to the design, the nodes are deployed because deployment of sensors node will be main issue in the sensor networks. The requirement of the application has to meet out by sensor

networks like, network connectivity issues, maximizing the sensing field and effectively utilize the energy of the sensor nodes.

IV. Cluster Based routing protocols:

In this routing method the nodes having high energy are selected as head, the data is received from the low energy nodes and head will transmit the data to another head located in the specific region. The cluster plays major of collecting the data from the nearby sensor nodes. The features of the cluster based routing protocol is enhancing the lifetime of the sensor, scalability; maximize the energy efficiency of the nodes the main drawbacks of this methods as additional overhead to cluster head, it will follow the direct transmission so that it will consume more energy, if the cluster head die then will not communicate with each other. Each probability of round the cluster head is selected based on the equation given below:

$$Pi(t) = \frac{K}{N - k(r * \bmod \frac{N}{k})} \quad \text{- - - - - - Eq. 3}$$

K is number of nodes, N is number of nodes in the cluster, r is the communication range.

V. Hierarchical routing protocol:

This routing method follows the 'Divide and Conquer' strategy. The entire region is divided into equal sized region and each region has own domain and router. Thus, the network is viewed at two levels: in the first level all the node having the information about the neighbor node and other routing regions have local algorithm to implement the routing method and the second level each section is considered as the single network , it is connected to network interfaces.

The Sensor nodes are arranged in hierarchies of different levels; For example, a city's local networks at one level, a country's cities at a higher level, and finally the network of all nations. Advantages of Hierarchical Routing:

- Storing of routing table size is less.
- Significantly fewer routing table calculations and changes.

Disadvantage:

- If network is designed based on the hierarchy method there is possibility to ignore the direct path from source and destination.

Location based routing protocol:

Location based routing protocol is the method of identifying the location of nodes using GPS and signal strength of the nodes. Facts about Location based routing protocol, first each node should know its own location, second node aware of the neighbor node and last source node find the shortest path to reach the destination node[3]. The two main algorithm proposed for location based algorithm one is GAF (GEOGRAPHIC ADAPTIVE FIDELITY) and second GEAR (GEOGRAPHICAL AND ENERGY AWARE ROUTING).The main advantages is cost value of each is less because it use location information of each node, it require less maintenance, it need less memory.

Meta-heuristic algorithm

The common physical-world problems have more risk, discontinuous process, interrelationship amongst variables and a large solution space. To overcome this issues introduced new method called Metaheuristic algorithms. The algorithms are called as optimization methods and are can able to produce best solution among the valuable amount of time. The purpose of optimization is to determine the best value for a set of variables in order to minimize (or maximize) an objective function while adhering to a set of constraints. This method plays important role in all aspects like financial and business planning, from industrial to automatic designing methods etc.

Energy Consumption of the node for transmitting k bits as follows:

$$P_{Tx}\, d = e_{amp}\, d\, 2k \quad \text{- - - - - Eq. 4}$$

k bits is energy consumption of received bits from a node is proportional to the receiver electronics energy per bit.,

Energy receiving of the node for transmitting k bits as follows:

$$P_{Rx} = e_{elec}\,(k) \text{ - - - - - - Eq. 5}$$

Table 1: Shows Different types' algorithm in each routing protocol.

Cluster Based routing protocols Algorithms	**Hierarchical routing protocol Algorithms**	**Location based routing protocol Algorithms**	**Meta-heuristic algorithm**
LEACH	APTEEN	GAF	Bat
HEED	PEGASIS	GEAR	Cuckoo
UCS			Jelly fish
TEEN			Ant colony
			Swarm intelligence

VI. Conclusion:

Compare to all networks, wireless multimedia sensor networks implemented for particular applications like military applications, radio signal tracking, chemical industry but this are not limited. The requirement of each application gets different features. The features and requirements are differing in all the applications. New communication protocols, algorithms, architectures, and services are required to accommodate this wide range of applications. In this paper surveyed the different methods to solve the issues in WMSNs. Here underline the feasible improvements method in research in each area. Many concerns surrounding WSN applications, including as communication architectures, security, and management, remain unresolved. In order to fill the gap between technology and application discussed all the methods to solve the issues in sensor networks.

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AI Detection Social Media Users Depression Polarity Score And Diagnose Using Auto Creative Therapy

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Abstract

Depression is regarded as the leading cause of worldwide disability and a leading cause of suicide. Clinical psychologists often diagnose sad persons via face-to-face interviews based on clinical depression criteria. Patients, on the other hand, often do not seek medical help in the early stages of depression. People are increasingly adopting social media to communicate their feelings these days. Sentiment Analysis (SA) is a computer tool for examining the polarity of emotions and ideas represented in a text. In the text, sentiment might be represented indirectly or openly. Several research on mental depression have shown that tweets written by people suffering from severe depressive illness may be used to diagnose depression. The potential for sentiment analysis to diagnose depression by analysing social media postings has sparked increased interest in this subject. We want to forecast sad individuals and quantify their depression severity using social media (Twitter) data in this study, which will assist in sounding an alert. A lexicon-enhanced LSTM model is proposed. The model initially leverages the sentiment lexicon as additional information before training a word sentiment classifier, and then extracts sentiment embeddings for all words, even those not in the lexicon. Word representation may be improved by combining the sentiment embedding and its word embedding. These characteristics are the outcome of a mix of feature extraction algorithms that use sentiment lexicons and textual contents to offer outstanding results in terms of depression identification.

Keywords: Sentimentanalysis,lexiconLSTM,social media tweet, depression Api phase

1.INTRODUCTION

Depression is a mental illness characterised by a continuous sense of melancholy and lack of interest, as seen in fig. 1.1. It affects how you feel, think, and act, and may lead to a range of mental and physical difficulties. It's also known as major depressive disorder or clinical depression. You may find it difficult to carry out day-to-day tasks, and you may believe that life isn't worth living.

Figure 1.1. Depression

1.1.1. Depression may be dangerous to one's health, particularly if it is recurring and of moderate or severe degree. It may make the individual suffer a lot and make them perform badly at job, school, and at home. Suicide is a possibility when depression is severe. Every year, more than 700,000 individuals commit suicide. In young people aged 15 to 29, suicide is the fourth highest cause of mortality[1]-[5]

1.1.2. Social Media

Social media is an online communication platform. Users may hold discussions, exchange information, and produce online content on social networking networks. Blogs, microblogs, wikis, social networking sites, photo-sharing sites, instant messaging, video-sharing sites, podcasts, widgets, virtual worlds, and other types of social media exist.

1.2. Problem Identified

People nowadays utilise social media sites such as Facebook, Twitter, Weibo, and WhatsApp extensively. These social media platforms have evolved into a platform for users to discuss their thoughts, feelings, and emotions with their family, friends, and other connected individuals. The users' everyday activities and mental states are reflected in their social media posting and sharing habits. One of the most significant distinctions between today's teens and young adults and previous generations is that they spend much less time in person socialising with their friends and far more time connecting online, mostly via social media.[6]-[10]

1.3. Sentiment Analysis

The method of assessing whether a piece of text is good, negative, or neutral is known as sentiment analysis. To give weighted sentiment ratings to entities, topics, themes, and categories inside a sentence or phrase, a sentiment analysis system for text analysis combines natural language processing (NLP) with machine learning methods. Sentiment analysis aids data analysts in major organisations in gauging public sentiment, doing detailed market research, monitoring brand and product reputation, and comprehending customer experiences. We attempt to identify positive, negative, and neutral sentiment levels from depression-related posts and comments made on social media sites in this study. Social media platforms like Facebook and Twitter are becoming more effective for aiding needy individuals who need extra attention or care in terms of mental health. Using deep learning, we attempt to formalise depression-related posts and comments into a succinct vocabulary database and determine the sentiment levels from each instance.

2. RELATED WORK

• Sentiment Analysis is a sophisticated text analysis tool that uses machine learning and deep learning algorithms to automatically mine unstructured data (social media, emails, customer care problems, and more) for opinion and emotion.

• Deep learning is a kind of machine learning that use numerous algorithms in a sequential sequence to solve complicated problems. It enables you to process large volumes of data correctly and with little human intervention.

CRM automation is widely utilised in direct marketing. It's a good idea to estimate the worth of potential direct marketing activities based on the customer's lifetime value.

2.1 Deep Learning use cases

Deep learning startups have had success using it to huge data for knowledge discovery, application, and prediction. Deep learning, in other words, may be a strong engine for providing actionable outcomes. • The power of deep learning may also be demonstrated in how it's applied to social media technologies. Consider Pinterest, which has a visual search feature that allows you to zoom in on a certain item in a "Pin" (or pinned picture) and find visually comparable things, colours, patterns, and more. Using a heavily annotated data set of billions of Pins collected by Pinterest users, the company's technical team employed deep learning to train its system how to detect picture attributes. The characteristics may then be utilised to choose the best matches by computing a similarity score between any two photos.

2.2 Natural language processing

Natural language processing is another hot issue, about which I published an essay. It may be found here. Negative sampling, word embedding, constituency parsing, sentiment analysis, information retrieval, spoken language comprehension, machine translation, contextual entity linking, writing style identification, and other applications are among the most common.

2.3 Customer relationship management

- It's often utilised in direct marketing to automate CRM. It's a good idea to multiply the value of potential direct marketing efforts by the customer lifetime value. Systematic recommendations
- Deep learning has been utilised in recommendation systems to extract significant characteristics for suggestions. It has been used to learn user preferences from a variety of areas..

3. PROPOSED SYSTEM

Propose a lexicon-enhanced LSTM model (LE-LSTM) that integrates sentimentlexicon into LSTM to capture additional word sentiment information. First, we pre-train a word sentiment classifier using sentiment lexicon as extrainformation. Then any word, even those not in the sentiment lexicon, may obtain its sentiment embedding. We concatenate the word embedding and its sentimentembedding as the input of the LSTM illustrated in fig 3.1 during the primary training phase and fine-tune the wordsentiment classifier network.

FIG 3.1 Lexicon Integration into LSTM Model

We initially apply a linear transformation on the lexical characteristics collected from datasets in order to retain the original sentiment distribution and have compatible dimensions for subsequent calculations. Later, the altered lexical characteristics are applied to the attention vector learnt in the baseline. Finally, all of the data is combined to provide the final projection.

Getting inspired is one of the most effective strategies to dig deep and conquer your obstacles. This module creates motivational phrases based on the osn user's depression level and motivates him automatically.

4. RESULTS AND DISCUSSION

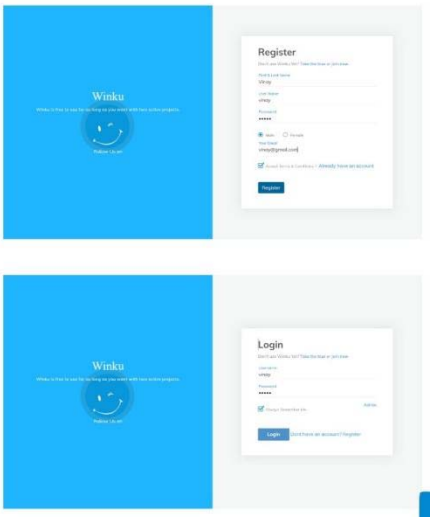

FIG NO 4.1 Register And Login

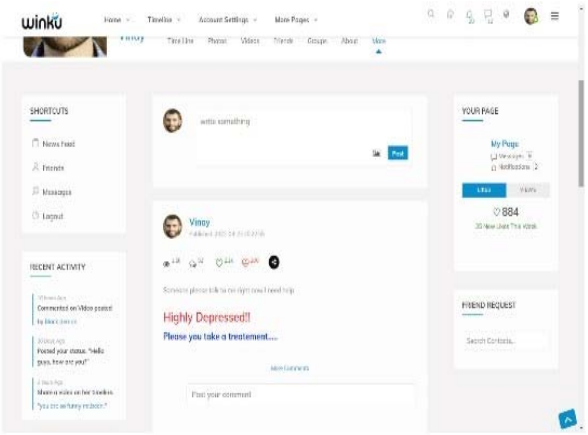

FIG NO 4.2 Alert Notification

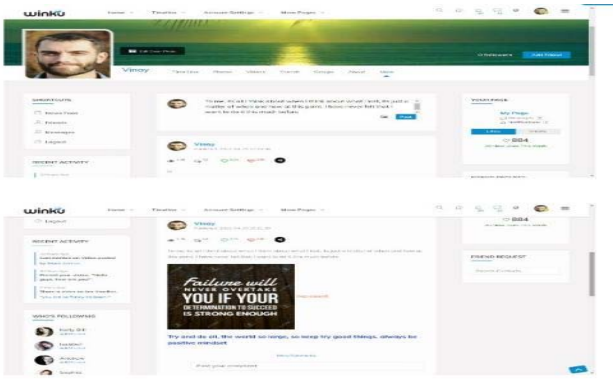

FIG NO 4.3 Motivational Quotes

It trains a shallow long short-term memory network to predict sad users and their depression intensities using the lexicon improved feature, as illustrated in fig 4. 1.Alert the most communicative osn user from their friends list (see fig 4) about their sadness level. 2.Automotivational loader automatically creates motivating quotations for the osn user and motivates him, as seen in fig 4.3.

5. **CONCLUSION**

For many sorts of positions, detecting and classifying depression levels is crucial. We provided a system for categorising depression levels using LE-LSTM algorithms in this study. We can acquire the sentiment embedding of each word by utilising the sentiment lexicon to train a word sentiment classifier. Concatenating the word embedding with its sentiment embedding as the LSTM input may improve sentiment analysis performance. The algorithms are intended to examine tweets for emotion recognition and the detection of suicide ideation among social media users.

6/ Future scope

Users of social networks may contact with their interested friends and share their thoughts, images, and videos that express their emotions, feelings, and sentiments. This opens up the possibility of analysing social network data for user emotions and sentiments in order to learn more about their moods and attitudes while using these online tools. The assessment takes a time-sensitive approach, rewarding early detections and penalising late detections. The potential for using language indicators in the research and diagnosis of depression is immense. Even without the use of complicated models, depression may be recognised in text quite rapidly. Visual analysis alone may reveal the difference between random Tweets and Tweets with depressed features simply by collecting, cleaning, and analysing accessible data. It is impossible to overestimate the value of language analysis in the field of mental health. You may get a good picture of a person's mental condition by analysing his or her speech. Even the most basic study of social media may provide us unparalleled access to people's thoughts and emotions, leading to much improved mental health knowledge and treatment. The results provide a new technique to identify and aid those suffering from depression.

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AIRep: AI and IoT based Animal Recognition and Repelling System for Smart Farming

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Abstract
Agriculture is becoming more automated, with technologies such as Deep Neural Networks (DNN) and the Internet of Things (IoT) being used to build complex tracking, monitoring, and control infrastructures. The successful management of interactions with non-agricultural ecosystem components, such as wildlife, is an important open challenge in this constantly changing environment. Preventing agricultural damage from wild animals is one of the key worries of contemporary farmers. Traditional solutions vary from the lethal (e.g., shooting) to the non-lethal (e.g., trapping) (e.g., scarecrow, chemical repellents,organic substances, mesh, or electric fences). Current techniques, on the other hand, often pollute the environment, which is harmful to people and ungulates, as well as being prohibitively costly, needing substantial maintenance, and prone to failure. In this study, we integrate artificial intelligence computer vision with deep convolutional neural networks to develop a system that can detect and recognise many sorts of animals, then employ ultrasonic emission suited to each species to keep them away. Edge computing devices can detect animals and activate the camera, then use deep convolutional neural network (DCNN) software to identify the target and interact with the Animal Repelling Module to tell it what sort of ultrasonic to emit in response.

Keywords: Animal Recognition, Repellent, Artificial Intelligence, Edge Computing, Animal Detection, Deep Learning, DCNN.

1.INTRODUCTION

Agriculture has gone through many revolutions, including the domestication of animals and plants a few thousand years ago, systematic crop rotation and other advances in agricultural practise a few hundred years ago, and the "green revolution" of the last several decades, which included systematic breeding and widespread use of man-made fertilisers and pesticides [1]-[4].

Figure 1.1. Agriculture and ICT innovation

2.RELATED WORKS

2.1.Smart Agriculture and Precision Farming Use Cases

Weeding using mechanical weeders

Weeds diminish agricultural output by obstructing light and nutrient intake, as well as providing bug shelter. As a consequence, farmers now have access to a tool that was previously unavailable: one that is not dependent on human labour.

We're going to attempt something new this year: mechanised harvesting.

Agricultural firms are losing money owing to inefficiency and delayed output due to a lack of automation. As a result, autonomous harvesting devices have been developed and are now commercially

accessible. The computer can determine if something is a fruit or vegetable, and then utilise the camera to give the arms picking instructions.

• Plant diseases may be discovered and recognised.

They identify illnesses using AI algorithms and assist agricultural enterprises in locating and treating contaminated areas.

AI algorithms for disease detection might be built into greenhouse cameras, drones, and other agricultural machines.

Farmers can respond to their crops before disease outbreaks turn disastrous, thanks to better disease detection.

Watering systems that are targeted and zero-waste efforts

Smart agricultural applications that employ IoT to increase productivity and efficiency include animal tracking, vehicle tracking, field observation, and inventory monitoring. Sensor data analysis is used in precision farming to make informed choices.

Smart mapping and sensing

Internal and exterior sensors are used by connected agricultural equipment to monitor the climate in real time. With the aid of these sensors, you can reliably monitor humidity, precipitation, and temperature. Farmers may use environmental data to assist them pick crop types that are best suited to their region's weather patterns.

• Monitoring fruit output and crop health

Sensors that assess soil moisture might help with water saving measures.

To handle data and monitor the state of crops and soil, deep learning algorithms and computer vision are utilised.

Predictive analytics [6] - [10] use machine learning algorithms to analyse acquired data and predict the influence of environmental conditions on agricultural yield.

3. PROPOSED WORK

DCNN employs artificial intelligence to recognise animal species and then uses focused ultrasonic emission to scare them away (i.e., different for each species). The design, implementation, and evaluation of an intelligent smart agricultural repelling and monitoring IoT system based on integrated edge AI that can recognise and discriminate between a broad range of animals and give ultrasonic sounds customised for each species. It's feasible that this integrated technology will help farmers and agronomists make better decisions and manage their operations.

The feat of animal recognition was accomplished using deep learning in the form of Convolutional Neural Networks (CNNs).

• DCNN DCNN DCNN DCNN DCNN DCNN

In the identification and categorization of images, Convolutional Neural Networks (CNNs) have shown to be quite successful. CNNs are feed-forward neural networks with several layers.

CNNs are made up of filters, kernels, or neurons, which include weights, parameters, and biases that the programmer may change. Each filter is a convolutional modification of the input signal that may or may not contain non-linearity. A standard configuration for a convolutional neural network is shown in Figure 3.1. Convolutional, pooling, ReLU, and fully linked layers are among the numerous layers that make up CNN.

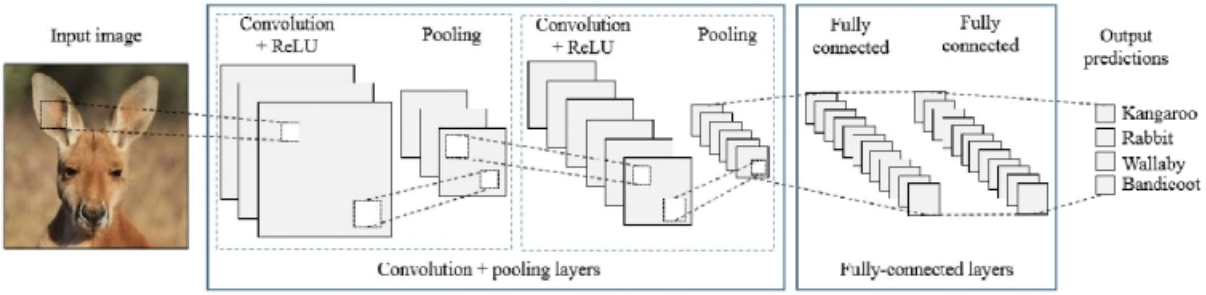


Figure 3.1.CNN

4. RESULTS AND DISCUSSION

This part creates a visual showing the accuracy and loss for each epoch during training and validation. The loss function is computed over all data items at each epoch, resulting in a quantifiable loss measure, however the curve shown after each iteration only represents the loss across a fraction of the whole

dataset.

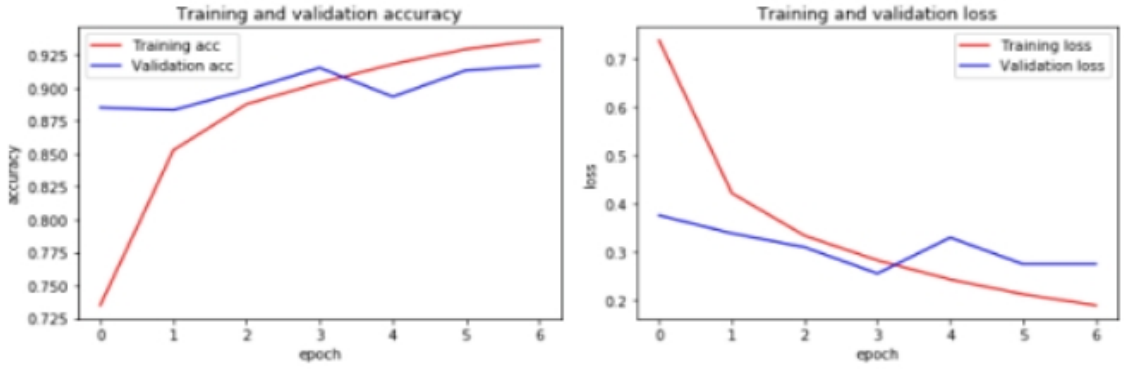


Figure 4.1. Training and Validation accuracy and loss graph

In studies, top-1 and top-5 accuracy on E2 were 80.6 percent and 94.16 percent, respectively, which is much better than the imbalanced dataset E1 (Fig. 7.2a). The accuracy of the combined CNN (Top-5) is shown against time in training and testing in Figure 7.2b.

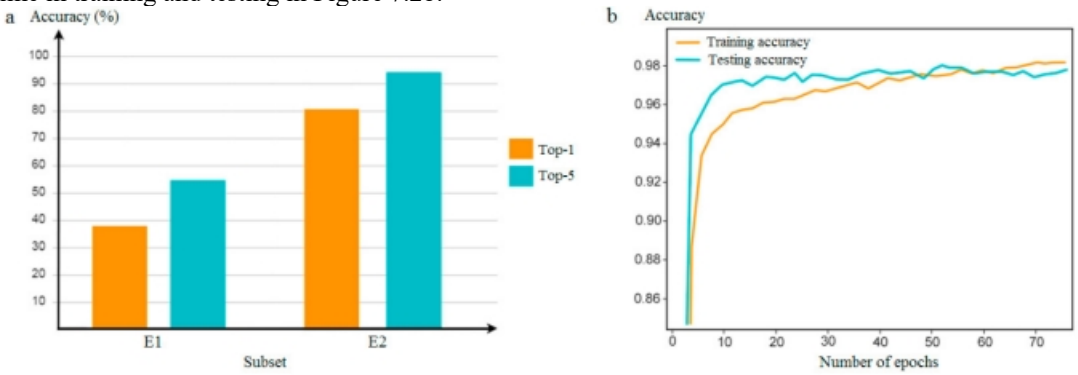


Fig.4.2. (a) accuracy of the joint CNN (Top-1 and Top-5) during training; (b) training and testing accuracy of the joint CNN (Top-5).

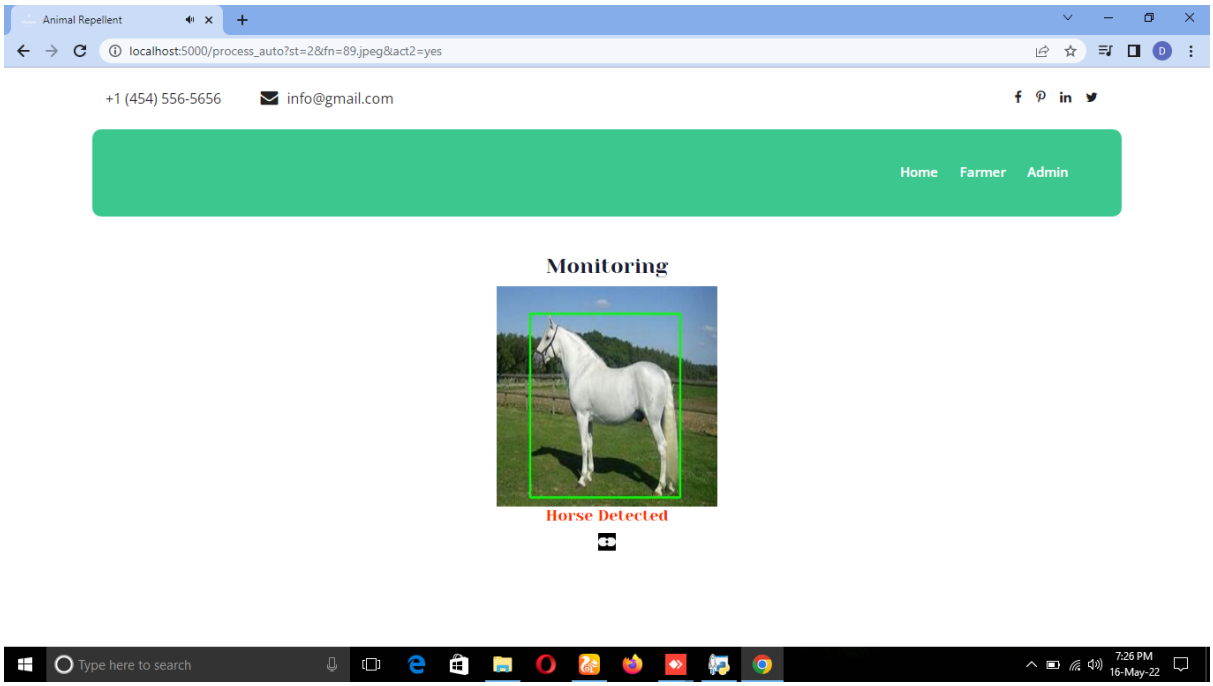
In the first attempt, a single-branch support vector machine was used instead of muzzle and contour information. The suggested combined CNN was executed in the second experiment according to the point-awarding criteria. Tables 1 and 2 demonstrate the average precision (AP), miss rate (MR), and false positives (FP) values for dataset E2 (FP).

Table 4.1.Animal recognition results using a single branch SVM.

Animals	**AP, %**	**MR,%**	**FP,%**	**Animals**	**AP, %**	**MR,%**	**FP,%**
Goat	78.83	12.2	11.3	Goat	76.52	8.4	16.3
Cow	80.64	9.4	14.8	Cow	81.3	7.8	12.5
Elephant	73.88	15.1	18.6	Elephant	75.54	14.2	17.9
Deer	76.74	13.7	17.4	Deer	69.88	19.6	22.4
Horse	80.91	8.9	16.1	Horse	63.85	24.2	26.9
Pig	79.72	8.1	18.2	Pig	79.21	16.3	18.7

Table 4.2.Animal recognition results using the joint CNN.

Animals	**AP, %**	**MR,%**	**FP,%**	**Animals**	**AP, %**	**MR,%**	**FP,%**
Goat	83.37	10.7	9.7	Goat	81.93	6.9	14.4
Cow	84.29	9.1	13.2	Cow	85.69	7.1	10.8
Elephant	79.13	12.4	16.3	Elephant	79.14	12.3	14.7
Deer	80.21	11.8	16.5	Deer	75.35	18.6	19.8
Horse	84.9	7.9	12.9	Horse	69.52	21.6	24.8
Pig	83.07	8	15.6	Pig	81.23	14.9	17.2



5. CONCLUSION

In the agriculture business, farm security is becoming more popular. An Animal Repellent System is created to employ sound and light to frighten the animals away, and a vision-based system is constructed using Python and OpenCV. If an animal is identified, the edge device uses its DCNN Animal Recognition model to identify which kind of ultrasound to emit and then sends that information to the AnimalRepelling Module. This study gave the first example of a real-time monitoring system driven by AI for analysing animal-caused crop damage. This kind of technology might help agronomists and farmers operate their businesses more efficiently.

6. FUTURE ENHANCEMENT

In addition, as previously mentioned, the suggested architecture may leverage numerous picture compression algorithms to minimise notice delivery time.

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AI-Powered Smart Glasses for the Blind and Visually Impaired

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Abstract

Vision is one of the most crucial human senses, because it helps us perceive our surroundings. However, millions of individuals throughout the globe suffer from vision loss. They are having difficulty navigating their everyday lives because they are unable to detect impediments in their environment, and one of their biggest challenges is identifying people. Other than automation, object detection is used in a variety of applications that have yet to be fully explored. This project includes one such application that employs detection to assist visually impaired individuals in identifying items ahead of them for safe navigation, as well as a face recognition system with aural output that may help visually impaired people recognise known and unfamiliar people. Speakers would provide them with voice-based assistance. We used a deep learning-based Faster Region-Convolutional Neural Network (Faster R-CNN) to identify and recognise humans and objects in the environment in this study. The Faster Region Convolution Neural Network technique processes and classifies the picture taken by the camera. The audio jockey receives the detected picture as an audio input. As a result, this model aids visually impaired persons in a more comfortable manner than white canes.

Keywords: VisualImpairment,Objectdetection,Faster Region Convolutional Neural Network,Audio Jockey.

1. INTRODUCTION

"Visual impairment" is a wide phrase that refers to any degree of visual loss that interferes with a person's ability to carry out everyday activities.

Types of Vision Impairment

Vision impairments are defined differently in different nations. Visual impairment is classified by the World Health Organization (WHO) based on two factors: visual acuity, or clarity of vision, and visual fields, which is the region from which you can detect visual information when your eyes are fixed and gazing directly at an object.

The SnellenChart is a visual acuity test. Two values are used to compute your visual acuity. The first value represents the distance between the reader and the chart.

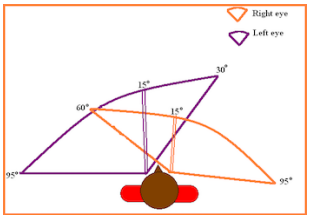

Figure.1.Snellen Chart using for calculating distance to opposite object

The second figure is how far a person with normal vision would have to stand from an item to view what you saw at 20 feet. A visual acuity of 20/80, for example, indicates you can see the chart from 20 feet away as well as someone who can read it from 80 feet away. In other words, you won't be able to see what a person with normal vision would see from 80 feet away until you get closer to just 20 feet away. This illustration depicts how the visual fields are formed by crossing the eyes [1]-[5].

2. RELATED WORK

Apart from providing a helping hand, assistive technology adapted with AI, material engineering, and robotics offers a number of ground-breaking instances that aid the physically crippled, intellectually challenged, and disabled.

• Visual Aids Powered by AI

Microsoft's Seeing AI software for persons with vision impairment has already been published. This software allows the user to hold their phone up to a person and have the phone describe their appearance, hair colour, age, if they seem happy or unhappy, and so on. You can learn what a product is, when it expires, and other information by pointing your phone at it. In addition, the software can read texts and detect structure components like paragraphs, headers, and lists.

• Glasses with Intelligence:

Smart glasses are currently in the early stages of development and are projected to enter the market in 2020. Smart glasses are equipped with augmented and virtual reality contrast lenses, allowing individuals to use them instead of glasses or contact lenses. These glasses assist people concentrate on a specific point of focus by allowing them to converge and diverge light beams. Both neuroscientists and computer vision experts at the University of Oxford are working on this technology to make it the greatest of its type.[6]-[10]

• Hearing Aids with Cognitive Functions

Hearing aids have been around for a long time. However, cognitive hearing aids are a dream accessory for everyone. These sophisticated intelligent hearing aids may tune in with brain waves to understand what a someone wants to hear at a certain moment depending on their mood swings, in addition to assisting with hearing. Its capacity to read people's minds and respond accordingly is what sets it apart. This implies that whether numerous individuals are speaking at the same time or if another kind of voice is dominant, the gadget may monitor and adjust the user's brain and silence all other sounds except what the user wishes to hear.

Text To Sign

Sign language is mostly used by those who are deaf or hard of hearing. However, not everyone is fluent in this language, since many people throughout the world are unaware of half of the signals used to communicate. As a result, firms all around the globe are developing prototypes that can transform sign language into text or speech that the communicator and receiver can comprehend. The gadget has a 3D camera that tracks, analyses, and interprets a person's signing motion in order to transmit it to others. This device's beta version is now on the market, and it can accurately understand messages with 98 percent accuracy. At both a personal and professional level, the combination of artificial intelligence, machine learning, and robots is changing assistive technology. The improvements in this technology are allowing the physically and intellectually challenged to live a normal life, as well as offering healthcare facilities with sophisticated systems to maximise patient treatment as soon as possible. Collaboration between human and machine intelligence may improve healthcare results in the future.

Machine learning (ML) is a powerful method to artificial intelligence (AI) that is aimed to create patterns from data and is becoming more prevalent in our everyday lives. ML procedures are designed to anticipate how various entities will behave in the future, enabling choices to be made based on those predictions.

3. **PROPOSED SYSTEM**

The project's planned solution aims to build and construct a Smart Electronic Glass that would aid visually challenged persons in identifying faces and things.

Face Recognition and Object Detection is a computer technique that deals with finding instances of semantic items of a certain class (such as individuals, buildings, or vehicles) in digital photos and videos. Face recognition and object detection are two disciplines that have seen a lot of progress. Face identification (used by Facebook to distinguish individuals), tumour detection (used in medical disciplines), and other applications utilise it. Object recognition problems have gotten substantially easy and efficient with the introduction of deep learning in computer vision.

Deep learning models outperform prior computer vision algorithms in terms of accuracy, time consumption, complexity, and overall performance. Deep learning outperformed previous computer vision approaches for object identification, leading to widespread use of deep learning models.

One of the most effective object identification algorithms (deep learning) is:

1. RCNN (Region-based Convolution Neural Network)
2. Rapid RCNN
3. Improved RCNN

R-CNN uses selective search to extract a number of areas from a given picture, and then evaluates whether any of these boxes contain an item. We first extract these areas, then utilise CNN to extract particular characteristics for each region. These characteristics are then utilised to detect things. Unfortunately, because of the various phases involved in the process, R-CNN becomes rather sluggish.

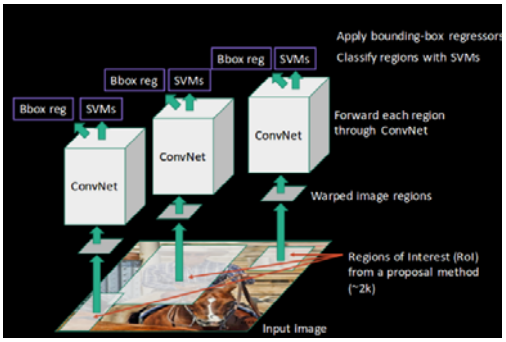

Figure.2.Fast Region-convolution Neural Network (Fast-RCNN)

In contrast, Fast R-CNN sends the full picture to ConvNet, which creates areas of interest (instead of passing the extracted regions from the image). It also employs a single model that collects features from the areas, classifies them into distinct classes, and outputs the bounding boxes, rather than three independent models (as shown in R-CNN) is shown in fig.2

All of these stages are completed at the same time, making it quicker than R-CNN. When applied to a big dataset, however, R-CNN is not quick enough since it employs selective search to extract the areas. Is shown in fig.3.

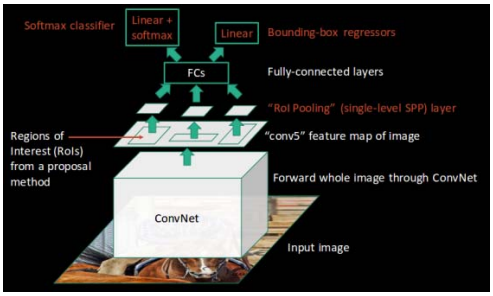

Figure.3.Faster Region-Convolution Neural Network(Faster-RCNN)

4. Results and Discussion

The sensor captures the picture of the opposing item, similar to a human face detection module. The image of a face is classed as a known or unknown person or an object. The training classified result and the test Live Cemara Captured Classified file are matched in this module. If a process data is triggered during processing, speech synthesis is utilised to warn the user, for example, by creating the word "stop." The audio for "Hi Ram" has been released is shown in 4 and 5.

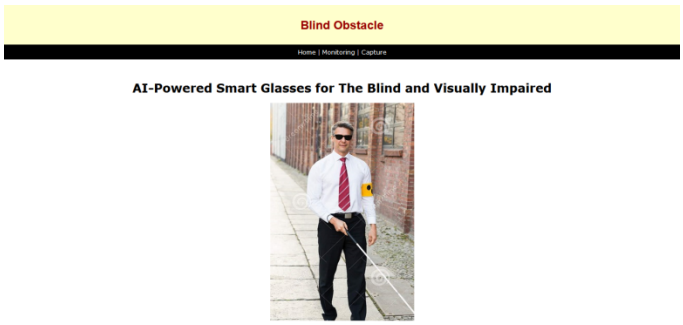

Figure.4.SmartClassforblindpeople

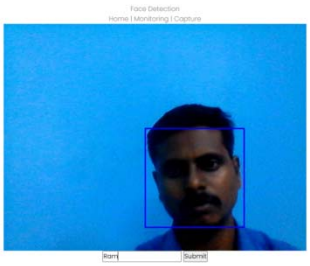

Figure.5.Image intentifing for known or unknown person

5. Conclusion

The item on display is a smart glass that combines the capabilities of a machine vision and obstacle detection and identification sensor. It can be easily promoted and made accessible to those who are visually impaired. It would also aid in the prevention of future injuries. Smart devices may be easily carried, and the system camera can monitor things and faces in the area and show them in audio format. Each model denotes a distinct job or mode. The user may execute the chosen task separately from the other tasks. The system's design, functioning mechanism, and principles, as well as certain experiment outcomes, were addressed. Allow visually impaired persons to engage more intimately with others around them without worry of their vision becoming clouded and hazy.

6. Future Work

Although it is still a prototype, our system represents a promising avenue for future research aimed at enhancing the spatial awareness of visually impaired people traveling in unfamiliar environments.

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Secure Sharing Military Information Using Image, Audio and Video With Steganography

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ABSTRACT

In the dispersed network environment, security is a crucial prerequisite for an information society. Individuals, corporations, and governments are all using various methods to safeguard their personal or military information. This method is also unusual in that the original military data may only be examined by authorised personnel who have the key to decrypt the files and extract the information buried in images, sounds, or videos. This technique used military secret data to safeguard information more effectively than previous methods.

Keywords: Security Information ,Discrete Wavelet Transform (DWT) , Least Significant Bit (LSB) , Steganography.

1. INTRODUCTION

The security of information has been one of the most essential aspects of information technology and communication since the birth of the Internet. Cryptography was presented as a mechanism for ensuring communication confidentiality, and many various methods for encrypting and decrypting data have been devised to keep the information secret. Unfortunately, it is not always enough to keep the contents of information secret; sometimes it is also required to keep the information's existence hidden. Steganography is the term for the method utilised to do this. In this paper, we offer a novel data-hiding system based on a variety of picture, audio, and video-hiding approaches and algorithms. [6]-[7].

Steganography is a kind of encrypted communication that allows for private and secure communication. It has a wide range of applications, including audio-video synchronisation, copyright management, television transmission, military use, and digital watermarking. Broadband internet connections allow for practically error-free data transfer, allowing individuals to share big multimedia files and duplicate them. Sensitive communications and information are sent over the internet in an unsecured format, yet everyone has something to keep hidden. The goal of steganography is to conceal hidden data within the cover medium while maintaining the cover medium's overall quality [8]-[10].

Actual information is not kept in its original format in steganography, but rather changed such that it may be concealed within a multimedia file, such as a picture, video, or music. The modern industries mostly want digital watermarking and audio and video steganography finger printing. We can preserve our secret data since the steganography stays intact throughout transmission and transformation. This is accomplished by converting the picture to a bit stream, which is then embedded in the changing frame. Because cybercrime is now reported so quickly, steganographic solutions must be as effective and safe as possible so that crimes may be reduced. For data and information security, cryptography and steganography should be integrated. [11]-[12].

Video steganography may be accomplished in two ways: by storing data frame by frame or by transforming frames to frequency domain and then storing the result. The first method is similar to spatial domain, whereas the second method is similar to frequency domain. Video steganography may be classed into two forms depending on the technique used for steganography: lossless and lossy steganography. Lossless steganography allows both the hidden information and the original video file to be recovered without error or alteration, while lossy steganography allows the hidden information to be retrieved properly but the original video to have flaws. [13]-[14].

Lossless steganography necessitates the storage of hidden data in a specified area and will take some time to execute the algorithm in order to locate the precise spot where hidden data may be put. As a result, the lossless technique is getting more difficult to apply in real-time applications, and this is dependent on the system requirements. Data must be stored at some LSB position or at particular pixel places in lossy steganography. This is simple to create and may be used in real-time with any standard system specs. The data is hidden using the LSB (Least Significant Bit). The index frame is the initial frame, and it comprises information such as where the information is saved, in what form it is stored, what file type it is stored in, and so on. It is quite straightforward to extract concealed information from steganography video [15] if the first frame is correctly received and the recipient recognises the information.

Because videos have a greater sample number of pixels or the number of transform domain coefficients than still images, they have more capacity and can hold more data. Also, because of their temporal aspects, videos have several qualities that are not seen in pictures, such as perceptual redundancy.

2. RELATED WORKS

Steganalysis technology is being developed using classic picture steganography. Because the hidden embedding approach affects the naturalness of the cover picture, audio, and video, it has certain security flaws. Figure 1 shows a coverless image steganography (CIS) system for selecting hidden pictures to circumvent this challenge. [1]

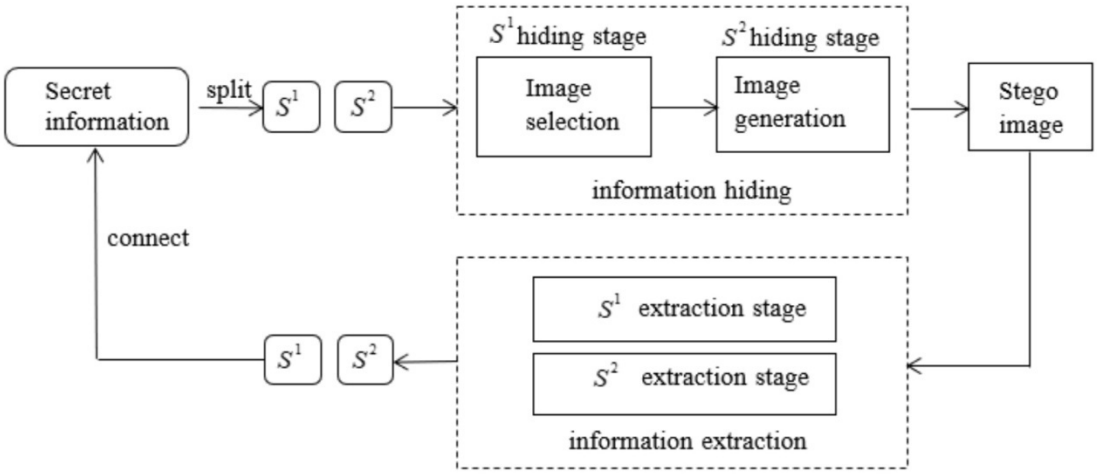

Figure.1.**The Flowchart of the Existing CIS Method.**

Steganography ensures the imperceptibility of secret messages hidden between the covers. Deep learning-based steganography, unlike classical steganography, provides an adaptable and generalised architecture that does not need knowledge in the embedding process. Most steganography algorithms, however, use photos as the cover instead than videos, which are more expressive and widely distributed. An encoder, a decoder, and a discriminator network are used to create a multi scale down-sampling feature extraction structure. Furthermore, a CU (Coding Unit) mask constructed from a VVC (Versatile Video Coding) video is first added to aid the network's learning capabilities. [2]

Steganography has gained popularity in recent decades owing to its capacity to transfer data invisibly. Steganography uses text, picture, audio, and video to hide hidden information. The quantity of hidden information drawn by video steganography is increasing. Also covered is the possibility of encryption systems. Different steganography approaches are classified as early embedding, middle embedding, and delayed embedding, depending on the time data is embedded. [3] Many video steganography algorithms based on the intra-prediction mode (IPM) have recently been developed. The majority of these algorithms are concerned with mapping rules and distortion functions. Because the steganography algorithm must first figure out how much cover is lost. This work proposes a new secure video steganography based on unique embedding algorithms to circumvent this difficulty. Video encoding is paired with video steganography. Then, during intra-prediction encoding, each qualifying block is evaluated and a one-bit message is inserted. Experiments show that our approach provides strong security while having minimal influence on video quality. [4]

To create stego video, we suggested three safe steganography methods that insert a bit stream of the secret message into the approximation coefficients of the Integer Wavelet Transform (IWT), DWT, and the LBP technique. The Mean Square Error (MSE) and PSNR are used to calculate the geometric difference between the cover and stego videos. The new findings reveal that the suggested algorithms may conceal a secret message with a large payload capacity while maintaining a high degree of security and invisibility. [5]

Hybridization of DWT with LSB is employed to determine the optimal bits from the cover movie for inserting the secret data in this study for picture decomposition. This research proposes an end-to-end deep learning network for audio and video steganography to achieve this goal. Artificial intelligence is employed to incorporate the secret data for the development of optimal pixels, and an artificial neural network is used as a classifier to categorise the appropriate areas in the cover data. When compared to previous work, the suggested study has demonstrated to be superior. [6]

3. PROPOSED WORK

The proposed work would use Discrete Wavelet Transform (DWT) compression, Least Significant Bit (LSB) replacement, and AES to hide information in certain frames of the. Because of the enormous size and memory requirements, the suggested technique employs picture, audio, and video based steganography. The text may be hidden in three different ways: picture, audio, and video steganography. Large audio files will be supported by the proposed technology. When uploading huge audio recordings, they will be divided into many parts and hidden in separate cover files. Frames are created from the video. Every 0.05 seconds, frames are divided. The frames are then compressed using the DWT Haar compression method. Select the frame that will be used to conceal the audio data. The audio data is then hidden in the specified frame using the LSB insertion method. The frames are decompressed using inverse DWT compression after data embedding. To create the steganographed video, the frames are reassembled. This video will be identical to the original. However, there will be little modifications. Human eyes are unable to detect this. This will be delivered to the recipient. The receiver may extract several sections of an audio file and combine them into a single audio file. The video will be divided into frames and compressed using DWT compression by the receiver. Each pixel in the steganographed frame will now have its LSB extracted. Gather all of the parts and turn each one into a character. This will separate the concealed audio data from the actual video. The suggested strategy is put into practise in real time, and the performance indicators are assessed. Figure 2 shows an architectural diagram.

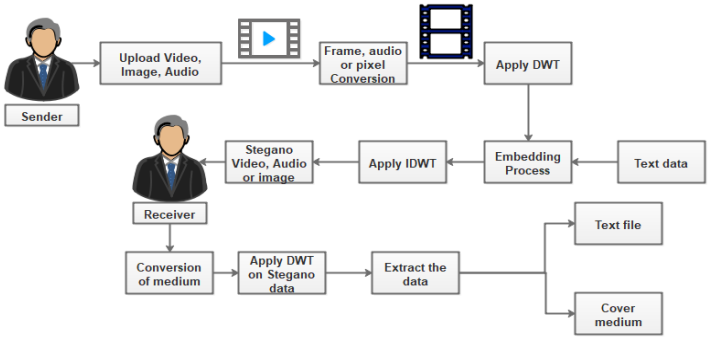

Figure.2. Architecture Diagram

ADVANTAGES

- DWT mechanism assures complete security of the secret image, video and audio.
- LSB achieves high embedding capacity compared with other data hiding techniques.
- Computational complexity is low.

4. RESULT AND DISCUSSION

1. Select the video file and frame to conceal the secret messages, then produce the secret keyword as shown in Figure 3.
2. The receiver gets the video containing the secret message and opens it with the appropriate software, then unhide the secret message using the supplied keyword (see fig. 4).

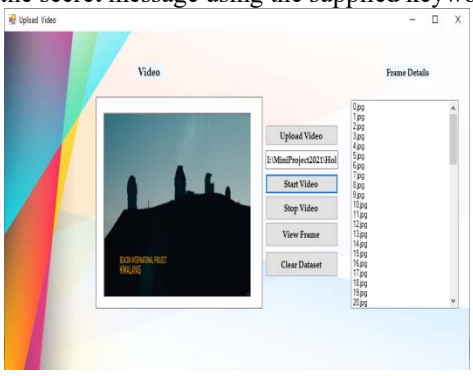

Figure.3. Sender

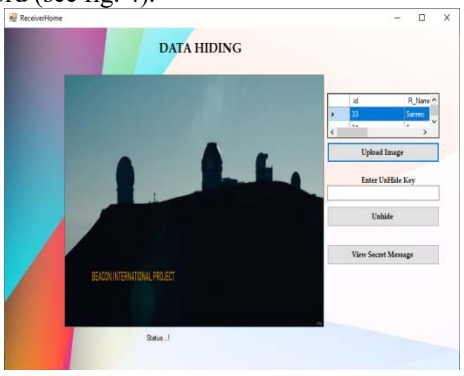

Figure.4. Receiver

5. CONCLUSION

To conceal data in picture, audio, or video format, a variety of steganography methods are available. DWT Haar compression and LSB substitution are employed in our method. A large audio file has been divided into many sections. The data is hidden using a special key. That exact key is also used to store data as a frame backdrop. Once the recipient has received the stegno video, combine the shares. The method described above is used to conceal data inside a picture, audio, or video file, resulting in a reliable and secure method of data transport. The suggested embedded video steganography provides a number of benefits, including ease of use, a simple and effective technique for embedding hidden messages, and increased security.

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GeoBox: Data Loss Prevention System using Location Defined Network

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Abstract

These days, companies and organisations want the greatest data exchange and access capabilities. Remote working and mobile access to resources and collaboration platforms make data and resources more accessible from anywhere and at any time. Employees want to be able to access documents and email from a variety of devices and places at the same time. Businesses are constantly at risk from untrusted network access. This might lead to data loss and overexposure of sensitive information. To address the shortcomings of logical security mechanisms, security mechanisms that interact with the physical environment have been developed, which coincides with the development of cyber-physical systems. To protect the security of a company's data and resources. We propose an innovative Virtual Fence that leverages location data and geospatial intelligence in this project. Understanding, insight, decision-making, and prediction are all aided by geospatial data analysis. The visualisation and analysis of geographical data is used to obtain location intelligence (LI). Then, using the location-based cryptosystem, we strengthen the security of data access in Data Server for a firm or any other specified place. Within a company, Virtual Fence may be used to safeguard critical information. Off, On, Restricted View, or Read Only are the options. Once a geo-fenced border has been established, firms' options are only limited by their imagination. The key advantage of putting up a geo fence like this is that it prevents data leaking. No one can access data from a different network location/device after the trusted network locations have been specified. The experiment demonstrates that our approach can be used in real-world situations.

.

KEYWORDS: VirtualFence,GeospatialData,GeospatialIntelligence,Cryptosystem,GeoFence,Boundary Data Sharing,Security,Location Intelligence.

1. INTRODUCTION

The delivery of various services through the Internet is known as cloud computing. Data storage, servers, databases, networking, and software are examples of these resources, as illustrated in fig 1.1. Both public and private clouds are possible. For a price, public cloud services deliver services via the Internet[1]. Private cloud services, on the other hand, cater to a limited number of customers. These services are a network system that provides hosted services. A hybrid option is also available, which includes components of both public and private services. Cloud computing is the use of computer technology (computing) in conjunction with Internet-based development (cloud). Google Apps, for example, offers common business apps online that can be accessed through a web browser and save software and data on the server[2].

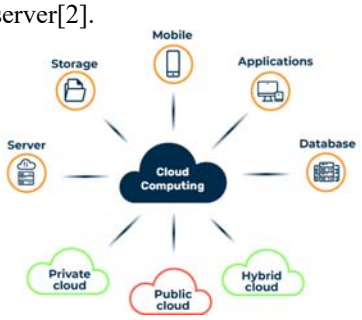

Figure 1.1. Cloud Services

1.1 Geospatial Intelligence

A Geo-fence is a feature that creates a virtual perimeter around a physical location. When a person enters or departs the boundaries of a certain region using a location-enabled device, actions are often triggered[3]. In most cases, the user will get a message with specific information that supports its real-time position.

The fundamental benefit of this technology is that it allows the virtual and real worlds to merge. We employ Geofencing in a number of initiatives, primarily in the health sector.

1.2 Geofencing

Geofencing is a location-based service in which a mobile device or RFID tag enters or departs a virtual boundary set up around a geographical area, known as a geofence[4], and an app or other software utilises GPS, RFID, Wi-Fi, or cellular data to trigger a pre-programmed action.

A geofence may activate mobile push notifications, trigger SMS messages or alerts, send targeted adverts on social media, monitor car fleets, block particular technologies, or offer location-based marketing data, depending on how it is designed.

Some geofences are used to monitor activity in secure zones, enabling management to get notifications when someone enters or exits the area[5]. Businesses may also utilisegeofencing to keep track of business property, monitor personnel in the field, and automate time cards.

1.3 How geofencing works

An administrator or developer must first create a virtual border around a specific area in GPS- or RFID-enabled software before using geofencing. When designing a smartphone app, this may be as easy as a circle drawn 100 feet around a place on Google Maps, as defined using APIs. When an authorised device enters or quits that region, the virtual geofence will trigger a reaction, as set by the administrator or developer..

2. RELATED WORK

Geofencing has been a regular practise for many firms as mobile devices have grown in popularity. Once a geographic region has been identified, the possibilities for what businesses may do appear limitless, and it has proven particularly popular in marketing and social media.

Other popular geofencing uses include:

• Social networking: Popular social networking applications, most notably Snapchat, are one of the most well-known uses for geofencing. Geofencing allows users to create location-based filters, stickers, and other shared content. It's all owing to these virtual perimeters, whether you're using a promotional filter at a concert, a custom-made filter for a friend's birthday, or posting to public, location-based stories.

• Marketing: Aside from social media, geofencing is a popular technique for companies to conduct in-store promotions by notifying you as you approach the shop. Businesses may also use geofencing to target advertising to a particular audience and determine which methods perform best based on user location data.

• Audience engagement: Geofencing is utilised to engage large audiences at events such as concerts, festivals, and fairs. A music venue, for example, may utilise a geofence to crowdsource social media postings or transmit venue or event information.

• Smart appliances: As more of our appliances become "smart," with Bluetooth capabilities, programming your fridge to warn you that you're out of milk the next time you pass by the grocery store is simpler than ever. You may also use a geofence to ensure that the thermostat is set to the right temperature when you arrive home from work.

• Human resources: Some businesses use geofencing to track personnel, particularly those who work off-site in the field. It's also a simple method to automate time cards, checking in and out workers as they arrive and go.

• Telematics: Companies may use geofencing to create virtual zones around locations, work spaces, and secure areas in telematics. They may be activated by a vehicle or a person, and they provide alerts or warnings to the driver.

• Security: Geofencing may seem intrusive, and it definitely has the ability to feel that way depending on how it's implemented. Geofencing, on the other hand, may be utilised to increase the security of your mobile device. You may, for example, arrange your phone to unlock when you enter or leave the house using a geofence, or to get notifications when someone enters or departs the property.

• Defence, Research, and Finance: IT may verify that devices deployed in finance, defence, or research are non-operational outside of the defined geo-fence by assigning geo-fences to them. IT may set different geofences for distinct regions of operation using an MDM application, and the device can become outdated outside of the geofences. The device is informed every time it enters or exits the geofence, allowing them to follow its whereabouts and check for any compliance issues. This keeps vital data on the device safe at all times and prevents access outside of approved areas.

• Delivery Executives: Assigning certain delivery executives to specific locations. By setting geo-fences to delivery executives, you may typically achieve maximum efficiency by avoiding having numerous delivery executives assigned to the same geographical region.

• Schools:E-learning is being increasingly widely used in schools to improve the training experience for college students. Setting geofences on school-owned devices removes the risk of pupils taking them home and exploiting them for personal gain. Geo-fences protect devices while also enforcing their intended use.
IT may implement numerous device restrictions for diverse geo-fences for remote and travelling employees. Wi-Fi setups and other settings particular to the business location are included in these device regulations. This allows employees to connect and work from numerous office locations without requiring IT assistance.
• Fleet Management: In logistics and transportation, devices with geo-fencing may assist in tracking the whereabouts of vehicles in the shortest amount of time. This guarantees prompt assistance in the event of a breakdown, as well as device and vehicle security. When diversions or slowdowns occur, geofencing is employed to aid the algorithm in making choices to redirect freight.

3.PROPOSED WORK

The Geo Server authentication and authorisation subsystems will be introduced in this project. Check out the many identity suppliers, such as Geo fence borders, MAC (Media Access Control), and IP (Internet Protocol), as well as offering examples of custom authentication plug-ins for Geo Server, integrating it into a home-grown security architecture. When data is tried to be opened outside of the geo fence, this system produces the victim file to wipe away the data..

3.1 Virtual Fence

The proposal calls for a Geo-fencing (geofencing) is a software feature that defines geographical limits using the global positioning system (GPS). Different methods, such as Ray-casting, Winding Number, TWC (Triangle Weight Characterization), and Circular Geofencing utilising the Haversine Formula, may be used to determine if a person is inside a geofence range. When someone enters or departs a certain region, a geofence alert is sent to the server. When data is tried to be opened outside of the geo fence, this system produces the victim file to wipe away the data.

3.2 Geospatial Intelligence Technology

Geo-fencing (geofencing) is a software feature that uses the global positioning system (GPS) or radio frequency identification (RFID) to define geographical boundaries. Geo-fencing allows an administrator to set up triggers so that an alert is issued when a device enters (or exits) the boundaries defined by the administrator. Virtual geofence barriers may be active or passive.

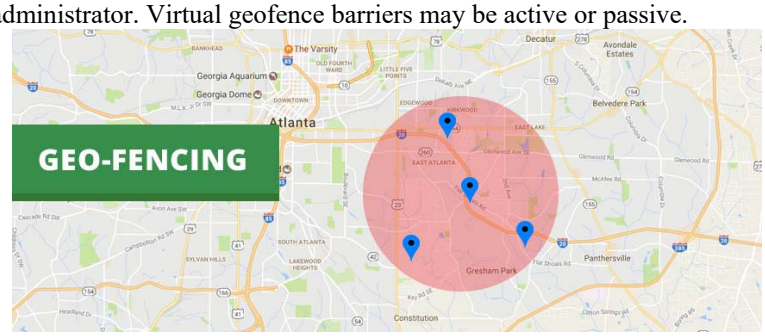

Figure .1.Geo-Fence Area

End users must opt-in to location services and have a mobile app open to utilise active geofences. Passive geofences are constantly on and function in the background, relying on Wi-Fi and cellular data instead of GPS or RFID. Geofences may be set up anywhere in the globe on mobile, tablet, and even desktop computers is shown in fig 1.

4. RESULTS AND DISCUSSION

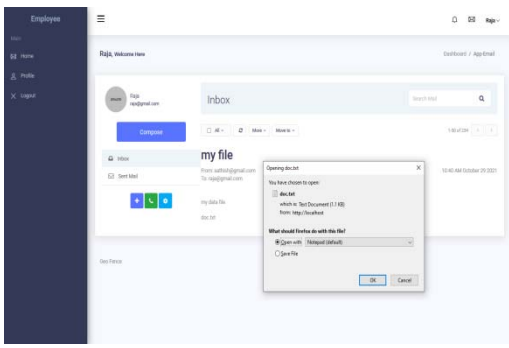

Fig..2. Geo fence corrupted data file

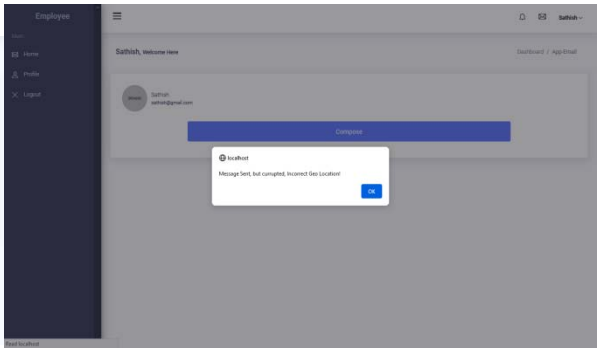

Fig.3. Geo fence readable data file

This is a software feature that leverages the global positioning system to determine geographic boundaries. When data is tried to open outside of a geofence range, the system produces the victim file to wipe away the data displayed in fig.2. Scrap the system and data displayed in fig. 3.if you don't care about anything else.

5. CONCLUSION

We established a unique location-aware architecture for data security in this project, which allows employees to participate without compromising their geographical privacy. Before employees assent to a job, we identified geo fencing as a necessary step to guarantee that data privacy is safeguarded. We offered methods and improvements for selecting efficient geo fence zones with little overhead and a high job assignment rate. It also creates the victim files; it checks the geo-fencing border values automatically and wipes away the system and files if the geo-fencing and MAC Address are out of sync.

6. FUTURE WORK

We want to consider more elaborate regulations in the future to capture additional privacy considerations than location. We also advocate on using this strategy with prominent email service providers. Geofencing should be used with care, particularly when it comes to marketing privacy. Massachusetts was one of the first states to pass a consumer protection legislation prohibiting the use of location-based advertising only last year. Copley Advertising, which was contracted by a Christian group to put up a geofence around women's health facilities and target women in the waiting area or adjacent with anti-abortion commercials, was barred by the Attorney General.

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SatChain: GEO Network Security Mechanism based on Blockchain and QKD Protocol

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Abstract

With the convergence of terrestrial wireless and satellite communications, the sixth generation (6G) networks are projected to create a completely linked world. Data processing capacity is minimal, storage and security are constrained due to satellite physical limits in terms of available power and area, and the data may be exposed to alteration or contamination by intruders. Since satellite communication has become more crucial in the development of global communication networks, there have been worries regarding its security. It's difficult to keep a satellite network safe from unauthorised data access while still making efficient use of storage capacity. In this project, a satellite communication network is suggested using blockchain technology and the QKD protocol, which is based on authentication and privacy protection. An architecture comprising of both traditional and limited devices linked to the blockchain through a wireless heterogeneous network has been built to achieve this goal. Registration, authentication, and revocation are used to carry out the communication. The satellite will send the acquired data to the terrestrial base station, which will record all key parameters on the distributed blockchain and delete any rogue node certificates from the blockchain. The proposed satellite-based Blockchain and QKD system offers a high degree of security for future 6G and beyond networks, the Internet of Things, self-driving vehicles, and other rapidly evolving applications.

Keywords:6G Networks,QKD,Blockchain,Satellitecommunication,Wireless network

1. INTRODUCTION

A satellite is a spacecraft that circles another object. Natural and man-made satellites are the two sorts of satellites. The Earth and the Moon are examples of natural satellites [1]-[5]. The Earth revolves around the Sun, whereas the Moon revolves around it. A man-made satellite is a device that is sent into space and revolves around the body shown in Figure 1.1.

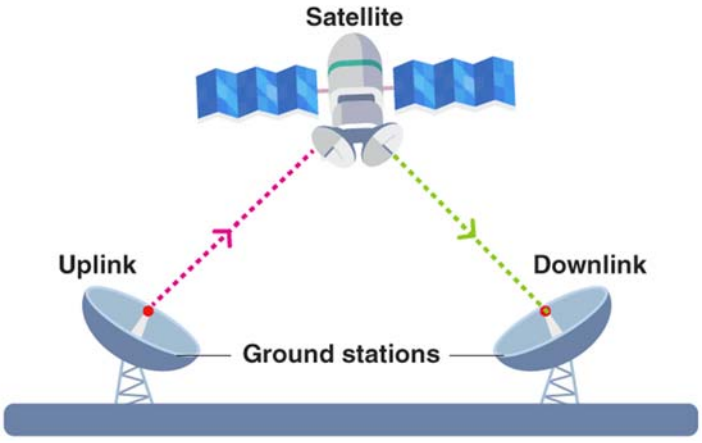

Figure 1.1.Satellite Communication

Low Earth Orbit (LEO)

LEO is located between 200 and 1200 kilometres above the earth's surface. This orbit has the benefit of a shorter signal travel time and a smaller chance of losing its course. On the other hand, since the satellite travels faster as the earth rotates, the coverage zone is fairly limited (in contrast to GEO) and the connection time from ground station to satellite is shorter. The growing interest in mobile communications through satellites in recent years has prompted a rise in LEO utilisation and research.

Medium Earth Orbit (MEO)

MEO is between 1200 and 35286 kilometres above the earth's surface. According to some sources, the Medium Earth Orbit is between 5000 and 13000 kilometres in height, or between two Van Allen belts [Walke00]. The Van Allen belts are two high-intensity radiation zones on Earth that are home to highly charged particles and high-energy neutrons. As a

result, the two belts are harmful to communication satellites. As a result, the satellite is not placed in the Van Allen belts zones.

Highly Elliptical Orbit (HEO)

The HEO's name comes from its elliptical shape, which allows for greater coverage of highly populated zones or otherwise inaccessible regions of the globe (such as the poles) without disrupting lower orbits.

Geostationary Orbit (GEO)

GEO is 35786 kilometres above the Earth's surface. The orbit is known as a geostationary orbit because the speed of satellites in this orbit is matched to the speed of the planet's rotation, ensuring that the satellite travels in lockstep with the earth. To put it another way, if one could view the satellite from the ground, the satellite would constantly remain at the same location in space from the perspective of the planet. The majority of communication satellites are stationed in GEO.[6]-[10]

2. RELATED WORK

The applications of satellite communication systems include the following.

- TV
- Telephone
- Monitoring of Weather Condition and Forecasting
- Military
- Navigations
- Amateur Radio
- TV broadcasting like DTH (Direct to Home)
- Radio Broadcasting
- Remote sensing applications
- Disaster Management
- Voice communications & Radio Broadcasting
- Internet Access
- Digital cinema
- Internet applications to provide the application of internet connection for GPS applications, data transfer, Internet surfing, and many more.

3. PROPOSED WORK

Geostationary earth orbit (GEO), medium earth orbit (MEO), and low earth orbit (LEO) are the three kinds of orbits characterised by satellite height (LEO). GEO satellites, for example, remain stationary in relation to the earth's surface, resulting in less doppler shift and a reduced likelihood of transmission outages than non-GEO satellites. GEO satellites operate at very high altitudes (35,786 km) and provide the most comprehensive coverage. GEO satellites are selected in our suggested protocol because to their low outage probability and vast coverage.

3.1.Quantum Cryptography

Quantum cryptography, also known as quantum encryption, uses quantum mechanics principles to encrypt communications such that they can never be read by anybody other than the intended receiver. It takes use of quantum's numerous states, as well as its "no change theory," which ensures that it cannot be disrupted unintentionally.

3.2Quantum key distribution:

The process of establishing a shared key between two trusted parties utilising quantum communication such that an untrusted eavesdropper cannot learn anything about the key. Quantum key distribution uses special purpose technology to produce and distribute cryptographic keying material based on the unique features of quantum mechanical systems.

Version 2 of the Internet Key Exchange: Quantum Key Generation (IKEv2) IKEv2 (Internet Key Exchange Version 2) is a protocol for establishing keys and security associations (SAs) for the purpose of establishing a secure Satellite Network (SN) connection that prevents data packets from being read or intercepted over a public Internet connection (see fig 3.1). This lets a distant computer on a public network to access resources while yet benefiting from the security of a private closed network.

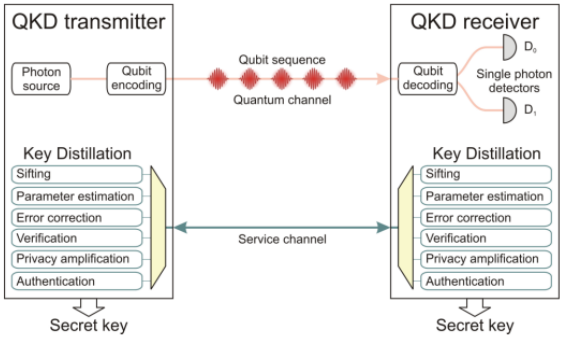

Figure 3.1. Quantum Key Distribution

3.3. SatChain

A consortium blockchain is presented to allow cooperative satellite constellations to share information. A novel idea called SatChain is suggested in this section. SatChains are a technique to tokenize space transactions as digital tokens that can be authenticated using a blockchain system. SDTs may be transmitted via a satellite constellation, which is a collection of satellite networks. As a result, blockchain may be used as an authenticator in this case for any communication patterns that may occur inside a single satellite constellation. As illustrated in fig. 3.2, SatChain is utilised to handle sensing data between satellites and DPC; as a result, blockchain may be used as a tracking system in this situation to identify predicted spacecollisions between satellites and DPC.

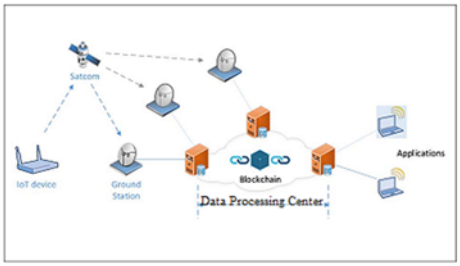

Figure 3.2.SatChain

3.4.Proof of Space Transactions (PoST)

Proof of Space Transactions (PoST) is a new blockchain protocol for verifying SEDs inside a satellite constellation and adding new blocks to the blockchain. Each satellite in a constellation is represented by a private key and a piece of cryptographic evidence for a satellite's private key that is cryptographically tied to a particular SED in the PoST approach. When a new SED is triggered between two satellites, the satellite that initiated the transaction communicates the transaction's cryptographic proof with the rest of the satellite constellation to certify the triggered SED's legitimacy. The receiving satellite also asks for the nonce code of the blockchain's latest block. A new block is added to the blockchain whenever the nonce code is validated by the receiving satellite.

4. RESULTS AND DISCUSSION

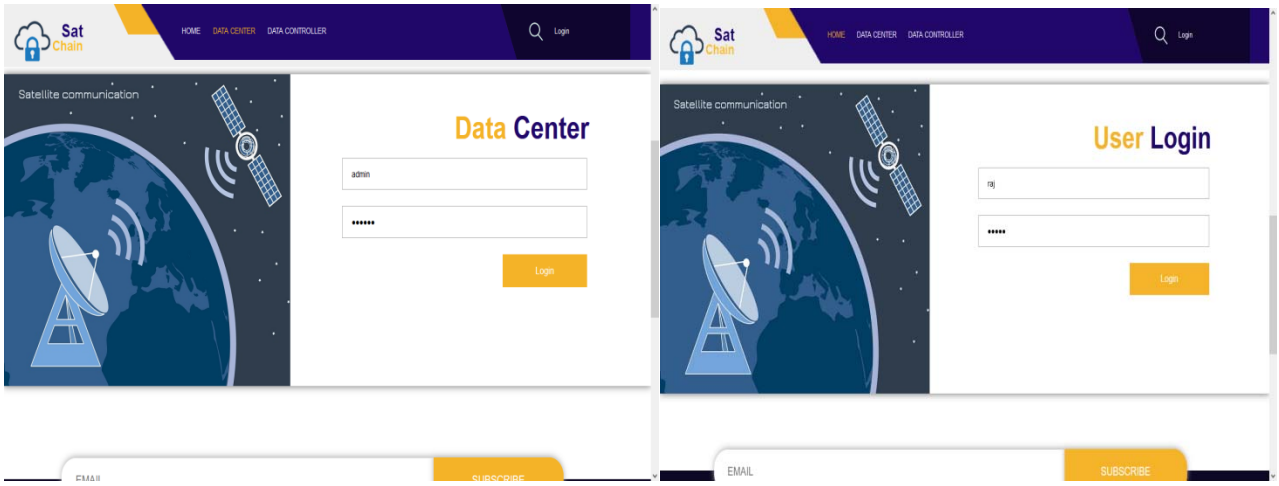

FIG NO.4.1 DATA CENTER AND USER LOGIN

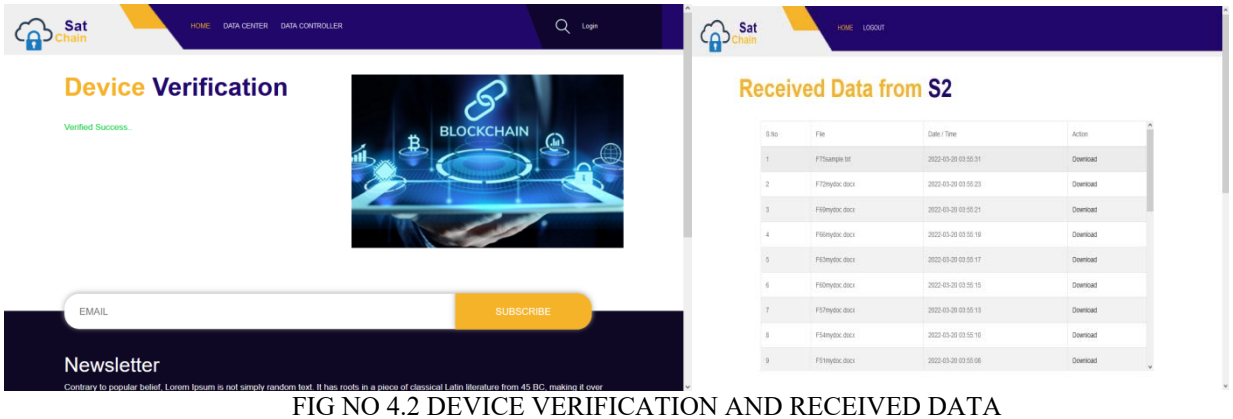

FIG NO 4.2 DEVICE VERIFICATION AND RECEIVED DATA

5. CONCLUSION

Not only is the satellite communication channel distinct from the common mobile channel, but it is also distinct from the ground station channel. The satellite communication channel combines the satellite and mobile communication channels into one. Hackers and external interference signals make satellite communication lines very susceptible. It may be difficult to keep satellite networks safe from unauthorised access and usage of data. Quantum Key Cryptography and block chain technology are used to investigate the security of satellite communication networks in terms of access control, secrecy, and security authentication in this research. The suggested approach is designed to address the security issue that arises when a centralised database is used in satellite communication. The simulation results suggest that the proposed strategy may greatly enhance satellite communications security and protection.

6. FUTURE WORK

The blockchain-satellite system will rely on cloud constellations in the future to manage data centres in orbit, where corporations may upload data and circumvent terrestrial networks; this strategy will aid governments and companies in obtaining information from many sources and orbits in space.

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Smart Face Door Lock System using AI and Edge Computing

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Abstract

Anyone today is concerned about security, whether it is data security or the security of their own house. Digital door locks have grown quite prevalent in recent years, thanks to technological advancements and the increased usage of IoT and AI. Because of its ability to assess facial points and detect identity in an unobtrusive manner, face recognition systems are widely employed for human identification. Face recognition systems may be used for surveillance at home, at work, and on college campuses, as needed. The difficulty with current face recognition systems is that they depend on either facial key points and landmarks or FaceNet face embeddings for recognition. Face detection has recently been effectively deployed using deep convolutional neural networks. Despite significant improvement, most current detection algorithms only use a bounding box to locate each face, making it impossible to segment each face from the background picture at the same time. To address this shortcoming, this study proposes G-Mask, a face detection and identification approach based on enhanced Mask R-CNN, which combines face detection and recognition into a single framework with the goal of obtaining more fine-grained face information. The resilience of the facial recognition system when an unfamiliar individual is discovered is also investigated in this research, with the system sending an SMS Web link to the home owner using edge computing. Using a door lock integrated server account, the door lock may also be accessed remotely from anywhere in the globe.

Keywords:AI, Deep Learning,Mask R-CNN,G-Mask ,SMS,Face recognition

1.INTRODUCTION

Locks have been around for a very long time. Locks have probably been around for as long as there have been treasures to safeguard, in some form or another. Every day, one is likely to come across a variety of locks. Locks are all around us, from combination locks on school lockers to deadbolt locks on front doors. There are several types of locks available nowadays. Some of the locks are fairly basic, requiring just a key or a sequence of digits to unlock. Other locks are exceedingly complex, requiring fingerprints or unique electronic key cards to access. To strengthen security, today's locks include a variety of mechanical and technological mechanisms. Traditional door locks have a variety of effects. Our front door had typical door locks, which we were all acquainted with. And we can't forget the most aggravating experience of our lives: almost stepping out the front door only to realise you've locked the door and left your keys on the kitchen table. If your children or pets are trapped inside, though, it may constitute a major security concern. Pin-and-tumbler locks are distinct from other locks in that they need a key to open. Several spring-loaded pins are contained inside a succession of tiny cylinders in basic pin-and-tumbler locks. One or more of the pins will stay in the path of the shear line if you don't have the correct key. The cylinder will not be able to revolve, and the lock will stay closed. Locks are now found on practically everything, from your front door to your smartphone, and are designed to protect privacy and secure access. This demonstrates how, through time, we as a society have evolved to value privacy and safety more and more. Choosing the correct kind of door lock for yourself is more vital than ever, in our opinion. First, let's define the difference between'smart' and 'conventional' locks. Most people aren't familiar with the word 'conventional' locks; we just refer to them as 'locks,' which refers to the typical non-automated door lock that must be manually engaged. You turn the key, and a deadbolt locks the door - it's that simple! Smart locks, on the other hand, are automated versions of standard locks or retrofitting accessories that may be connected into smart home systems in their most basic form. They, too, normally use a standard lock, but the mechanism may be engaged and operated remotely, which can enhance the whole home security experience significantly. Smart locks, like regular locks, come in a variety of designs and sizes. Keep the lock clean and well-maintained to prevent unauthorised access to the code! Some digital door locks feature PIN codes that are up to ten digits long, which isn't what you want![1]-[5]

Recognize that you are short on time and in a rush to achieve a deadline. If the key is jammed in the lock, however, do not push it to open or shut; you may wind up exacerbating the situation. The buildup of dirt or filth in your locks might cause stiffened or delayed door locks. If you find that your lock's handle is sluggish or that putting the key

into the lock is problematic. It will be difficult to close or lock your door effectively if the door latch does not catch the strike plate. This issue might arise from time to time and is caused by improperly placed or bolted hinges, moist conditions, or excessive heat. The main goal of this research is to create a reliable face recognition and identification system called G-Mask that is based on an upgraded Mask R-CNN for a safe and secure door lock system. In a hotel-like setting, a password (OTP) and SMS processing are utilised to create a secure and easy-to-use smart door lock.
Locks have been around for almost 4,000 years. There is no such thing as a proper conventional lock even now. Smart locks, which have only been on the market for around 10 years, have certain technical restrictions[6]-[7]

2.RELATED WORK

Artificial intelligence (AI) is a branch of computer science devoted to resolving cognitive issues such as learning, problem solving, and pattern recognition that are often associated with human intelligence. Artificial intelligence, abbreviated as "AI," may connote robots or future scenarios, although AI extends well beyond science fiction's automatons and into the non-fiction of today's sophisticated computer science. Professor Pedro Domingo, a well-known machine learning researcher, divides machine learning into "five tribes": symbolists, who have roots in logic and philosophy; connectionists, who have roots in neuroscience; revolutionaries, who have roots in evolutionary biology; Bayesians, who deal with statistics and probability; and analogizers, who have roots in psychology. Bayesians have recently been effective in advancing the science in a variety of areas under the moniker "machine learning," thanks to recent improvements in the efficiency of statistical calculation. Similarly, breakthroughs in network computing have led to the development of an area known as "deep learning" by connectionists. Both machine learning (ML) and deep learning (DL) are computer science topics that stem from the Artificial Intelligence discipline.

Deep learning startups have had success using it to huge data for knowledge discovery, application, and prediction. To put it another way, deep learning has the potential to be a strong engine for generating actionable outcomes. • The power of deep learning may also be demonstrated in how it's being applied to social media technologies. Consider Pinterest, which has a visual search feature that allows you to zoom in on a certain item in a "Pin" (or pinned picture) and find visually comparable things, colours, patterns, and more. Using a heavily annotated data set of billions of Pins collected by Pinterest users, the company's technical team employed deep learning to train its system how to detect picture attributes. The characteristics may then be utilised to choose the best matches by computing a similarity score between any two photos.

3. PROPOSED SYSTEM

Authorized access has come a long way from using keys, pin codes, cards, and fingerprints. We now find We're about to enter the age of facial recognition. Traditional door locks are generally the first thing that springs to mind when you think about locks. There is a keyhole and a manual latch on these locks. Traditional locks have a number of drawbacks, including the inability to remember one's keys, door locks being jammed, and the ability to quickly break the lock. People believe that conventional locks are unsafe, so they switch to smart locks. However, smart locks have their own problems, such as forgetting their codes or not being able to use their fingerprints. For accessing door lock systems, this study suggested a model Mask R-CNN dubbed G-Mask. As a result, when an unfamiliar person's face is identified or recorded, this project devised a technique for the facial recognition system to send an SMS link to the system's owner.

When an unknown person's face is captured using Mask R-G-Mask CNN's model, the system will send an SMS link to the owner with that unknown or unauthorised person's captured face and a request for permission from the owner. If the owner or user grants permission, the door will be opened; otherwise, it will not.
The suggested technique is based on the Mask R-CNN framework, which is the current state-of-the-art object recognition system that has shown remarkable results on a variety of object identification benchmarks. The proposed G-Mask approach has two branches, one for face identification and the other for face and background picture segmentation, as shown in Figure 3.1. The input image's face characteristics are extracted using the Face Feature Module, and the Region of Interest (RoI) is quickly constructed on the feature map using the Region Proposal Network (RPN). We also employ the Region of Interest Align (RoIAlign) to accurately retain specific spatial coordinates and create a fixed-size feature map. The bounding box is identified and categorised at the network's end in the detection branch, and the associated face mask is formed on the image in the segmentation branch using the Fully Convolution Network (FCN).
Mask The RCNN is a deep neural network designed to handle the issue of instance segmentation in machine learning and computer vision. To put it another way, it can distinguish between various things in an image or video. You feed it a picture, and it returns the bounding boxes, classes, and masks for the item. This is a big plus for the

end user, but it's also a big plus for multifamily buildings and workplaces since it relieves them of the chore of handling key cards.

• Access to remote control

Using the registration procedure, new users may be granted access quickly and easily, even from afar. Furthermore, you may quickly change settings and provide one-time or temporary access to your premises. It analyses the faces of all those seeking to enter and only lets people in who have been pre-approved by the user.

• Link to Face Verification Face Verification A link will be generated and sent to the user in order to verify the identity of an unauthorised user via some dedicated artificial intelligent agents for remote certification, which either authorises the door to open appropriately or signals a security-violation alert to the security guard and activates the buzzer is shown in fig.1

• Blacklist

It enables the user to build a "blacklist" of persons who are prohibited from accessing your company.

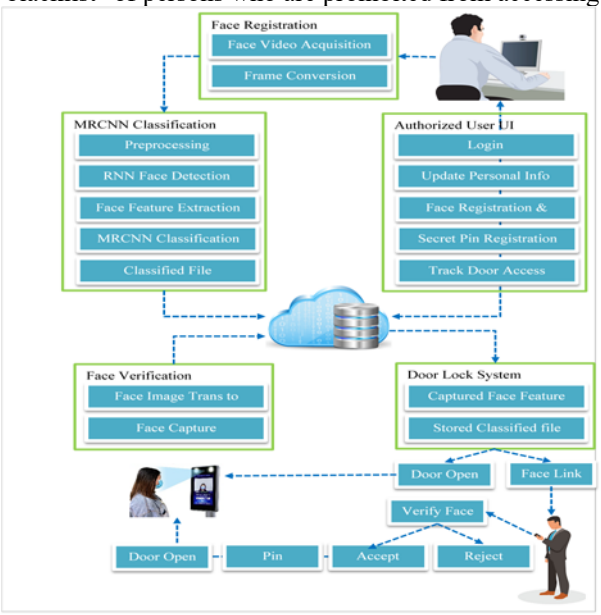

Fig.1.Face Identification

Face Identification

The picture is supplied to the face detection module after the Smart Glass Camera captures the object or face image. This module identifies the areas of a picture that are most likely to be human. After utilising the Region Proposal Network (RPN) to identify faces, the face picture is sent into the feature extraction module, which extracts the main characteristics that will be utilised for classification. The module creates a short feature vector that accurately represents the facial picture. The retrieved characteristics of the face picture are compared with those stored in the face database using FRCNN with the assistance of a pattern classifier. The picture of the face is then classed as known or unknown. If the picture face is recognised, the relevant individual is found and the process continues.

4. RESULT AND DISCUSSION

FIG NO .2. REGISTER AND LOGIN

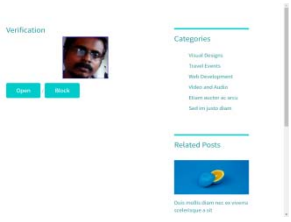

FIG NO .3. Verification

The shown in fig.2 and fig.3 for register and vertifcation

5. CONCLUSION

This paper outlines a Smart Home Security system. For user authentication, models for face and vocal recognition have been suggested. Region - Mask For face authentication, a convolutional neural network using Face Net based on one-shot learning is utilised to analyse the user's taken picture. The minimal distance for face recognition based on the retrieved characteristics. The user is classed as a database member or unidentifiable based on these factors. Aside from that, the model not only identifies the identities of uncovered faces, but it also recognises the identities of masked faces. The eye and nose area of a masked user should be readily visible. For the overall Home Security system, the suggested model yields a final accuracy of 82.71 percent.

6.FUTURE SCOPE

This system has many characteristics, including a facial recognition system for a safe and secure door lock system. As a result, if an unauthorised person or relatives gain access to the residence, they will only do so after receiving permission from the family head or approved users who receive the illegal person's or relatives' SMS link. Only if those authorised users provide their consent does the door open; otherwise, the door does not open. As a result of this strategy, individuals feel comfortable and secure about their home door lock systems since no one can enter without the consent of the authorised user.

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Energy Efficient Techniques In Multipath Routing Protocol Using Modified Genetic Algorithm

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Abstract

The Ad hoc On-Demand Multipath Distance Vector (AOMDV) routing protocol uses a newtness function (FFn) to determine the optimal path. We introduce this function and its usage in the Genetic Algorithm (GA). It is planned to use FFn in the AOMDV routing protocol (AOMDV-FFn). There is a connection between the AOMDV mechanism and the genetic algorithm (AOMDV-GA). These protocols enable an optimization process to choose the paths with the highest fitness values, enforcing the shortest path, maximising residual energy, and minimising data traffic even when data packets are dropped at random. The optimum path is calculated using the FFn and the TCP Congestion Control Enhancement for Random Loss (TCP CERL). The relative efficiency of the different mechanisms is evaluated.

Keywords:TCP Congestion control, AOMDV, AOMDV-GA, Genetic Algorithm

1. INTRODUCTION

Mobile ad hoc networks (MANETs) are wireless networks in which individual nodes are free to come and go as they want without being tethered to a specific physical place. Due to the distance between the source and the target, MANET is a multi-hop network in which the source node communicates with the target node through intermediate nodes. Exciting new technology, MANET lets users make temporary connections without setting up any underlying infrastructure in advance. Critical in emergency situations, disaster relief areas, and brief conflict zones. One of MANET's most serious problems is connection failure, which disrupts previously established connections. The AOMDV (ad hoc on-demand multi-path distance vector) routing protocol is often used since it selects paths with the fewest possible hops. After a node or channel failure, AOMDV automatically switches to a backup route, which improves throughput and decreases latency. Data transmission stops and the process of identifying another route begins in a single path routing approach, degrading network performance [1]-[5]. Self-configuring, self-organizing, and infrastructure-free, mobile devices form a mobile ad hoc network (MANET). Also called "on-the-fly" or "spontaneous" networks. The nodes in a mobile ad hoc network (MANET) are mobile computers that work together to form a wireless ad hoc network and operate as routers and hosts. A wireless sensor network with a single base station and nine relay nodes is shown in Figure 1. There are two possible paths from source node 1 in the network to the destination node BS: either 1 > 4 > 5 > BS or 1 > 2 > 6 > 9 > BS. These routes do not include any nodes other than the starting and ending ones in their entirety. The two paths leading to and from the node are considered to be its "paths," or individual pathways. Routing protocols often prioritise boosting QoS performance in the sensing network above reducing routing processing time. Therefore, determining the best possible course of action would use a lot of power due to the considerable processing time involved. As the amount of routing requests and the time required to process them both rose, which is mostly dictated by the complexity of the routing algorithm, the sensors' batteries would eventually run out. The sensors in a network are considered bad nodes if their power has been drained. Network performance is impacted in terms of data throughput and communication delay between end nodes; hence, different paths should be explored. To avoid experiencing dead nodes, particularly during data transmission time [6]-[10], it is recommended that routes be selected such that they go across nodes that have sufficient energy.

2. RELATED WORK

The Genetic Algorithm is both a method for finding the best solutions and a computational model that mimics the processes of natural selection and biological evolution. First, genetic algorithms define a population of individuals with genes that can solve the challenge at hand. Therefore, each individual may be seen as a unique being with its own set of chromosomes. In the genetic algorithm, the notions of natural selection and the survival of the fittest are used. Using the original population as a starting point, the genetic operator combines crossover and mutation operations to create a new population with a different set of solutions. This method, like natural epigenetic population evolution, will produce a solution set population that is more adapted to solve the issue than the previous generation (as described by the fitness function) and may therefore be used as the approximate optimal solution to the problem. The challenge of multipath routing in WSNs might be seen as a Darwinian competition for survival. Furthermore, while searching for the best path, it is important to consider the energy requirements and fault tolerance of each network node.

3. PROPOSED ALGORITHM

In order to determine the optimal path, the Ad hoc On-Demand Multipath Distance Vector (AOMDV) protocol is introduced here, along with an unique fitness function (FFn) that might be utilised in a Genetic Algorithm (GA).
Second, we present a routing protocol based on AOMDV and FFn (AOMDV-FFn).
Third, the AOMDV mechanism incorporates the genetic algorithm (AOMDV-GA).

4. PROPOSED SYSTEM

Following in its predecessor's footsteps, the AOMDV-FFn multipath routing protocol uses the AOMDV algorithm. AOMDV-GA is an innovative routing protocol that makes use of the evolutionary algorithm (GA is shown in fig.2.). When an RREQ is broadcast and various routes are received, the sender node must choose the shortest and most efficient route with the least amount of energy consumption and the least amount of traffic, taking into consideration the risk of connections failure resulting in random data packet loss. In other words, the FFn will take into account the following: • the residual energy at each node along the route, • the distance of each potential route, • the congestion along each possible route, and • the discrimination of random loss from congestion lossis shown in figure.1.

Figure.1. Proposed System Process

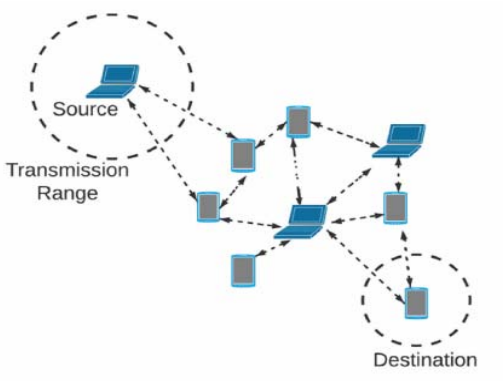


FIGURE.2.UNSIGNCRYPTION

4. RESULTS ANDDISCUSSION

The MANET node is transmitted and receiving the signal is shown in figure from 3 to 8.

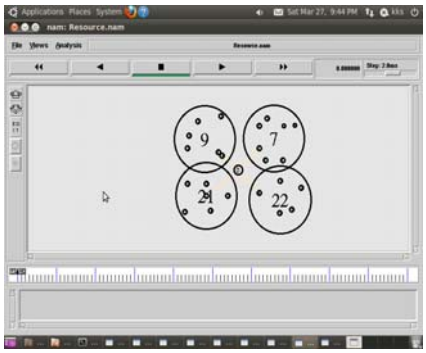


Figure.3. Initial Node creation AOMDV-FFn multipath routing protocol

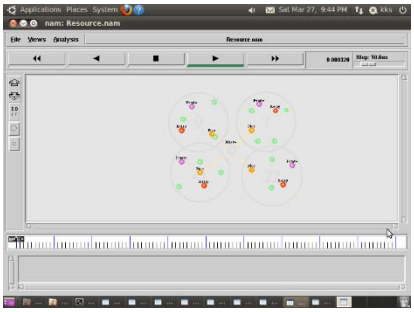


Figure.4.Initial Acknowledgement

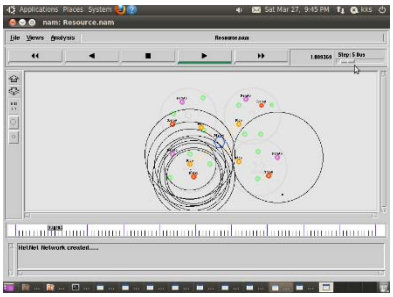


Figure.5. Communication with new fitness function (FFn) Method

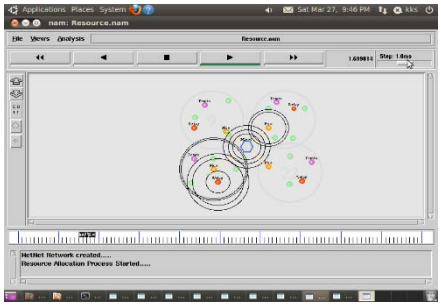


Figure.6. AOMDV-FFn multipath routing protocol

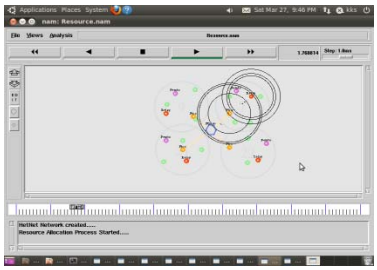


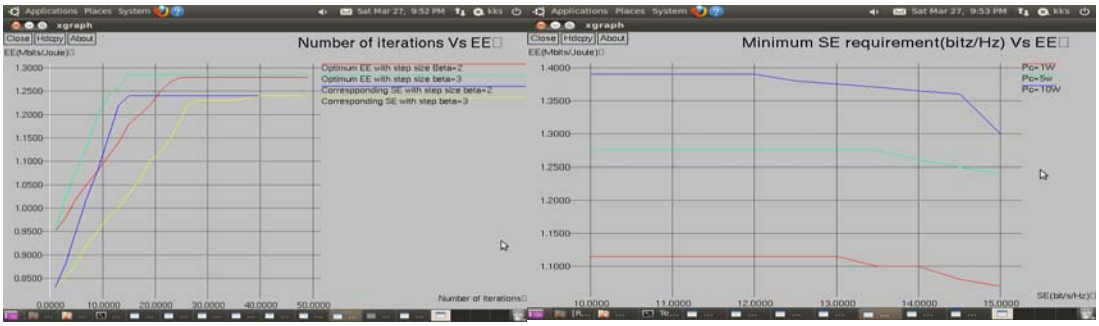
Figure.7.Communication with Low Communication Nodes

Figure.8.Resource Allocation with AOMDV-GA Blocks

5. GRAPHS AND ANALYSES

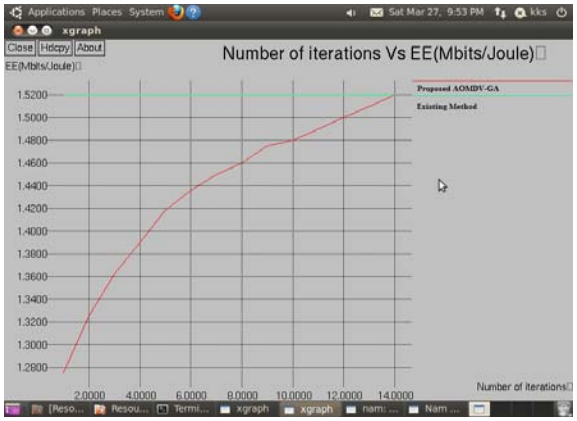
Network Simulator (NS2) is a simple event-driven simulation tool that has been successfully used to probe dynamic resource allocation in communication networks. NS2 is capable of simulating wired and wireless network services

and protocols. As can be seen in Figure 9, NS2 gives its users the ability to build network protocols and simulate their operation.



(a) (b)

((c)



(d)

Figure.9(a,b,c & d).Number of iterations vs EE

6. CONCLUSION

Improved routing efficiency for IEEE 802.11 MANETs is the topic of this study. The random loss of data packets is an inevitable consequence of connection failure caused by the roving nature of nodes in MANETs. More data

retransmissions would be required, increasing energy consumption. We propose a fitness function that takes into account travel time between nodes, the efficiency of traffic flow, and the amount of energy used.

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Ensembling Efficientnet's Algorithm Used For Low Light Enhancement With Raw Image

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Abstract

The raw image pattern-based quality has been enhanced in this project. The translation of RAW picture qualities into quantifiable components offers a method for analysing how RAW image elements affect enhanced performance scientifically. Currently, the REENet (RAW-guiding Exposure Enhancement Network) project is in the works. This method produces pictures with a greater PSNR, image resolution, and high intensity and resolution. to conduct a new assessment The Factorized Enhancement Model (FEM) framework decomposes RAW image characteristics into measurable factors and offers a tool for scientifically exploring how RAW image features influence enhancement performance. The empirical benchmark results show that data linearity and metadata-recorded Exposure Time are the most critical factors, leading in considerable performance improvements in several measures when compared to approaches that employ sRGB images as input. A RAW-guiding Exposure Enhancement Network (REENet) is constructed using the information gathered from the benchmark results, which makes trade-offs between the advantages and inaccessibility of RAW pictures in real-world applications, enabling RAW images to be utilised purely for training.

Keywords: F*actorized enhancement method, RAW images, deep learning, RGB data, low light enhancement, algorithm*

1. INTRODUCTION

Imagery suffers from a multitude of difficulties in low-light situations, including increased noise, lower visibility, colour cast, and so on. To some degree, more advanced camera equipment and specialised photographic systems come at a price in terms of reducing degradation. Modern digital cameras attempt to address the issue by adjusting the shooting settings, but this has its own set of issues. A high ISO, for example, generates noise, whereas a lengthy exposure duration causes blurring. As a consequence, enhancing low-light images using software is both cost-effective and attractive. The updated approaches are provided with two sorts of pictures in most instances. 1:

• Images in RAW format

• Images in the RGB colour space.

Which are created by using a range of methods on raw pictures, such as demos frosting, white balance, tone mapping, and so on, while taking into account human eye preferences and system limits, like as storage capacity. As reported in these earlier articles, low-light enhancement algorithms that employ RAW data as input often provide substantially better results than those that use sRGB data. On one side, RAW data has two inherent advantages to sRGB pictures. 1) The original data is almost immediately retrieved from the sensors and records meta-data pertaining to the hardware and shooting settings, while sRGB photographs have been adjusted for human visual preference and system requirements, resulting in information loss. 2) Linear: Because RAW data is acquired instantaneously by sensors, the connection between RAW data and various exposure levels stays linear, but the dependency on the sRGB domain after processing is nonlinear. Obtaining RAW pictures from real-world apps, on the other hand, may be more difficult. To begin with, RAW photos contain a large amount of data that is costly to store, hence many devices only record sRGB images. Second, a powerful display of RAW photographs requires a lot of professional processing steps and technical knowledge on the side of the user. As a consequence, more casual users choose a pocket device like a mobile phone over more complicated shooting tools like digital single-lens reflex cameras (DSLR). As a consequence, sRGB image-based applications that are easy to use are becoming more popular [1]-[5].

LLE is a pre-processing step that is employed in applications including autonomous driving, scientific data collection, and general visual enhancement. Images with a limited dynamic range and considerable noise levels originate from poor lighting and uneven brightness. Computer vision algorithms that understand such images may perform badly as a result of these properties. This approach enhances the visibility of a picture's underlying features. The example model includes a reference floating-point frame-based algorithm, as well as a simplified version without division operations and a hardware-compatible streaming fixed-point implementation of the reduced method.

By inverting an input picture and then applying a de-haze algorithm to the inverted image, this example generates LLE. After inverting the low-light image, the pixels representing the non-sky area have low brightness in at least one colour channel. This property is comparable to a blurry picture. These black pixels provide a reasonable measure of haze effects since their intensity is largely due to scattering, or air-light. The method enhances the dark channel in an inverted low-light image by changing the air light picture dependent on the ambient light conditions.

A 3-channel low-light RGB picture is supplied to the LLE algorithm. The LLE Algorithm is shown in this block diagram.

In current digital camera systems, the image processing pipeline translates sensor data into a more visually acceptable picture with less noise, which is stored as an RGB file (e.g. sRGB image in JPEG or PNG format). When compared to the processed sRGB picture, the RAW file offers the following advantages:

Metadata may be accessed. During image collection, cameras record the shooting settings as meta-data d meta for the original sensor data d sens. Due to hardware impacts such as different black levels, saturation, and lens distortion, sensor data is particularly camera-specific and is approximated using a camera-specific real-world noise model. A RAW file f raw is made up of sensor data d sens and meta-data d Meta [6]-[10].

Data linearity is a term used to describe the consistency of data. A linear picture's pixel values are directly linked to the real-world signal, which is the quantity of photons received at that location on the sensor, ensuring direct proportionality at various exposure levels. Techniques for hardware calibration To recreate linear RAW data y raw from sensor data d sens, Fcali (•) techniques like as linearization and lens calibration are utilised.

Adaptive normalisation with restricted contrast has been developed for these. Dynamic Histogram Equalization Maintains Image Brightness A contrast-enhancing technique was utilised. The approach employed was a contextual and variable contrast enhancement method. For contrast enhancement, a tiered difference representation-based method was adopted. For contrast enhancement, 2D histograms with layered difference representation are used.

The Proc image processing pipeline is described in this section. Because the particular pipelines and settings of the processing systems in each kind of camera are kept as trade secrets, we refer to them as "black boxes" in our discussion. Despite this, the typical image processing system assists in the building of a concise mathematical model, as shown in Figure, that we can use as a framework to evaluate the parts of RAW that enhance low-light picture improvement, as shown in Figure. Libra, which is treated as a black box in this discussion, processes all sRGB pictures used as final targets in the benchmark. As stated, the shortened processing pipeline, which includes a simpler DE mosaicking module, only provides intermediate monitoring in the RAW sector and has no impact on benchmarking performance, offering just the essentials.

In this benchmark, we look at a variety of RAW data consumption techniques with a variety of inputs and instructions to evaluate how much of a difference RAW data properties may make to the low-light improvement issue. The results of the experiments are utilised to investigate the impacts of metadata attributes including linearity, exposure time, and white balance parameters, as well as quantization levels defined by L, E, W, and Q. The SID dataset may be utilised for both training and evaluation purposes. A sub-dataset was created using a 7S and a Bayer sensor. There are 409 low/normal-light RAW images in this collection. There are 280, 93, and 36 matched photographs in the training, testing, and validation sets, respectively. For performance comparisons, we run several operations on input/target pairs depending on RAW file properties and feed them into a similar architecture, namely U-Net. SID teaches all methods from the bottom up. Unpacking RAW data with a Bayer pattern into four channels, linearizing the data, and normalising it to [0, 1] are the training settings for RAW-based approaches. After that, the data is fed into a U-Net. Libraw analyses matching sRGB photographs without employing histogram stretching for sRGB-based approaches since it brightens images during processing, which is incompatible with our benchmarking and development aims [11]-[15].

2. RELATED WORK

Deep learning startups have had success using it to huge data for knowledge discovery, application, and prediction. To put it another way, deep learning has the potential to be a strong engine for generating actionable outcomes. • The power of deep learning may also be demonstrated in how it's being applied to social media technologies. Consider Pinterest, which has a visual search feature that allows you to zoom in on a certain item in a "Pin" (or

pinned picture) and find visually comparable things, colours, patterns, and more. Using a heavily annotated data set of billions of Pins collected by Pinterest users, the company's technical team employed deep learning to train its system how to detect picture attributes. The characteristics may then be utilised to choose the best matches by computing a similarity score between any two photos. As a consequence, for image fire detection, we recommend utilising even deeper Convolutional Neural Networks, with fine-tuning based on a fully connected layer. Our fire detection system employs two cutting-edge Deep CNNs: VGG16 and Resnet50. On an imbalanced dataset that we built to imitate real-world situations, the Deep CNNs are put to the test. It includes shots that are difficult to identify and that are purposely unbalanced, with many more non-fire images than fire images. The dataset is now freely accessible over the internet. According to our results, introducing completely connected

3. PROPOSED SYSTEM

Using a deep convolution neural-based algorithm, the recommended technique improves the image's raw picture resolution. A deep convolution neural REENet convolution neural network-based approach is utilised to improve photo resolution. The PSNR is increased in this suggested method to improve picture resolution.For image processing, the suggested system uses a deep convolution neural based approach to boost raw picture resolution. For enhanced picture resolution, a deep convolution neural REENet convolution neural network based method is used. This suggested approach is used to boost picture resolution by increasing PSNR is shown in Fig.1..

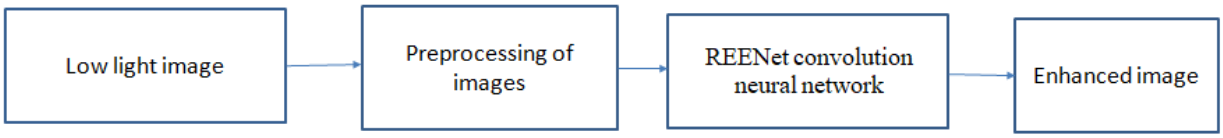
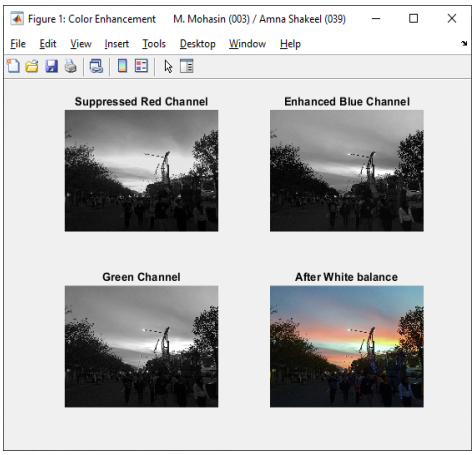
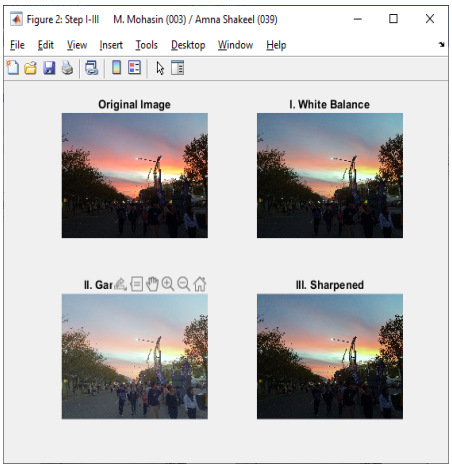


Figure.1. Proposed Block Diagram

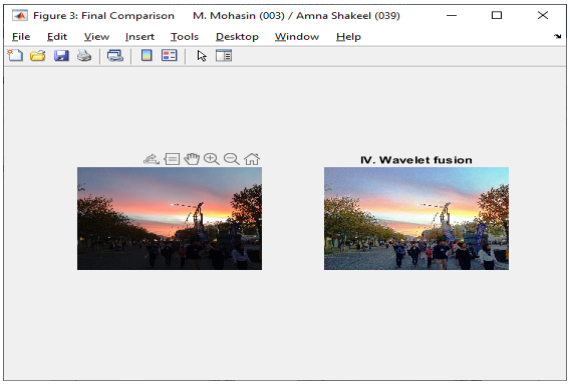
4. RESULTS AND DISCUSSION



(a)



(b)



(c)

Figure.2 (a,b&c) Enhancement of RAW Image

The process of various stages to enhance the RAW image is shown in figure.2.

5. CONCLUSION

For the first time, we investigate the benefits of RAW for low light enhancement in detail in this research. The linearity, access to meta-data, fine-grained information (more abundant intensities and colours), display inconveniency, and loss of performance of Files are all examined in detail, and their effects on low-light improvement are illustrated with quantitative results. We utilise a new way to tackle low-light enhancement in a Factorized Enhancement Model to generate a clear and plain description that divides the ambiguities of this work into numerous measurable aspects (FEM). The planned REENet makes use of RAW-guiding techniques. It overcomes the challenges created by sRGB photographs' nonlinearity and the absence of RAW images in many applications, surpassing various state-of-the-art sRGB-based solutions. Our infrastructure only needs RAW photographs during the training phase and performs better in testing with just sRGB inputs; as a result, our solutions absorb as much RAW data as possible during training but do not rely on RAW input and change the ISP approach in current applications. Experiments show that our method is more effective and that our model design is logical.

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Fast Binary Multiplier Based On Counter, Compressor And Parallel Prefix Adder

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Abstract—The fundamental approach is adding up numerous operands, which is a common operation on DSP systems. The Wallace Tree structure, which functions as the circuit's bottleneck, adds all of the partial products of a basic multiplier circuit. Counters and compressors with high compression ratios are required to speed up the addition process. We apply a unique approach based on the sorting network and split logic in the proposed research, which employs fast saturated binary counters and compressors. When the counter's inputs are partitioned asymmetrically into two groups and fed into sorting networks, sequences that can only be represented by one-hot codes are reordered. Due to the smaller size of the sorting network needed, the (7,3) counter may be built using the aforementioned approach. In the LSB, compressors with a 4:2 reduction ratio are employed to compress just a piece of the product. Because of the space and energy savings, it is ideal for use in error-tolerant systems. For the final addition of multipliers, we suggest employing a kogge-stone adder-based parallel prefix adder to reduce critical path time even further. When compared to the present approximation multiplier, the suggested technique produces better area-delay and power-delay products. The fundamental approach is adding up numerous operands, which is a common operation on DSP systems. The Wallace Tree structure, which functions as the circuit's bottleneck, adds all of the partial products of a basic multiplier circuit. Counters and compressors with high compression ratios are required to speed up the addition process. We apply a unique approach based on the sorting network and split logic in the proposed research, which employs fast saturated binary counters and compressors. . When the counter's inputs are partitioned asymmetrically into two groups and fed into sorting networks, sequences that can only be represented by one-hot codes are reordered. Due to the smaller size of the sorting network needed, the (7,3) counter may be built using the aforementioned approach. In the LSB, compressors with a 4:2 reduction ratio are employed to compress just a piece of the product. Because of the space and energy savings, it is ideal for use in error-tolerant systems. For the final addition of multipliers, we suggest employing a kogge-stone adder-based parallel prefix adder to reduce critical path time even further. When compared to the present approximation multiplier, the suggested technique produces better area-delay and power-delay products.

Keywords—Binary counter, 4:2 compressor, counter, multiplier, one-hot code, sorting network.

I.INTRODUCTION

Any computer must be able to add several operands quickly and reliably. Multiplier circuits' speed and power efficiency are crucial to the overall performance of microprocessors. Multiplier circuits conduct filtering and convolution in a digital signal processor or arithmetic logic unit. When multiplying binary numbers or fixed-point values, some products must be assembled. The multiplier incurs a large amount of extra delay and requires more energy as a consequence of integrating these partial outputs. The fundamental approach is adding up numerous operands, which is a common operation on DSP systems. The Wallace Tree structure [1], whose performance is the bottleneck, is used to sum all the partial products of a basic multiplier circuit. In public-key cryptography, such as RSA and elliptic curve encryption, a large number multiplier based on the Toom-Cook [4] or Karatsuba approach [3] is used to generate modular multipliers (ECC). Several studies have looked at these two ways, with some even putting them into hardware. The summation of numerous operands is discussed in different areas of the circuit in the publications. In fully homomorphic encryption (FHE), a post-quantum cryptosystem that offers high security in cloud computing, a number theoretic transform (NTT) [6] is urgently needed to speed huge number and polynomial multiplication. The fundamental processing unit in certain implementations of the high radix [6] NTT consists of the aggregation of numerous operands..

The Wallace tree structure [1] and its version, the shortened Wallace tree [2], are the most often employed to sum multiple operands. To speed up the summing, these approaches employ complete adders as (3,2) counters, resulting

in logarithmic time complexity. Another term for this structure is a carry–save structure. Several articles since then, notably [7]–[12], have focused on improving the framework in order to speed up the summing process.

Data mining and database management [20, 21], automated teller machines and communication switching [1, 14], scientific computing [13], artificial intelligence and robotics [7], video [11], and signal processing [12] all need classification. Hardware implementations of sorting are prevalent in high-performance applications, frequently in the form of application-specific integrated circuits or field-programmable gate arrays [12]. The hardware sorting devices may be configured in a variety of ways to meet a variety of demands. Depending on the application, the number of inputs might vary from nine to tens of thousands when working with photos. Any combination of binary values, integers, and floating-point numbers with a precision of 4 bits or more up to 256 bits may be used as data.

Efficiency and low power consumption are major goals when building devices. The quantity of space on a chip is often restricted. Because leakage current grows exponentially with temperature, it becomes more vital to maintain low chip temperatures as manufacturing processes improve. It is critical to consume as little energy as possible. A primary priority is the development of low-cost, low-energy sorting systems. A network of compare and swap (CAS) nodes, often known as a Batcher (or bitonic) network, is the most common technique. Pipelining is a breeze in this kind of network. Hardware-based solutions outperform sequential software-based solutions due to their parallel nature. The total number of CAS blocks and the price of each individual CAS block have an impact on hardware costs and power usage.

II.SORTING NETWORK

The sorting network [14], a high-performance parallel hardware network, is used to sort data. If a sorting network can sort a collection of data whose components are all 1-bit integers, then it can sort any set of numbers, according to the well-known 0,1 principle [14]. It is utilised only for sorting data that consists of a single bit in this investigation [13]. Figure 3.1 [14] depicts a typical three- and four-way sorting network. Each vertical line represents a distinct sorter that accepts and outputs one-bit information as input and output. The sorter processes the bigger inputs first, followed by the smaller ones. Figure 1 depicts the input of a four-way sorting network (4 SN) as [0, 1, 1, 1], while the input of a three-way sorting network (3 SN) is shown as [0, 1, 1]. (3) SN After being processed by a three-tiered sorter, the input sequences for both 4 SN and 3 SN are rearranged with the greater number at the top and the smaller number at the bottom.

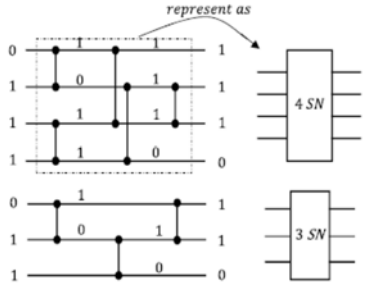

Fig. 1. Three- and four-way sorting networks.

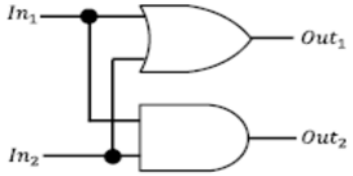

Fig. 2. Two-input binary sorter.

As previously stated, the sorter rearranges two inputs based on numerical values. Figure 2 shows a logical circuit that might be used to sort two sets of 1-bit data effectively. In a single layer of a sorter, two-input basic logic gates are employed, while three- and four-input basic logic gates are utilised in a network to sort data.

III.(7,3) COUNTER

We'll begin by examining the primary point of comparison, the design in [11]. Fritz and Fam [11] presented fast (6,3) counters with symmetric stacking structures, and a saturated (7,3) counter was then built from them. The quickest of the seven counter designs (7,3) is achieved by adding a MUX to the essential route without optimising it, although it has poor delay performance. We suggest an immediate creation of a (7,3) counter using this technique to answer the issue in [11]. Instead of one symmetrically stacked set of sorting networks, as shown in Fig. 3.1, we start with two sets of networks stacked in opposing orientations. We generate three special Boolean equations [see (2),

(13) and (15)] by constructing one-hot code sequences, considerably reducing the complexity of the Boolean expressions associated with the outputs.

To begin, all "1"s will be at the top of the series if there are any, while all "0"s will be at the bottom if there are any, as illustrated in Fig. 3. If the two "1"s and "0"s exist at all, they must meet somewhere in the newly ordered sequence. If the sequence contains just ones or zeroes, we may deal with it by adding a fixed one-bit "1" at the start and a fixed one-bit "0" at the conclusion of the reordered sequence to ensure that the 0,1-junction always resolves to the exit state. Second, the total number of ones and zeros in the original and reordered sequences remains unchanged (the inputs of two sorting networks). We disregard the padded "1" since it cannot be erased and hence has no influence on the overall number of "1"s in the padded sequence.

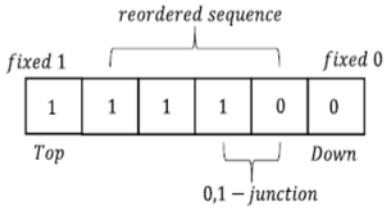

Fig. 3. Definition of a sequence**.**

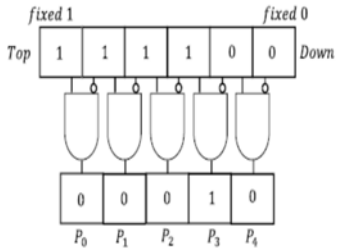

Fig. 4. One-hot code generation circuit.

Both three-way and four-way sorting networks need three layers of binary sorters, as shown in Fig. 1. (the two binary sorters on the same layer in fourway sorting network can be calculated in parallel). Each layer of binary sorters is made up of a single two-input logical gate, as illustrated in Figure 2. This shows that the three-way and four-way sorting networks take about the same amount of time to complete. The seven inputs of a (7,3) counter were split in half as a result of this. One portion has four bits, whereas the other has just three.

As seen in Fig. 3, the rearranged sequence can only be adequately represented by the 0,1-junction, which promises an extended fixed "0" and "1." The 1,0 at the 0,1-junction must be read from left to right. As a result, the four-way sorting network will be used as an example once again, with a final shape similar to that shown in Fig. 4. To create the new sequence P0P4, this framework employs a Boolean expression (AB). Because the altered and extended sequence includes just one 0,1-junction, sequence P0–P4 only contains one "1." If and only if the values P0|P1|P2|P3|P4 = 1, the range P0P4 is a one-hot code. If the sequence's components (P0–P4) are divided into two groups at random, with P0, P2, and P4 in group 1 and P1, and P3 in group 2, there is precisely one "1" in the sequence.

$$P_0|P_2|P_4 = \overline{P_3|P_4}. \qquad (2)$$

This rule applies to all results of random separation. From the output sequence of a three-way sorting network, we utilise the same method to construct the one-hot code sequence Q0–Q3. The preceding rule applies to this sequence as well. The two sequences we have currently are P and Q. P0 = 1 indicates that the four-way sorting network's input sequence contains no "1," P1 = 1 indicates one "1," Pi = 1 indicates I "1"s, and Q indicates the sequence. The following are some symbol conventions. The outputs of the (7,3) counter are C2, C1, and S, with C2 having the most significant weight and S having the least.

The output of a four-way sorting network, which comprises H1–H4 from left to right in Fig. 3.3, is denoted by the sequence H. From left to right, sequence I represents the output of a three-way sorting network, which contains I1–I3. When C2 = 1, the input sequence of the (7,3) counter comprises at least four "1s," as shown in Table I. P4 = 1 indicates that sequence H contains four "1s" (also in the input sequence of 4 SN, as the sorting network has no effect on the total number of "1s"), but Q0 = 1 shows that sequence I has no "1s." P4&Q0 = 1 shows that there are 4 + 0 = 4 "1s" in the input 7 bits. As a result of this method of representation, C2 = 1 when the sum of the subscripts of P and Q is no less than 4.

C2=P4&(Q0|Q1|Q2|Q3))|(P3&(Q1|Q2|Q3))|(P2&(Q2|Q3))|(P2&(Q2|Q3))|(P2&(Q2|Q3))|(P2&(Q2|Q3))|(P2&(Q2|Q3))|(P2&(Q2|Q3))|(P2&(Q (P1&Q3). (3) Notice that the sequence Q satisfies using the same approach as in (2).

$$Q_0|Q_1|Q_2|Q_3 = 1 \quad (4)$$

$$Q_1|Q_2|Q_3 = \overline{Q_0}. \quad (5)$$

Put (4) and (5) into (3), we get

$$C_2 = P_4\left|\left(P_3\&\overline{Q_0}\right)\right|\left(P_2\&\left(Q_2\left|Q_3\right.\right)\right)\left|\left(P_1\&Q_3\right).\right. \quad (6)$$

C1 = 1 because the total of the subscripts of the sequences P and Q equals 2, 3, 6, and 7. (see Table I). As a result, we get the following equation:

$$C_1 = (Q_0\&(P_2|P_3))|(Q_1\&(P_1|P_2))| (Q_2\&(P_0|P_1|P_4))|(Q_3\&(P_0|P_3|P_4)). \quad (7)$$

Note that

$$P_0|P_1|P_4 = \overline{P_2|P_3} \quad (8)$$

$$P_0|P_3|P_4 = \overline{P_1|P_2}. \quad (9)$$

Equation (7) is reduced to the following equation:

$$C_1 = (Q_0\&(P_2|P_3))|(Q_1\&(P_1|P_2))| (Q_2\&(\overline{P_2|P_3}))|(Q_3\&(\overline{P_1|P_2})). \quad (10)$$

P2|P3, P2|P3, and P1|P2, P1|P2, build two multichannel selection structures in (10). C1 may be determined quickly using the circuit depicted in Fig. 5. S may be readily calculated using the following equation: (P1|P3) (Q1|Q3) (11) S = (P1|P3) (Q1|Q3) (11) S = (P1|P3) (Q1|Q3) (11) S = (P1|P3) (

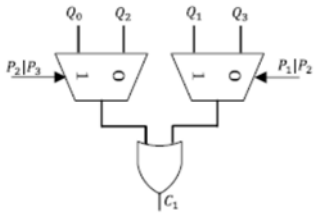

Fig. 5. C1 generating circuit.

We have got two sequences H1–H4 and I1–I3. Here, we extend sequence H1–H4 by H0 (denotes the fixed "1" in Fig. 3) and H5 (denotes the fixed "0"). Do the same for sequence I. I0 denotes the fixed "1," and I4 denotes the fixed "0." Thus, we have the following equation:

$$P_i = H_i\&\overline{H_{i+1}}, \quad i = 0, 1, 2, 3, 4$$

$$Q_i = I_i\&\overline{I_{i+1}}, \quad i = 0, 1, 2, 3. \quad (12)$$

In addition, we notice that, when subsequences selected from the sequence Q or P are given, if their subscripts are successive (P1, P2, and P3 for example), the result of "OR" them up can be easily expressed by sequence I or H (P1|P2|P3 =H1&H4 for example). Thus, the Boolean equation (12) is generalized as (13).

$$\sum_{n=i}^{n=j} P_n = H_i\&\overline{H_{j+1}}. \quad (0 \le i \le j \le 4)$$

$$\sum_{n=i}^{n=j} Q_n = I_i\&\overline{I_{j+1}}. \quad (0 \le i \le j \le 3). \quad (13)$$

Based on this, (10) is simplified to (14), which can also be calculated from the circuit in Fig. 6

$$C_1 = (Q_0\&(P_2|P_3))|(Q_1\&(P_1|P_2))|(Q_2\&(\overline{P_2|P_3})) |(Q_3\&(\overline{P_1|P_2})) = (Q_0\&(H_2|\overline{H_4}))|(Q_1\&(H_1|\overline{H_4}))|\left(Q_2\&\left(\overline{H_2|H_4}\right)\right) \left|\left(Q_3\&\left(\overline{H_1|H_4}\right)\right).\right. \quad (14)$$

There is another trick for sequences H and I. Because H0–H5 are all in order, this means that, if Hi = 1 (i= 0, 1, 2, 3, 4, 5), then, for every j <i,Hj= 1 always holds and so is the sequence Q. Then, we get the following equation:

$$I_i = I_i|I_{i+j}, \quad (i = 0, 1, 2, 3; j \ge 0; i + j \le 4)$$

$$H_i = H_i|H_{i+j}, \quad (i = 0, 1, 2, 3, 4; j \ge 0; i + j \le 5). \quad (15)$$

Note that H0 = I0 = 1 and H5 = I4 = 0 always hold; we can simplify (3) as (using a trick:A|(A&B) = A|B)
C2=(P4&(Q0|Q1|Q2|Q3))|(P3&(Q1|Q2|Q3))|(P2&(Q2|Q3))|(P1&Q3)
= H4|(H3&I1)|(H1&I3)|(H2&I2). (16)

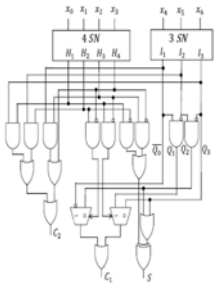

Fig. 6. Overall (7,3) counter circuit.

Figure 6 depicts the whole structure. The pathways from H and I sequences to C2, C1, and S are virtually indistinguishable. This property, which is derived from (3) and (4), adds to the parallelism of the circuit (7). The area of the suggested design, on the other hand, will not expand as a result of the parallelism, as demonstrated in the following sections. In reality, it is decreasing. Boolean statement simplifications at stages (2), (13) and (14) are among the reasons for the lower footprint (15).

IV.(4:2) COMPRESSORS

A (4:2) compressor, as shown in Fig. 9, serves the same logical goal. We also use sorting networks to build a high-speed (4:2) compressor. We noticed that the final step of the four-way sorting network (Fig. 1) only sorts the two data in the centre, meaning that the data at the top and bottom are the highest and lowest of the four data, respectively.

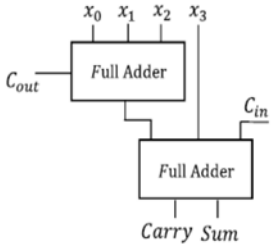

Fig. 9. (4:2) compressor combined by full adders.

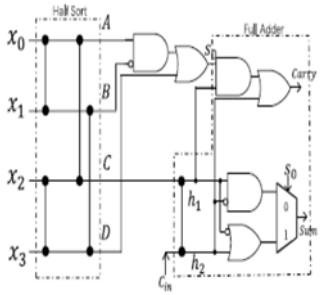

Fig. 10. Proposed exact (4:2) compressor.

The "Half Sort" results are labelled A, B, C, and D in Figure 10, which is titled "Half Sort." Because A and D are the largest and least data, the sequence [A, B, D] is already sorted completely. A modified "Full Adder" is used to calculate the sum of s0, Cin, and C. (as illustrated in Fig. 11). Equation describes the "Full Adder" (30).

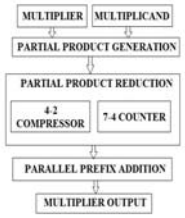

Fig. 11. Block diagram of proposed multiplier.

A novel counter and compressor architecture based on a sorting network is presented, as well as the construction of an 8x8 multiplier. Using a parallel prefix adder also reduces the latency of the final addition. In comparison to existing options, the suggested approach uses less resources and has a lower latency. Because it employs a sorting network, the (7,3) counter is more adaptable than previous designs. In addition, exact/approximate (4:2) compressors, which are built using a sorting network, are presented. When utilised in approximation applications, they perform better in ADP and PDP.

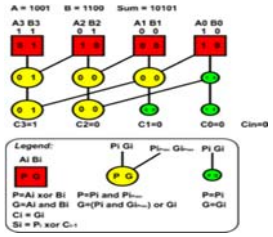

Fig.12 Kogge stone adder

V. EXPERIMENTAL RESULTS

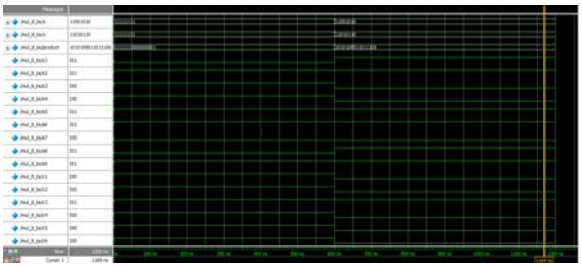

Fig.13 Simulation result of Propose Multiplier

The suggested multiplier's simulation result is shown in Figure 13. The counter and compressor are used to implement multipliers. It employs a kogge stone parallel prefix adder for the final addition to increase latency and power efficiency even further. Table I lists some of the parameters for the proposed multi-level compressor and counter-based multiplier, including area, power, and latency. Several kinds of compressors and counters are used in the suggested design to optimise space, latency, and power consumption.

Table.I. Comparison Results of Multiplier

Parameters	Area (Gate Count)	Power (mW)	Delay(ns)
Existing Multiplier	1260	181.97	32.340
Proposed Multiplier	1272	177.87	29.780

VI. CONCLUSION

A revolutionary counter and compressor design is presented with the use of a sorting network and the building of an 8x8 multiplier. In addition, a parallel prefix adder is employed to reduce the final addition's total latency. The proposed technique has a lower latency and uses less resources than current methods. The (7,3) counter is more versatile than rival systems because it uses a sorting network. In addition, to generate exact/approximate (4:2) compressors, a sorting network-based technique is applied. They perform well in ADP and PDP when used for approximation purposes.

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Steganography Photograph Substitution Attack using Deep Fractal Network

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ABSTRACT

In a variety of settings, IDs and MRTDs (Identification and Machine-Readable Travel Documents) are used to identify and validate individuals. To mitigate the dangers associated with this fraud issue, governments and ID and MRTD manufacturers must continue to develop and strengthen security measures. In light of this, we provide StegoFace, the first efficient steganography solution designed for face pictures printed in conventional IDs and MRTDs. StegoFace is an end-to-end facial image steganography model comprised of a Deep Convolutional Auto Encoder capable of concealing a secret message in a face portrait and, as a result, producing the stego facial image, and a Deep Convolutional Auto Decoder capable of reading a message from the stego facial image, even if it has been previously printed and then captured by a digital camera. In terms of perceptual quality, facial pictures encoded with our StegoeFace technique surpass StegaStamp produced images. On the test set, the peak signal-to-noise ratio, hiding capacity, and imperceptibility values are utilised to assess performance.

Keywords - Id proof, RNN face detection, BECC Translator, DC auto encoder/ decoder, Validation.

1. INTRODUCTION

Any document that may be used to confirm a person's identity is known as an identity document (also known as a piece of identification or ID, or informally as papers). It's commonly referred to as an identification card (IC, ID card, citizen card),[a] or passport card if it's issued in a compact, normal credit card size format. [b] Some nations offer formal identity papers, such as national identification cards, which may be required or optional, while others may rely on regional identification or informal documents to verify identity.

Figure 1.1. Identity Card

In many countries, a driver's licence may be used to verify identification in the lack of a formal identity certificate. Some nations refuse to recognise driver's licences as identification, owing to the fact that they do not expire as papers in such countries and may be outdated or readily falsified. A person's identification document is used to link them to information about them, which is generally stored in a database. The most secure method is to use a unique national identification number, however some nations lack such numbers or do not include them on identity papers [1]-[5].

2. OVERVIEW

Different types of identifications have been introduced, ranging from national identity (ID) cards to drivers' licences to worker ID cards, but due to the ease with which they can be manipulated and faked, they have not helped to address the issue of insecurity, fraud, and other vices for which they were introduced. To do so, the card would need to be linked to a real-time central repository that confirms the individual's authorization to possess the identification card itself, therefore confirming the card-holder relationship.

ID Card Security Issues

However, identification national cards need more attention and purpose since they aid in the battle against insecurity and other vices among the country's residents and immigrants. The following are some of the problems with the National Identity Card:

Error due to human error: It is a significant task to ensuring that all personal information is input accurately. Human mistake may accidentally limit an individual's freedom, create grief, and compromise data security. It may also create delays in the issuance of ID cards, resulting in a waste of government funds.

Forged identification and counterfeit cards are simpler to clone than the "smart" National identity card, which is still in use in a handful of counties.
Falsification of content: an attacker takes advantage of a flaw in the electronic ID card system to alter the data of people. The repercussions vary depending on the motivations of the attacker; for example, it might be employed to exact vengeance on a specific individual.
Theft or loss of identification cards puts a lot of strain on both the government and the holder, particularly in the case of standard ID cards, which include more information than "smart" ID cards [6]-[10].

3. STEGO ANALYSIS

Steganography is a method of hiding secret information inside (or even on top of) a non-secret document or other medium in order to prevent discovery. The word "steganos" means "hidden" or "covered" in Greek, while the term "graph" means "to write" in Greek. When you put these words together, you get something that sounds like "secretwriting" or "hidden writing."

Figure .1. Steganography

The purpose of steganography is to conceal and deceive. It is a form of covert communication and can involve the use of any medium to hide messages is shown in figure.1.

4. SYSTEM INFRASTUCTURE

The face picture and the secret message are received as inputs into the encoder initially. Using a face identification model, the relevant portion of the picture is identified and cropped. A binary error correcting coding scheme is also used to encode the secret message. The secret message information contained inside the face picture is resistant to imagecarrier physical distortions and other forms of noise and mistake is shown in figure.2.

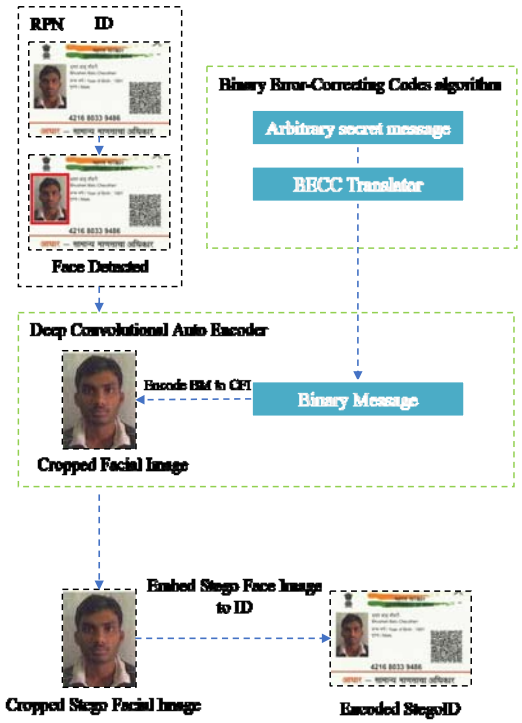

Figure.2.: System Design – Deep Convolutional Auto Encoder

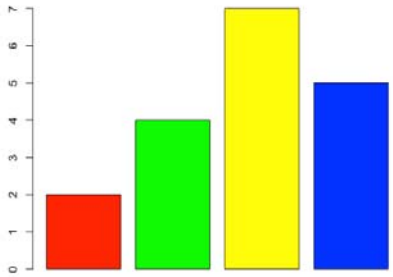

Figure.3.Cropped Facial image

Authorized Verifiers connect into the StegoFace online dashboard and then upload the ID card to Auto Decoder in this module. A document picture is shot using a mobile camera, then the encoded section of the image (the portrait) is recognised and clipped in the decoding process. Finally, the recovered message is examined, and the portrait's integrity is confirmed is shown in Figure.3.

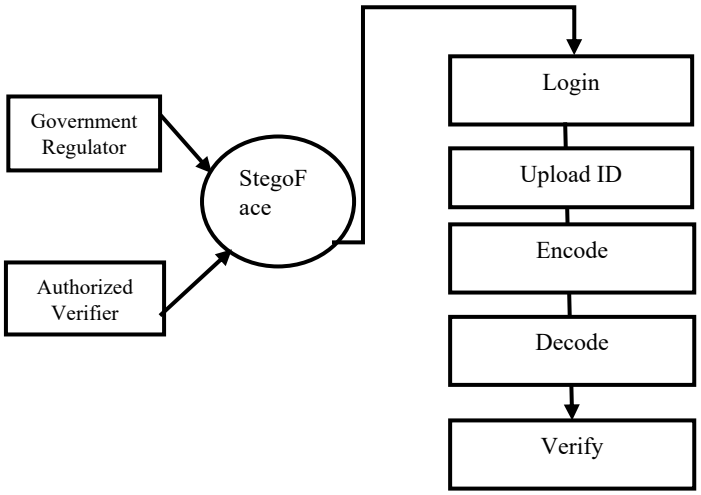

Figure .4.Verifier Control panel

Image preparation speeds up the matching process and increases the odds of a perfect match. Face photos are preprocessed to fulfil the encoding criteria. Because the cover picture and the secret image should be the same size, the preprocessing module resizes the hidden image to 256 x 256 is shown in fig.4 & 5. One input layer and

three convolutional layers with increasing numbers of filters make up the preprocessing module is shown in

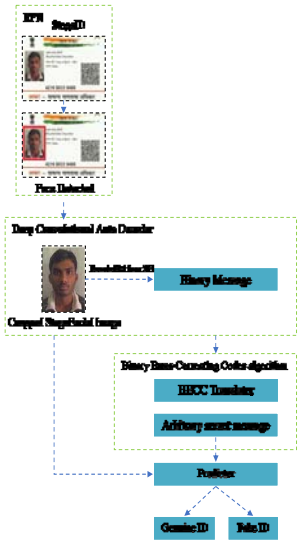

fig.5.

Figure.5.:System Design – Deep Convolutional Auto Encoder

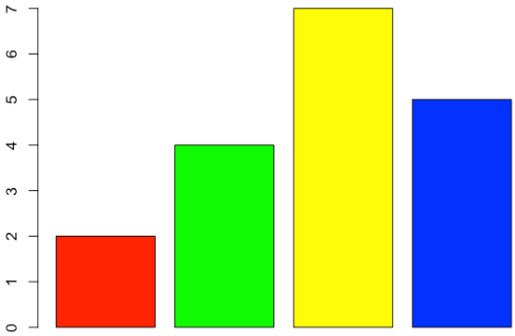

Figure.6.Embed Stego face image to id PSNR value is 100DB

Face Detection

For a robust ID verification process that conceals a messagein the facial image is shown in fig.6..

Detect faces

Region proposal network (RPN) The region proposal network (RPN) starts with the input image being fed into the backbone convolutional neural network is shown in fig.7.

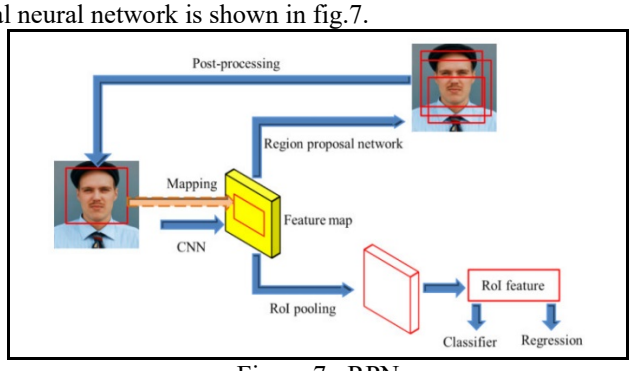

Figure.7.: RPN

Face segmentation is required for face detection from faces with a backdrop. Before performing the recognition method, it is necessary to choose sub-regions (patches) of the picture.

Make boxes around people's faces.

Anchors with 4, 8, 16, 32 scales and 0.5, 1, 2 aspect ratios are employed. Each grid in the picture now has a total of 12 anchors. W = w/16, H = h/16, and 16 is the sub sampling ratio, resulting in a total of W x H x 12 anchors.

• Proposal Layer for Regions
The RPN loss is designed to encourage the network to identify anchors as either background or foreground, and to alter the foreground anchor to better match the face area.
Classification Loss + Bounding Box Regression Loss = RPN Loss
Cross entropy loss is used to topenalize the erroneously classified boxes in the classification loss. The difference between the real regression coefficients and the regression coefficients predicted by the RPN is used to calculate regression loss.
Cropper
Cropping refers to the area of a picture where the face may be found and can be utilised for encoding.
Cropping the face body is done by beginning the crop at (0, 90) and finishing it at (290, 450) in the original picture.
BECC Translator 1.2
A binary error correcting code (BECC) is an encoding system that sends messages as binary integers and allows them to be retrieved even if some bits are flipped incorrectly. They're employed in almost every kind of communication delivery.
Codes in blocks
The message is contained in block codes, which are fixed-size blocks of bits. The superfluous bits are added for mistake correction and detection.
Codes with convolutions
The message is made up of data streams of varying lengths, with parity symbols formed by sliding the Boolean function across the data stream.
Error correction is accomplished via the hamming code approach.
Code Hamming
A block code is an example of hamming code. This algorithm detects the two simultaneous bit mistakes and corrects single-bit faults.
Face Steganography Using Deep Convolutional ID
Auto Encoder (version 2.1)
The encoder network is the generator's initial component. The goal of the encoder training process is to find the best balance between the encoder's capacity to restore perceptual qualities of input pictures and the decoder's ability to recover the concealed information. The preprocessing module's concatenated features are sent into the embedding network. A convolutional layer with 3 filters isplaced at the end of the embedding network to convert the256 X 256 X 8 feature vector into 256 X 256 X 3 stegoimage output.
Auto Decoder (version 2.2)
After adding noise to the pictures, the decoder network is included into the whole design. The decoder's purpose is to retrieve a message encoded in a face picture.
Before the DCAD, the RPN block is put. Five convolutional layers with a rising number of filters make up the expanding encoder section of the extraction network (8, 16, 32, 64, 128). There are five convolutional layers in the decoder, each with a decreasing number of filters (128,64, 32, 16, 8). AnReLU activation is included into each layer is shown in figure 8. There are five convolutional layers in the decoder, each with a decreasing number of filters (128,64, 32, 16, 8).

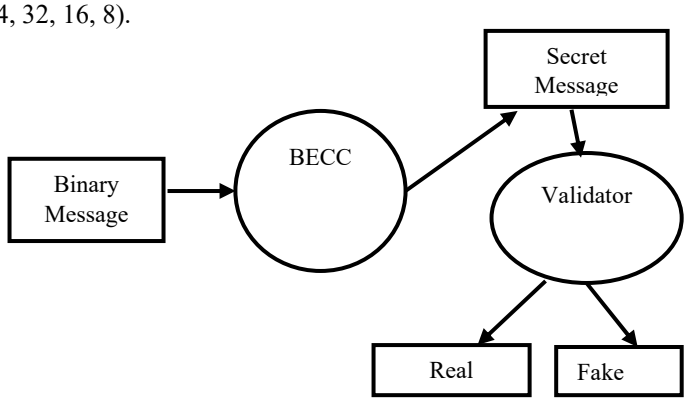

Figure.8.: BECC

In the context of IDs and MRTDs, the StegoFace is a paradigm for encoding and decoding a secretmessage in face photographs. The encoder receives the face picture and the secret message as inputs initially. A binary errorcorrecting codes algorithm is used to code the secret message at the same time. The encoded cropped picture is then printed on an ID card in lieu of the original face image.

In terms of the decoder, a digital camera captures the encoded face picture on the ID card.

5. EXPERIMENTAL RESULT

Three criteria are widely used to evaluate steganographic techniques: imperceptibility, capacity, and security. The peak signal-to-noise ratio is another essential numerical statistic. It's vital to dispel any concerns regarding the Payload's existence in cover operations. Any conjecture about the cover's veracity detracts from stenography's goal and facilitates cryptanalysis. The size ratio between the cover medium and the hidden message is referred to as payload capacity. Steganography strives to conceal Payload; hence, the more the Payload capacity achieved by an algorithm, the better this goal is serviced. However, there is a balance between the Payload of the ability and its invisibility/imperceptibility. Statistical assaults use a series of statistical tests on visual data to identify a Payload's embedding. When a secret message is hidden, certain steganographic methods create signs or artefacts. A statistical assault must not be guided by an artefact left by an algorithm.
Channel noise may cause modifications during the transmission of a stego message through a communication channel. The Payload is also corrupted as a result of cropping, rotating, or resizing. The mechanism for embedding the Payload determines the vulnerability to corruption. The vulnerability of an embedding algorithm should be as low as feasible.
PSNR (peak signal to noise ratio) = 1.5
PSNR denotes a change in the performance image metric collected during the Payload embedding method. A high PSNR value suggests a high-quality picture, indicating that the original photo and the stegoface are quite similar to one another. PSNR may be calculated using log:

$$PSNR = 20\log_{10}\left(\frac{MAX_f}{\sqrt{MSE}}\right)$$

where (255) is the maximum 8 bits value representation of a pixel; while MSE indicates the mean squared error or difference between the cover and the stegoface in pixel's values, given as

$$MSE = \frac{1}{mn}\sum_{0}^{m-1}\sum_{0}^{n-1}\|f(i,j) - g(i,j)\|^2$$

where *M* and *N* represent the photo's dimensions, *x* and *y* denote the photo coordinates, Cx,yCx,y denotes the cover photo, and Sx,ySx,y represents the stegoface.

6. CONCLUSION

The goal of this article is to hide security encoded data in ID and MRTD papers while still allowing for picture integrity checking. With this in mind, we provide StegoFace, the first efficient steganography solution for face photos printed in standard IDs and MRTDs. StegoFace is an end-to-end Deep Learning Network comprised of a Deep Convolutional Auto Encoder capable of concealing a secret message in a face portrait and, as a result, producing the encoded image, and a Deep Convolutional Auto Decoder capable of reading a message from the encoded image, even if it has been previously printed and then captured by a digital camera. StegoFace outperforms current approaches by enabling pictures to be used in their context, regardless of the backdrop. This feature also enables us to utilise the approach without any picture parameter limits. In compared to prior techniques, this is aimed to aid the decoder in reading messages from smaller pictures. The resize network reduces the size of encoded pictures sent to the decoder. In terms of perceptual quality, facial pictures encoded with our StegoFace technique surpass StegaStamp produced images.

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Design and Development of U-Shaped Antenna Structure for Wireless Communication

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Abstract: The WiMax/WLAN antenna is used to provide a full-duplex radio communication system. This report's antenna design included a triple-band operation with a large impedance bandwidth for WLAN/WiMAX systems. The antenna is built as a U-shaped antenna with a modest dimension of 20X18mm2. The antenna's overall performance on three separate bands The U shaped antenna is used to operating frequencies for 2.5GHz to 5.5GHz. The findings were simulated and validated using the HFSS simulator. The return loss is obtained at maximum value -28.05dB and minimum value is -18.05dB. The gain is obtained at maximum value 7.2dB and minimum value is 4.2dB. The VSWR is obtained at maximum value 1.8 and minimum value is 1.4. As a consequence of the modelling findings and parameter settings, the antenna may concurrently function in the WLAN, WiMAX, and MIMO frequency bands.

Keywords:- U Shaped, Gain, Return Loss, VSWR and Radiation Pattern

1. INTRODUCTION

The fast development of microstrip antenna technology started in the late 1970s. Basic microstrip antenna elements and arrays were reasonably well established in terms of design and modelling by the early 1980s. Printed antennas have received a lot of attention in recent years because of their benefits over existing radiating systems, which include light weight, small size, cheap cost, conformability, and simplicity of integration with active devices. Microstrip Patch antenna consists of a radiating patch on one side of a dielectric substrate with a ground plane on the other. The patch is usually composed of copper or gold, which conducts electricity. On the dielectric substrate, the radiating patch and feed lines are normally photo etched. The fringing fields between the patch edge and the ground plane are what cause microstrip patch antennas to emit. The study has been done at the centred frequencies 28GHz and 38GHz in the reference publication [10], where the transformer coupling is utilised. The H-slot and E-slot were used to construct an antenna for the concentrated frequency of 60GHz in the reference work]. Their gain is 5.48 decibels, while their reflection coefficient is -40.99 decibels [1]-[5]

Due to the availability of extremely broad spectrum bands in several sectors, particularly in mobile communications, millimetre wave bands have attracted a lot of attention in recent years. Wireless cellular network development has accelerated in recent decades, and applications such as smart phones, tablets, and video streaming have a strong need for high-quality data transmission. The capacity of cellular networks in 2020 is expected to be 1000 times that of current fourth generation (4G) technology. In the meanwhile, it is expected that the cellular network will be capable of connecting 50 billion devices for wireless services. mm wave frequencies typically vary from 6GHz to 100GHz, with 6GHz, 15GHz, 28GHz, 38GHz, 60GHz, and E-band(71-76GHz,81-86GHz)] being the most common. The vast majority of communication systems run at frequencies below 3GHz, and accessible spectrum, particularly in the microwave bands, is becoming scarce. As a result, millimetre wave bands must be used since they have a large untapped spectrum ranging from 20GHz to 90GHz.. The 5th generation wireless system is abbreviated as 5G. It denotes the predicted phase of mobile telecommunications, which goes much above the current 4G standards, which have a throughput speed of 1Gbps and a connection speed of 25Mbps. 5G supports a variety of network types, while 6G aggregates them dynamically. The federal communication commission has designated a frequency spectrum for 6G that ranges from 95GHz to 3THz, which is not presently utilised in any consumer electronic products and has a greater bandwidth and large potential for data streaming. For operating frequencies greater than 10GHz, commercially accessible substrates are being used to fabricate antennas., while the Rogers RT/Duroid 5880 is an exception. The tensile strength and water absorption properties of Rogers substrate are both high. When compared to the other substrates, it has the lowest electric loss, which results in outstanding return loss and

bandwidth values, as well as the lowest voltage standing wave ratio [6]-[10]. The micro strip patch antenna is the most basic antenna to construct, and it has attractive properties such as a low profile, light weight, tiny size, and cheap cost, and it is ideally suited for planar and non-planar surfaces. The use of an array is critical for improving gain and other radiation parameters [6], and this study offers both an array and an antenna. The suggested antenna features a substrate sandwiched between the ground plane and the radiating element patch on one side and the ground plane on the other. Metal has been utilised for the ground and patch. Microstrip line feeding is employed because it is easy to simulate. An adjustable inkjet printed antenna for 5G millimetre wave wireless applications has been created in reference paper, with a bandwidth of up to 10GHz and an omni-directional radiation pattern. A millimetre wave microstrip patch antenna has been built for predicted 5G communication at the centred frequencies of 38GHz and 54GHz, with bandwidths of 1.94GHz and 2GHz, and gain of 6.9dB and 7.4dB, respectively, in reference document . The reference study proposes a PIFA antenna with concentrated frequencies of 28GHz and 38GHz and a greater bandwidth. The study has been done at the centred frequencies 28GHz and 38GHz in the reference publication, where the transformer coupling is utilised. The H-slot and E-slot were used to construct an antenna for the concentrated frequency of 60GHz in the reference work [11]-[14]. Their gain is 5.48 decibels, while their reflection coefficient is -40.99 decibels. The suggested U-shaped antenna for 5G communication operates at centred frequencies of 24.6GHz and 41.1GHz, with greater bandwidths, reduced insertion loss, and a very low reflection coefficient (return loss) (expressed in dB) Another U-shaped antenna is planned for 6G communication, with concentrated frequencies of 100GHz and 189GHz and a greater bandwidth.

2. DESIGN OF U-SHAPED STRUCTURE

A design approach is presented based on the simplified formulation that has been provided, which leads to feasible designs of rectangular micro strip antennas. The process assumes that the required information comprises the substrate's dielectric constant (r), resonant frequency (fr), and substrate height (h). The steps are as follows:

Specify the following values: r, fr (in Hz), and h, Determine the following: W, L. The following are summaries of fundamental operation for the parameters of a microstrip patch antenna. The dielectric constant of the antenna substrate is given as r. The r has the most impact on the antenna's bandwidth and radiation efficiency. The lower the permittivity, the broader the impedance bandwidth and the lower the excitation of surface waves.

The antenna substrate thickness is denoted by the height h. The bandwidth and coupling level are affected by the substrate thickness. For a given aperture size, a thicker substrate results in a larger bandwidth but less coupling. The length of the microstrip patches is L. The antenna's resonance frequency is determined by the length of the patch radiator is shown in table 1. The width of the microstrip patches is provided as w. The antenna's resonant resistance is affected by the patch width, w, with a broader patch having a lower resistance.

Table.1. Design Parameters

Sl.No	Parameters	Value
1	Size	20X18mm2
2	Length of the Patch (L)	20.5mm
3	Width of the Patch (W)	16.5mm
4	Substrate	FR4
5	Thickness of the Substrate	1.6mm
6	Loss Tangent	0.008
7	Operating Frequencies	2.5GHz to 5.5GHz

3. RESULTS AND DISCUSSION

When the load is mismatched with the load, the whole power is not provided to the load, and the power is returned, which is referred to as a loss, and the loss that is returned is referred to as the return loss. The U shaped structure antenna is shown n figure .1. A larger return loss means that the antenna is radiating more power, which raises the gain. The u-shape microstrip patch antenna resonating at 2.5GHz with a maximum return loss of -28.05dB and an impedance bandwidth of 180MHz is shown in figure 2.

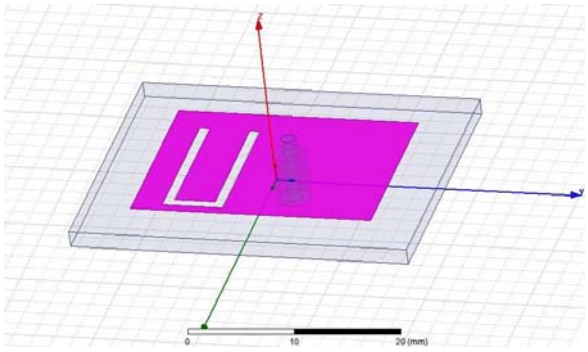


Figure.1. U-Shaped Structure Antenna

The antenna gain is a number that represents the antenna's performance, or its capacity to concentrate energy in one direction to provide a better image of the radiation performance. This is measured in decibels, and in a nutshell, it corresponds to the direction of highest radiation. The computed gain of the proposed antenna is shown in Figure 3. The greatest gain possible is 3dB. All communication equipment must comply with the VSWR standard. It determines how effectively an antenna is matched to the cable impedance when the reflection is equal to zero. This indicates that there is no reflection and that full power is delivered to the antenna. The Voltage Standing Wave Ratio (VSWR) simulation result is presented in Fig.4.

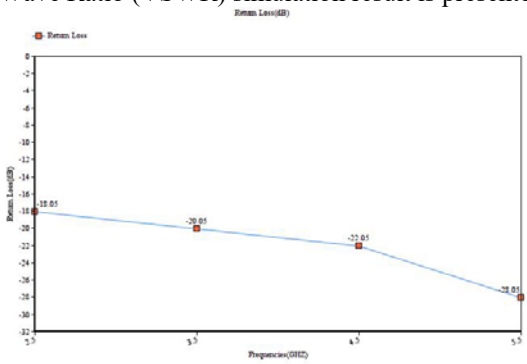
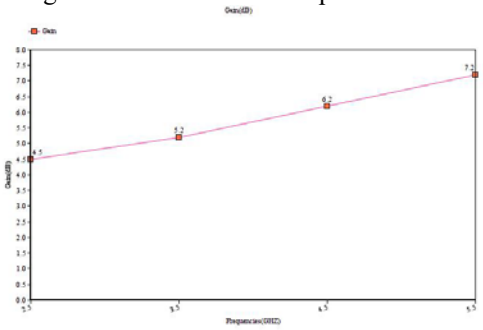


Figure.2. Return Loss of the U-Shaped Antenna

The power emitted or received by the antenna determines the radiation pattern of the microstrip Patch Antenna. It is a function of the antenna's angular location and radial dispersion. Figures.5. depict the proposed microstrip patch antenna's radiation pattern.

Figure.3. Gain of the U-Shaped Antenna



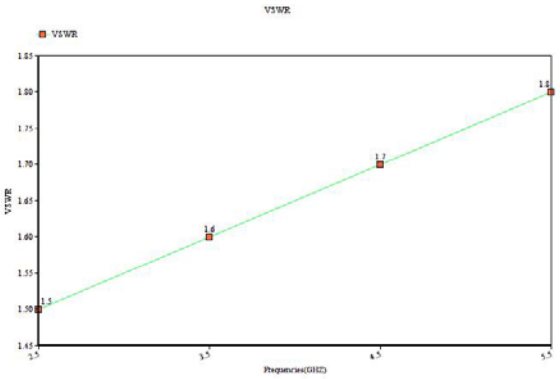
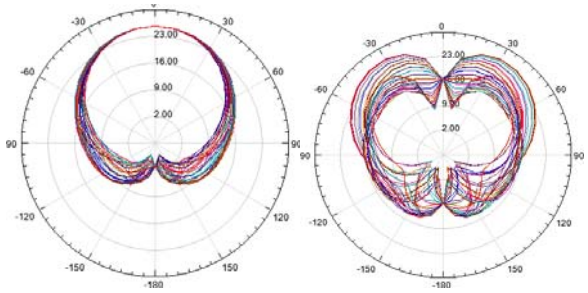
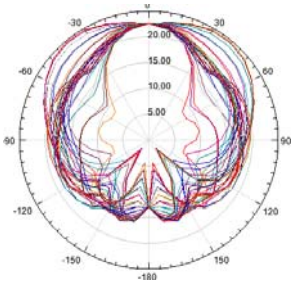


Figure.4. VSWR of the U-Shaped Antenna



(a)



(b)

Figure.5. Radiation Pattern of the U-Shaped Antenna

4. CONCLUSION

We constructed a patch antenna that operates from 2.5GHz to 5.5GHz and compared the results for various slots in this study. We may argue that numerous factors such as antenna size, substrate selection, feed method, and operating frequency can all have an impact on the antenna's performance. After simulation, the findings show a bandwidth of 5% and a gain of 7.2 dB. As a consequence, we find that the U-Shape slot design delivers better bandwidth and gain than other slot outcomes. It is critical to consider the feed method, impedance, and substrate as primary characteristics. The antenna's performance is also influenced by where the Feed line is terminated. Array antennas and other feeding methods may be used in the future to enhance the gain.

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Wireless Charging of Electric Vehicle

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ABSTRACT

Around the world, static wireless charging is rapidly gaining popularity as a way to recharge electric cars (EV). But even a fully charged electric vehicle has a finite driving distance. More batteries are required in order to increase its operating range. It is now possible to extend the range of an electric car without adding heavy batteries by using dynamic wireless charging. One kind of vehicle that could avoid this issue is the modern electric car. On the other side, Dynamic WPT will render obsolete a plug-in charger and static WPT, thereby tripling an EV's total range. Since we can charge an EV while we are travelling, we won't need to stop or worry about running out of electricity. In the future, batteries from hybrid, electric, and other vehicles may be recycled using this method. You will need a transmitter coil and a receiver coil in order to utilise wireless charging. Mutual induction will allow the transmitter coil to provide electricity to the receiving coil as it passes both. On the other hand, the distance between two adjacent coils influences wireless power transmission (WPT). Using Analysis Maxwell simulation software and a system made up of two Archimedean copper coils, we examine the effects of vertical and horizontal misalignment on the WPT. At a 150 mm air gap, the transfer power is 3.74 kW with a 92.4 percent efficiency. A 6.1 kW electric vehicle's battery is fully charged in around 1 hour and 39 minutes when there is a 150mm air gap. Dynamic charging is also made easier by having a designated charging lane. When operating an EV in a charging lane, the power transfer is calculated using mutual inductance. To determine how far an EV can go with this extra power, one may utilise the load power.

Key Words: Electric vehicle, wireless power transfer, dynamic charging, efficiency, charging lane

1. INTRODUCTION

The first electric vehicle was released by General Motors in 1996, and that was the start of the electric vehicle revolution. On the other hand, with the debut of Chevrolet and Nissan, EV manufacturers have taken a technologically amazing and socially acceptable stride forward in the name of environmental responsibility. A major step in protecting the environment, enhancing the dependability of transportation, and reducing dependency on fossil fuels is switching to electric vehicles. Because of this considerable benefit, an increasing number of firms are investing heavily in researching and enhancing electric car technologies. Built on the concept of wireless charging is the Wireless Charging System (WCS). An induced EMF in the second coil, known as the reception coil, may be used to generate electrical energy with a certain current in the first coil, known as the transmitter coil [1]–[5]. As a result of advancements being made in this field by automakers and research organisations, charge while driving (CWD) infrastructure may become generally available over the next ten to twenty years. As a result, a number of firms are looking at methods to improve the charging process for electric automobiles while also increasing their range. System for paper design with resonance frequencies ranging from 40 to 85 kHz (S-S, or series-series). According to the experts, WPT technology performs best in low-power electric vehicles. On the other hand, one of the key problems facing EV producers is dynamic charging. Since the invention of wireless charging for electric cars, two WPT strategies have shown to be highly effective. Both capacitive wireless power transmission (CWPT) and resonant inductive power transfer (RIPT) have been shown to be effective substitutes for conventional electrical power distribution systems (RIPT). Studies have shown that inductive charging is substantially more effective than capacitive charging and has a higher power density. The magnitude of the inductive properties is influenced by the coupling coils' diameters. Many researchers are looking into how to provide more power to the receiving pad in order to boost the efficiency of electric cars in dynamic situations. However, most work is inefficient, and RIPT is no different. When operating an electric car, misalignment is another element that reduces overall efficiency. Efficiency falls when there is a coil mismatch between the transmitter and receiver. The coupling coefficient rises from 0.2 to 1.6 for a 20% misalignment of the coils. Several shielding materials may be used to achieve the desired results of magnetic field alignment and leakage flux reduction. A ferrite item has been shown to diminish magnetic fields while having minimal impact on neighbouring objects. The coil may also have an impact on the crystal structure of the ferrite. Circles, striated circles, squares, rectangles, T-cores, U-cores, E-cores, Double Us, and striated blocks [6] through [10] are just a few of the forms and sizes that are available. Due to their high battery capacities, EVs' WCS may be able to deal with concerns about range, battery shortages, and wasted space. Dynamic WCS, on the other hand, encounter challenges such worse efficiency, decreased power transfer, bulkier design, and electromagnetic compatibility. On the other hand, dynamic WCS has been investigated to address the reduced range of concern related to a continuous charging facility. This technique allows the battery storage unit to be charged while the EV is in motion. In this case, the automobile just needs a limited amount of battery storage. In order to enable wireless charging, also known as dynamic charging, Wireless Charging Units (WCUs) are positioned on the road so that energy is captured by mutual induction as a car passes over them. To address the issue's restricted range, increase the transit range of electric vehicles. Dynamic WCS is hindered by two major issues, though: horizontal misalignment and a large air gap between the EV and the charging channel. Coil alignment and air-gap distance inside the coils have a significant impact on the efficiency of power transmission. When the distance between two coupling coils is kept as small as possible, more energy may be passed between them. Circular pads (CP), circular rectangular pads (CRP), double-D pads (DDP), double-

D quadrature pads (DDQP), and bipolar pads are among the coil topologies (BPP). It has been shown that the inductive system utilising DD and QDQ coils maintains maximum efficiency whether the coils are positioned correctly or incorrectly. The typical air gap for small automobiles is between 150 and 300 mm. This article's emphasis is on simulation and computation in these ranges as a result. However, it could go up for larger cars [11]–[13]. This study offers a comprehensive discussion of dynamic WPT under the mutual induction paradigm. Then, the transmitter and receiver coils are modelled using Ansys Maxwell software, and WPT simulation is run. Ansys Maxwell can simulate and model electromechanical parts, including transformers, electric machines, and wireless charging, to mention a few. As a result, a mathematical equation should be used to confirm the final results. Additionally predicted are the system's effectiveness and energy use. The amount of energy an electric vehicle can take in from a charging lane as well as how far it can go after its stored energy has been used up are calculated in the last step. Numerous research have focused on simulating and calculating WPT transmitter and receiver coils.

2 .WIRELESS POWER TRANSFER

An inductive coil is used to transmit electricity in the IPT technique. The static approach for WPT is the most effective when the receiver coil is centred above the transmitter coil. However, when considering dynamic charging, the receiving coil moves and can only collect a certain amount of magnetic flux from the transmitter coil (see Fig. 1). The transmitter and receiver coils are brought into resonance using a capacitor on the transmitter side and a compensation network on the receiving side. The RIPT method is the name given to this process. The most effective method for wirelessly transferring electricity over short distances is called RIPT. Series-series (s-s), series-parallel (s-p), parallel-parallel (p-p), and parallel series (p-s) compensation networks are the four compensation networks used in the RIPT technique. The s-s compensation network is used in this study because it provides the receiving pad with the most power. The switching frequency of RIPT [13]-[15] is likewise greater than that of IPT.

Grid power is converted from low frequency (lf) to high frequency (hf) ac using an ac-dc converter and a dc-ac inverter. Using the s-s compensating technique, both the transmitter and receiver coils may send as much energy as is practical to the reception. The receiving pad will typically be placed on the vehicle's floor, while the sending pad will typically be positioned below the road's surface. The receiver pad is often positioned lower on the EV's frame in order to gather more magnetic flux. To charge the batteries, high-frequency AC is converted into DC via an AC/DC converter. The battery management system (BMS) communications and power controller are used to keep everything running smoothly and safely. The whole charging procedure from the grid to the car is shown in Figure 2 from [14] to [15]. (G2V).

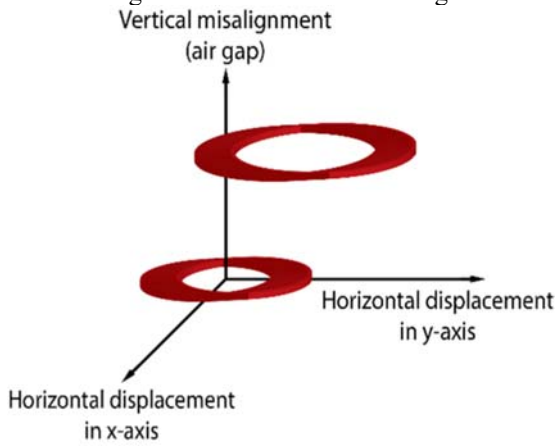


FIGURE 1. Misalignment of the transmitter and reception coils.

3. COIL DESIGN

In WPT systems, many types of coils are used. The circular coil is the best arrangement for high-frequency wireless communications since it has any sharp edges. The eddy current is thus kept to a minimum. The WPT technology operates more effectively as a result of the coil's strong magnetic field. The intended transmitter coil and receiving coil are shown in Figure 5.

4. EQUIVALENT EQUATIONS

After being built, an Archimedean spiral coil is challenging to alter. Proper modelling is needed for an Archimedean spiral coil. An Archimedean coil's inductance is computed in a different way than a circular coil is.

The Wheeler formula given in may be used to compute the transmitter coil's self-inductance (1).

The most significant variable in this case is M, or mutual induction. We can determine the quantity of power transferred to the receiving end thanks to mutual inductance, which is crucial for taking subsequent actions. As the coils are moved up and down, the magnetic field and the amount of mutual induction change. Mutual induction will be calculated using the radii of the current filaments in the transmitter coil (Rt) and receiving coil (Rr) (Rr). The subscripts 't' and 'r', which range from 1 to 18, denote the number of turns in the coil; R1 represents the radius of the first turn, and so on. N and Nr denote the number of turns on each coil, whereas D denotes the vertical separation between the transmitter and receiver coils [3, 6]. As a consequence, you may use to get the root-mean-square value of the magnetic flux density B0 (2). To get the total magnetic flux density in the receiving coil, we simply sum the individual figures for each turn.

. $$B_{\circ} = \frac{\mu_o}{4\pi} I_{Trms} \sum_{t=1}^{N_1} \frac{2\pi R_t^2}{\left(R_t^2+D^2\right)^{3/2}} (2)$$

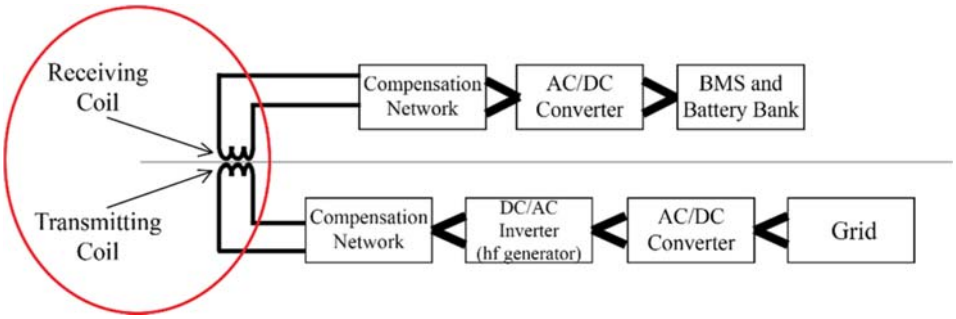


FIGURE 2. Block diagram of G2V

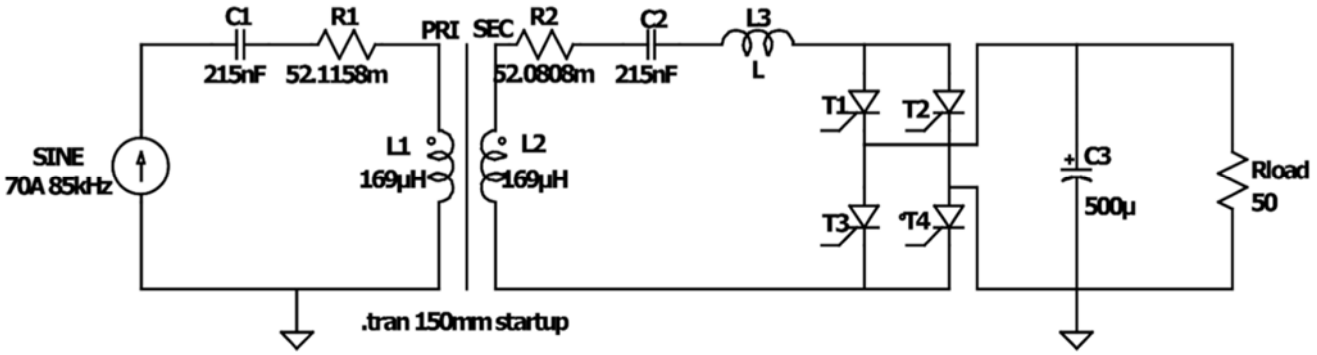


FIGURE 3. RIPT Equivalent Circuit.

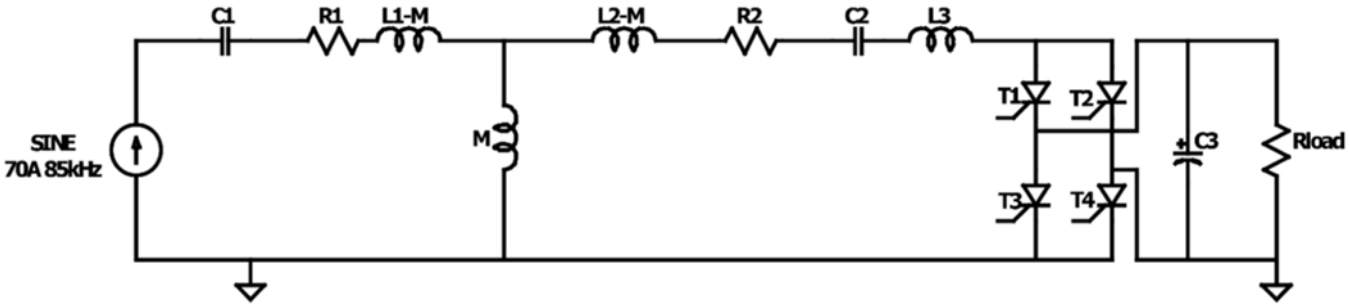


FIGURE 4. Inductance Equivalent circuit diagram

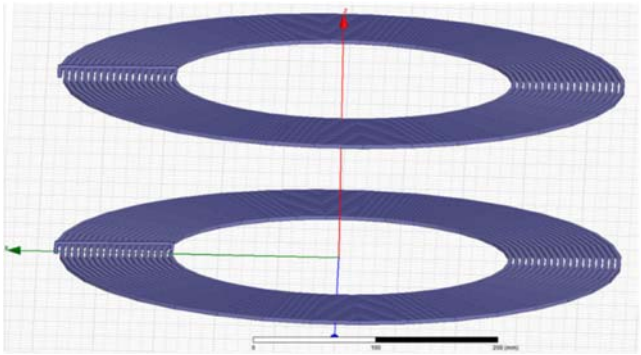


FIGURE 5. Coil both Transmitter and Receiver

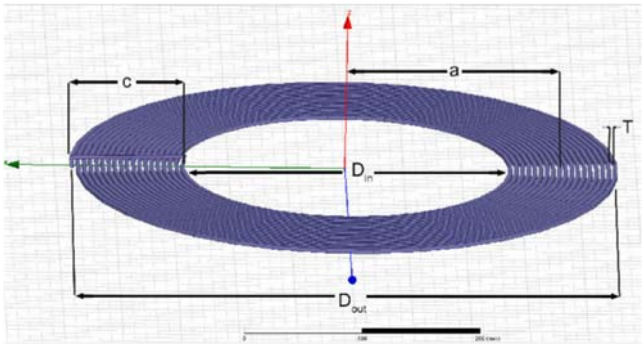


FIGURE 6. Archimedean coil.

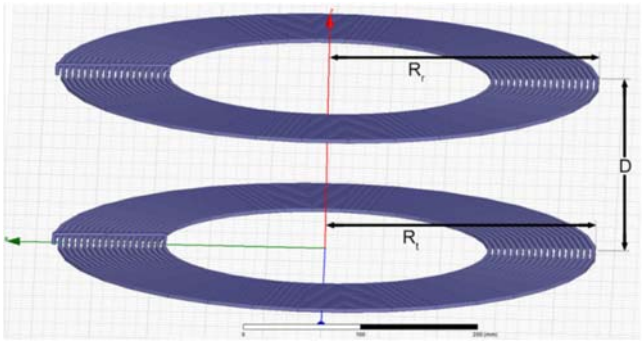


FIGURE 7. Transmitter and receiver coil at D

The final mutual inductance equation, M, is obtained by calculating the total mutual inductance between the transmitter and receiver coils for each turn of the transmitter and receiving ends. (9 may be used to calculate the mutual inductance of two coils regardless of the distance between them.

$$M = \frac{\mu_o}{2}\pi R_r^2 \sum_{P=1}^{N_t} \frac{2\pi R_t^2}{\left(R_t^2+D^2\right)^{3/2}} (5)$$

4.3. CALCULATION OF COUPLING COEFFICIENT

The amount of magnetic flux produced by one coil's current that is communicated to another is indicated by the coupling coefficient, or k. In this range, k may have any value between 0 and 1. When k is equal to 1, the flux from one coil is precisely proportional to the flux from any other coil. Additionally called as "magnetically tightly coupled," this phenomena. If k = 0, there is no relationship between the output flux of one coil and the output flux of another coil. It might also be said to be magnetically separated. The magnetic coupling coefficient of Archimedean coils is strongly influenced by the overall winding area. The coupling coefficient may be calculated using the fundamental equations [1] through [5].

$$K = \frac{M}{\sqrt{L_1 L_2}} (6)$$

Here, L_1 andL_2 are self-inductances of the transmitter coil and receiver coil respectively which is from Equation (1).

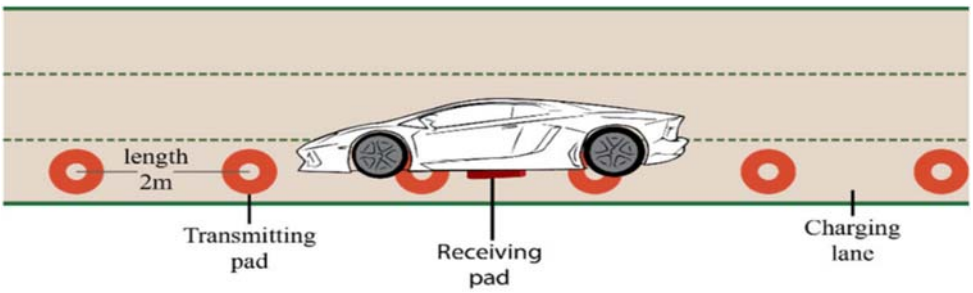


FIGURE 8. Dynamic Charging

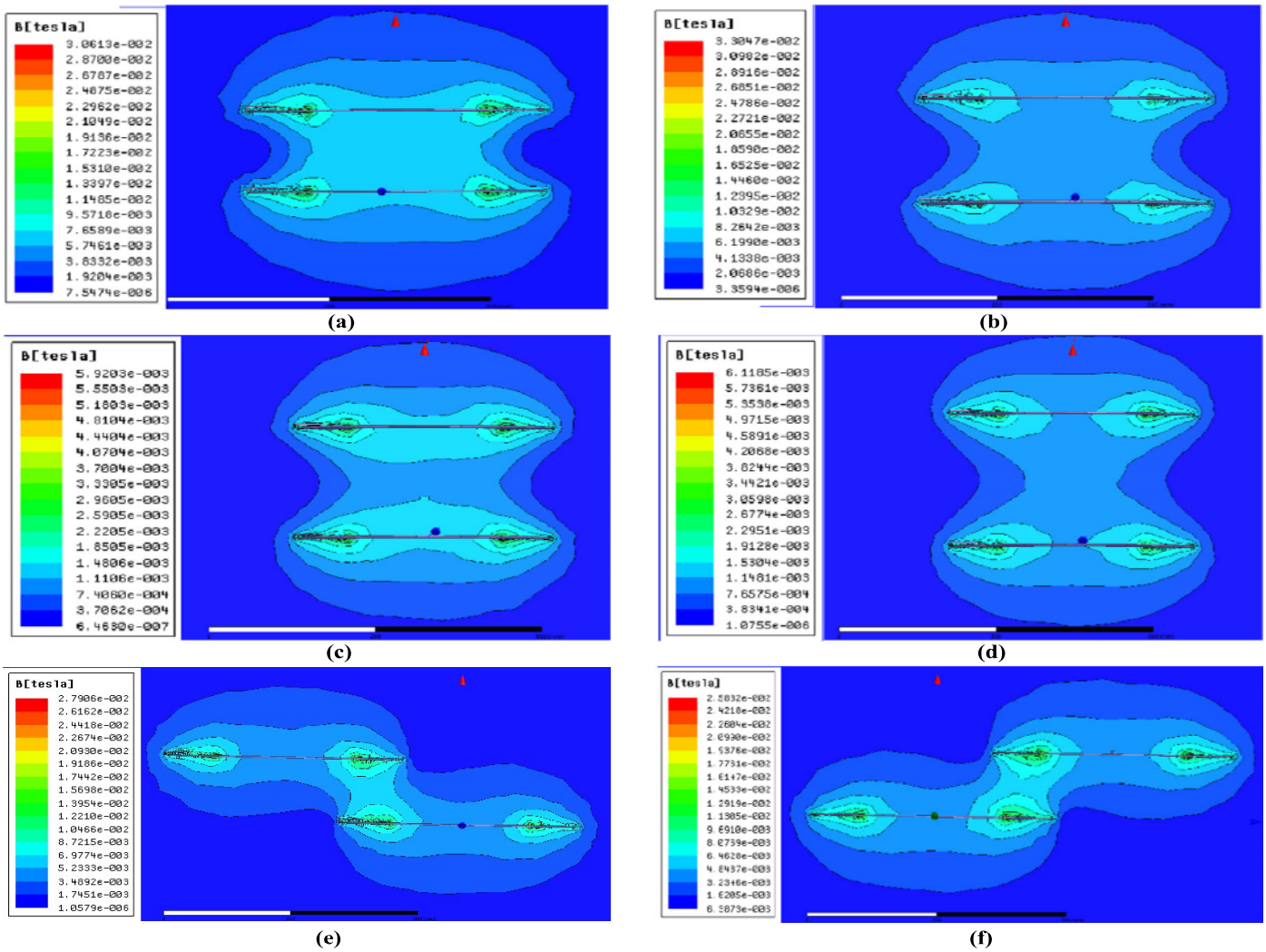


FIGURE 9. Magnetic Flux Density Variation.

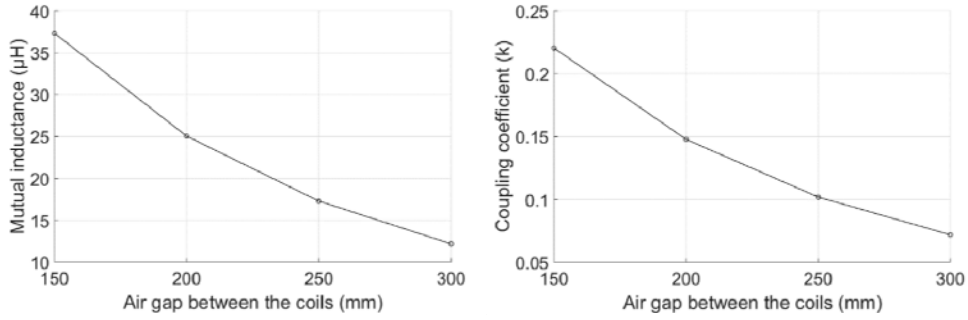


FIGURE 10. Reduction of Mutual Induction and Coupling Coefficient

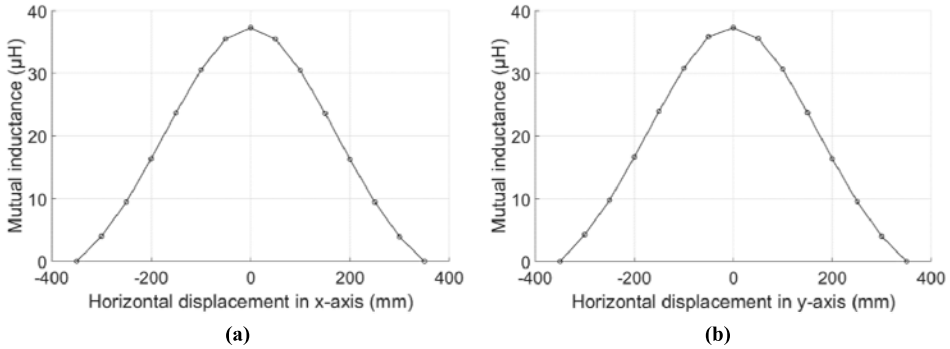
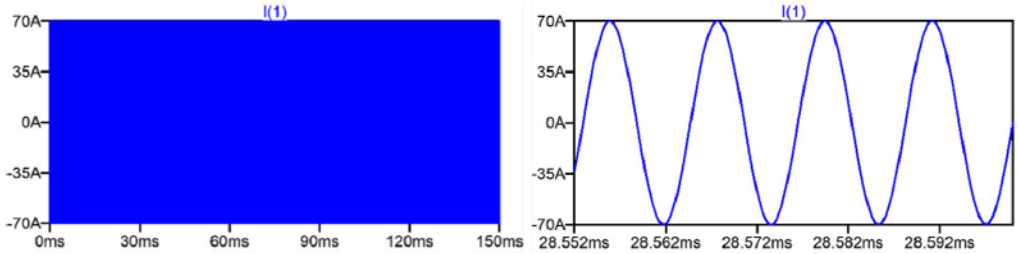


FIGURE 11.Mutual Inductance Variation.



(a) **(b)**

FIGURE 12.Input Current Waveform.

After calculating this equation, the total load power for a single transmitter coil while the receiver coil is moving will be (0.104922)W = 0.20984 W. A 3 kilometre charging lane has been designed for the WPT. 500 transmitter coils will be required for a 1 km section of track if the distance between transmitter coils is 2m, as shown in Fig. 8.

5. RESULTS AND DISCUSSIONS

The simulated data in Fig. 9 after the mutual induction simulation shows how the magnetic flux changes as the air gap widens. As the distance between the coils increases, the area for the transmitter coil's magnetic flux density decreases. The magnetic flux density reception zone of the receiver is thus becoming smaller. The estimated and simulated values are almost comparable, as shown in Table 2, after testing of the transmitter and receiver coils' mutual and self-inductance.

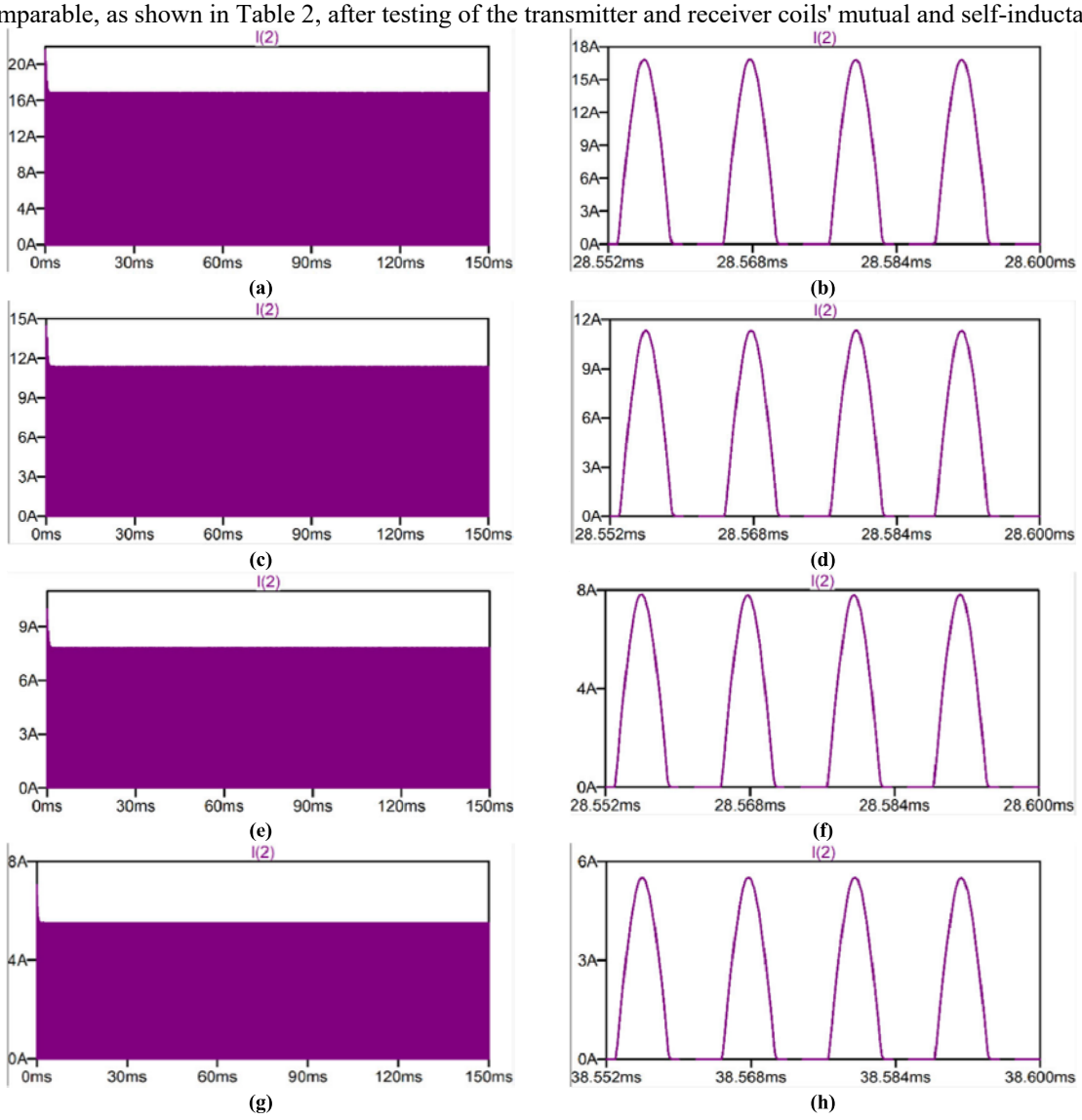


FIGURE 13. Load Current Waveform

TABLE 2.Value of Inductance both Calculated and Simulated.

Inductance	**Calculated**	**Simulated**
Self Inductance(L_1)	176.624 µH	169.844 µH
Mutual Inductance(M)	38.892 µH	37.33368 µH

The mutual inductance and coupling coefficient for a 150mm–300mm air gap between the transmitter and receiving coils are graphically shown in Figure 10. According to this graph, the mutual inductance and coupling coefficient decrease as the air gap grows. As seen in Fig. 11, the mutual inductance is at its maximum magnitude when there is no movement. Whether on the positive or negative axis, the mutual inductance decreases as the displacement increases until it reaches zero at around 350 mm from the centre. This happens when both the x- and y-axes are shifted.

Figure 12 displays the waveform of an input current of 70A with a resonance frequency of 85 kHz. In Figure 13, the load current for the four simulated air gap values is shown. It demonstrates the current's dwindling as it moves from the power transfer coil to the load. These numbers are computed using a model of the circuit shown in Figure 4 with known mutual and self-inductance.

3.74 kW is the load power for the air gap of 150 mm. Table 3 provides additional values for different air gaps between the coils of the transmitter and receiver. As a result, it may take 1 hour and 39 minutes to fully charge the battery of an EV with 6.1 kW of power from a totally discharged condition for a 150mm air gap when the EV is correctly orientated to its transmitting pad. Figure 14 demonstrates that the efficiency of 150mm coils is much greater and rapidly decreases when the air gap between the coils increases [10]–[15].

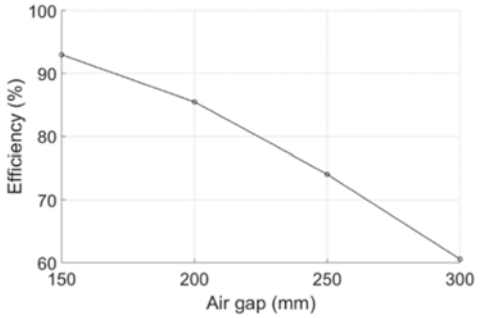


FIGURE 14. Efficiency

TABLE 3. Calculated the Load Power.

Air Gap (mm)	Load Power (kW)
150	3.740
200	1.564
250	0.745
300	0.370

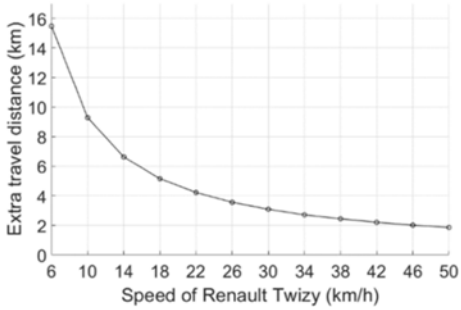


FIGURE 15. Extra Travel Distance

We may determine the power transmission to the receiving end while the EV is moving down a track with no y-axis movement and a 150 mm air gap by inserting the result from Equation (18) into equation (17).

The preceding result shows that power diminishes as the horizontal displacement and air gap change. Figure 15 illustrates how far the extra energy stored in the battery may go via the 150 mm air gap of the Renault Twizy EV to the transmitter coil of the charging lane. It makes sense that the power used is dependent on the EV's speed given the same air gap and no y-axis displacement.

6. CONCLUSION

In recent years, WPT researches have gained in popularity. In this work, the existing WPT techniques are evaluated and contrasted, and RIPT is designed as a substitute. Using the RIPT technique, frequency resonance between the transmitter and receiver coils is established. The impact of air gaps and misalignments on the WPT is shown while an EV is driven through the charging lane. Beginning with a simulation of the effects of the air gap and horizontal movement between the coils on mutual inductance along the x and y axes, the soft Maxwell 3D modelling application used to investigate WPT is utilised to further understand the WPT. Following that, the results should be verified using mathematical formulas. Equations for current, voltage, and inductance between two objects should be found. We provide the resulting estimates of power consumption and efficiency for a 150 mm air gap. The amount of time required to fully charge an EV's battery may be easily determined using the load power. A model is thus developed to investigate power transfer at different rates and, eventually, the range of the EV given the available power. On the other side, speed affects how much energy the receiver pad can absorb from the transmitter pad. Shielding components like ferrite planners and aluminium plates may be used to

increase the amount of power that reaches the receiver. This finding could open up new opportunities for research on high-resonant frequency RIPT-based wireless charging of electric automobiles on tracks.
This study's major objective is to show how to determine wireless power transfer for a moving electric automobile using vertical and horizontal misalignment. For the reader to have a complete picture of dynamic WPT, we additionally create and simulate coil misalignment.

7. REFERENCES

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Solar Powered IOT based Smart Solid Waste Management System

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ABSTRACT

In this paper, we provide a solar-powered, Internet-of-Things-based smart waste management system capable of real-time remote monitoring to ensure the proper collection, transportation, and disposal of rubbish from homes and businesses in any country. Reliable garbage pickup and disposal on a regular basis is essential to maintaining a healthy ecosystem. The primary goal of this research is to create an efficient and effective smart garbage collection and disposal system to maintain a comfortable living environment. The proposed system uses a long-range (LoRa) communication device to enable real-time remote monitoring of multiple solar-powered smart bins spread out across the city and linked to the control station, and an Automated Vehicles Locating System to oversee waste collector activities like collection and disposal time (AVLS). Each site also contains a conventional bin as a backup in case the electronic one breaks down. Solar panels, WSNs, IoTs, cloud computing, and the shortest route finding algorithm are only some of the technologies woven into the fabric of the system's design. Renewable energy source, multiple smart trash bin, SMS notification system, automated vehicles tracking system, web-based real-time monitoring system, and shortest route generation system are the six subsystems that will be created inside this framework. All of these components will eventually work together to form a waste management system that is both effective and efficient in terms of resources used.

Keywords :IOT, smart bin, smart city planning, WSN, E32- TTL-100 LoRa module, AVLS, arduino mega, US sensor, PIR sensor, GSM module, solar power.

1.INTRODUCTION

One of the most critical problems of our day, waste management affects countries of all economic levels. When nations develop economically, they also take on more environmental responsibilities. There are many different types and categories of rubbish, from medical waste to radioactive sludge, from everyday household trash to toxic industrial waste[1-3]. Numerous affluent countries are able to handle and treat waste materials of various forms while developing nations are finding and adopting smart waste management solutions that have enormous real-world advantages. However, developing countries still have significant challenges when it comes to collecting and properly discarding municipal and industrial garbage. Major cities in underdeveloped countries have among of the worst waste management systems and are notorious for littering and illegal dumping[4-6]. Cities like Dhaka, Bangladesh's capital, were in the forefront of the country's rapid urbanisation and industrialization as it developed as a developing nation. An increase in urbanisation in developing countries has transformed the characteristics of solid wastes, and MSW production has skyrocketed over the last decade. Overflowing trash cans and dustbins are a common sight in public places around the country, contributing to both uncleanliness and visual clutter.

It also causes air pollution and spreads a foul odour over the neighbourhood. People may be put at risk of contracting infectious diseases, and the value of the neighbourhood may go down as a result. It is difficult to use existing waste management practises in underdeveloped countries because of factors such as the socioeconomic environment and unexpected infrastructural challenges[7-9]. It costs the government a lot with little return to ensure that garbage is not carried and disposed of improperly, creating an unhealthy and inhospitable environment. Thus, trash must be properly contained, dumped, collected, transported, processed, and reused so that it may be used as a resource for the country. To do this, we proposed a new approach to trash management. A clean, healthy, and green environment may be the consequence of the IoT-based, solar-powered waste management system proposed above. This system would ensure proper garbage collection, real-time remote monitoring, and disposal.

2.RELATED WORKS

Many academics in academia and business have been developing new uses for IoT in smart cities. Taking into consideration the advantages of IOT technologies, they proposed several concepts for efficient waste management in urban areas, and this research provides a short overview of a selection of these works. To improve waste management, the authors of[10] utilised smart city platform technology, but their attention was entirely on data collection. In this research, however, numerous methods have created optimization-based waste management systems. Using LoRa WAN technology and a route optimization strategy, the authors of paper[11] present an Internet of Things-based waste control and management system that is well-suited to rural areas. However, there was a lack of transparency in terms of communication and optimal placement of trash cans. In [12], the authors investigate the most efficient trash collection route designs. This essay, however, is predicated on an IOT cloud solution that merges device connection, data processing, and control rather than the design and optimization of trash collection. In order to maximise efficiency while minimising power consumption, the scientists designed a simple system that can detect when trash cans are full, gather that information, and then transmit it across a wireless mesh network. However, there are certain conceptual flaws with the system that need to be resolved. Closest neighbour search, colony optimization, genetic algorithm, and particle swarm optimization are only a few of the suggested optimization methods for IoT-based waste management provided in[14]. In order to collect garbage, the authors created a system that featured an autonomous line-following vehicle and a robotic hand, but they did not implement any algorithms to optimise the process[15,16]. The authors of[17] suggest a high-tech trash can equipped with a chute specifically designed to service multi-family dwellings. The trash in this system is monitored by a US sensor, and when it gets close to being full, an Arduino Mega acts as a microcontroller and texts a reminder to the garbage man.

In [18], the authors use an 8051 microcontroller to create an Internet of Things-based garbage management system that can detect when a trash can is about to overflow. The transmitter's microprocessor, radio frequency (RF) transmitter, and sensors are all housed in the wastebasket. While an RF receiver, Intel Galileo, and a web browser make up the receiver's core technology stack. Infrared (IR) sensors were used in a microcontroller-based system and the trashcan was connected to a central system through Wi-

Fi, displaying the trash's current status on a mobile web page. Real-time waste statistics for the whole city may be obtained by using a network of sensor-equipped smart bins connected through cellular network, which generates a massive amount of data. For reliable Smart City and M2M solutions, the authors of [21] developed a Smart Waste Management System (SWMS) that is controlled by Internet of Things (IoT) technology and geospatial technology and intelligence sensors like US sensors. The proposed technology might reduce the workload of trash collectors by keeping track of the collection process. The inexpensive camera and infrared (IR) sensors work together to maintain the streets of[22] clean and hygienic. In this post, we set out to find ways to decrease the total cost of trash collection and transportation while simultaneously raising service quality and enhancing people's quality of life.

3.THE PROPOSED SYSTEM

The suggested WSN-based system architecture is shown in Figure 1 and has various pertinent IOT-based Solar-Powered Smart Waste Management System with Real-Time Monitoring- An Advancement for Smart City Planning 2020. 12() G The Global Journal of Computer Science and Technology, Volume XX, Number 5, Version I, Year 2 Included in the 020 subsystems are solar panels, intelligent trash cans, a text message alert system, a web-based real-time monitoring system, automatic vehicle location tracking, and a web-based shortest route-finding system for collectors. The size of a city and the amount of rubbish generated daily in that city decide the total number of smart bins (SB1, SB2,...., SBn, where n is an integer) and waste collectors (WC1, WC2,...., WCn, where n is an integer) operating under a central control station. In Figure 1, we see a city-wide deployment of SBs supported by a network of CBs. Each smart bin in a city also has a traditional trash can nearby in case the electronic one fails. To ensure a garbage-free environment at all times, the conventional bin may be used instead of the smart bin if the smart bin's lid is permanently closed due to technical issues or other causes such as a truck/collector accident, breakdown, lengthy idling, etc. Using WSNs for wireless communication, smart bins gather information from a variety of sensors and then transmit that data and other pertinent details to the control room. The control station not only stores and visually displays data recognised from several smart bins, but also gathers data from these bins. Whenever the trash can is overflowing, the SMS notification system included into each SB transmits an instantaneous alert to the central station, while simultaneously updating the trash can's state on the LCD and activating the smart bin's Red LED. The bin won't be able to be opened until the garbage has been removed. To ensure that collection and disposal chores are completed in a timely way, the control station, upon receiving several SB alert messages, generates a shortest route on the map and sends it to the collector, along with the collecting time. When the garbage can is empty, the smart bin will notify the central station and update its status. It is planned to build a web-based application to monitor and manage the collection and disposal of all smart bins in real time.

4.REQUIREMENT ANALYSIS

The following hardware and software components are used in our works.

a**) Hardware Requirements**

i. Solar panel, solar controller, battery pack & regulation circuit
ii. Arduino Mega
iii. Servo motor with motor driver & metallic gear
iv. PIR Sensor
v. US sensor
vi. LCD
vii. GSM module with SIM
viii. E32-TTL-100 LoRa module
ix. Automated Vehicles Locating System (AVLS)
x. Robot car kit etc.

b**) Software Requirements**

i. Bootstrap, JavaScript and PHP language-based web application
ii. MySQL based database
iii. Google maps API premier service etc.

5.DESIGN AND IMPLEMENTATION

The planned system is broken up into sections, with each section serving as a hub for various subsystems that will carry out certain functions. The hardware and software components of this system are briefly discussed here. The planned system is broken up into sections, with each section serving as a hub for various subsystems that will carry out certain functions. The hardware and software components of this system are briefly discussed here.

a) Solar Energy System

Regulated electricity is provided to the different components of smart bins by solar energy, the world's cleanest and most plentiful renewable energy source. Connecting the solar panels, the solar charger controller, and the rechargeable battery results in the solar power system shown in Figure 2. The solar panel is designed to convert the energy of the sun directly into electrical current. Overcharging is prevented by the solar charger controller's management of current flowing from the solar array to the storage batteries. Many of the parts and sensor systems in smart bins rely on regulated power from the circuit that controls it.

b) Touch-Free Smart Bin

Figure 3 depicts a trash can utilising wireless sensor network (WSN) technology and an Arduino Mega microcontroller for data collection and processing. The Smart Bin design takes a regular garbage can and upgrades it with sensors that detect when it's becoming full, then uses wireless communication to alert the proper authorities. In this research, touch-free dustbins are used, with passive infrared sensor (PIR) motion sensors measuring waste level and ultrasonic sensor (US) sensors detecting the presence of a human being. There is no need to put your hands in the trash to open the lid since the bin's lid opens automatically when a person walks up to it. The garbage can cover is opened and closed by a servo motor that operates on its own. There is a digital screen inside the bin that shows the current status of the bin. The trash can's fill level is shown on the LCD as either empty, 50% full, or 90% full. There is a Red LED that lights up when the percentage of garbage in the bin exceeds 90 percent, signalling that the bin

should not be used until it is completely emptied. The trash can's lid won't release until all the rubbish has gone inside, so nobody can screw it up by dumping trash in there prematurely. A green light indicates that the trash can is empty (0% full) and a yellow light indicates that it is halfway full (50 percent full). Those who do not read the message shown on the LCD may still determine whether or not they should go to a certain trash can to dispose of their trash by looking at the corresponding one of three different coloured LEDs. Fill-level indication scenarios are summarised in Table 1. The E32-TTL-100 is a long-range (LoRa) wireless communication module that connects smart trash cans to the central control hub, where it relays information such as the trash can's unique identifier, its fill level, the current time, and its status. .

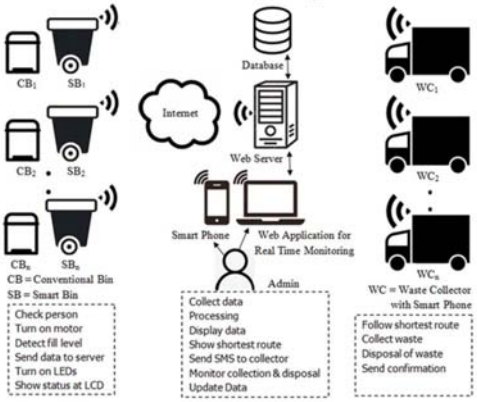

Figure 1: Illustration of an automated smart waste management system framework for the smart city

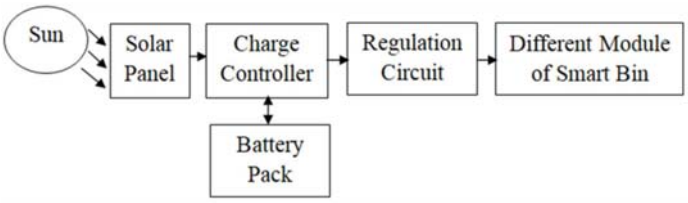

Figure 2: Block diagram of the implemented solar power source

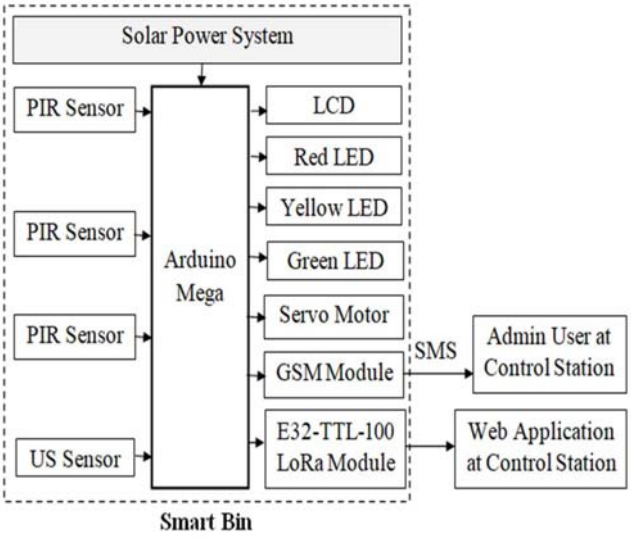

Figure 3: Block diagram of the implemented smart bin

Table 1: Waste bin conditions and fill level indicators

Condition	Threshold	INDICATORS			DESCRIPTION
		LED	LCD	SMS	
1	0%	Green	The bin is empty.Please use it.	Not Sent	Empty
2	≥50%	Yellow	The bin is semi-full.Please use it.	Not Sent	Semi Loaded
3	≥90%	Red	The bin is full.Please use the conventional bin.	Sent	Full Loaded

c) SMS Notification System

When a smart bin is full, it will send an SMS to the central control station with the bin's unique identifier and name. Uncollected trash may be reported by customers using an integrated customer complaints module in the SMS notification system. This work

utilises a GSM Modem for SMS notification since it accepts SIM cards from any GSM network provider, can send and receive data over the network, and can be remotely controlled and logged. The RS232 port allows for two-way data transfer, which might be useful for developing embedded software and communicating with other devices. Figure 4 shows a block schematic of the actual SMS notification system.

d) Control Station

The suggested system architecture revolves on the control station, which coordinates all tasks between the various subsystems. The control room is home to the system's core server, which is where you'll find the web server, database, and fastest route-finding algorithm for trash collection. The smart trash cans transmit data to a central control station, which subsequently processes and stores the information in a database server. The responsible authority will be able to check in on the status of the smart bins and order collection and disposal right from their web browser, thanks to the GUI for showing data from the online application for real-time monitoring. To monitor the numerous smart bins and trash trucks in real time, we developed a web application. In this research, we use a computer as a command centre. Using this web application through the Internet, an administrator in the control room or from anywhere may coordinate all of the responsibilities of the many subsystems of our developed system. The results of the developed web app are shown in Figures 8 through 11. This web app's front end is built using HTML, CSS, and Bootstrap, while the back end is built with PHP. MySQL is utilised in this web application for database storage and administration. The web application for real-time monitoring will communicate with the corresponding garbage collector(s) through Google Map API, and the shortest route-finding system will then transfer the unique route map to them. The Google Maps API is a JavaScript interface that makes it easy to include an enhanced version of Google Maps into other websites. Users who have upgraded to Google Maps API Premier may connect through HTTPS. In order to show users where their trash cans are and what condition they are in, this app makes use of the Google Maps API. With the help of the AVLS installed in each vehicle, managers may track the whereabouts of the WCs in real time using a custom web application. The AVLS uses state-of-the-art GPS technology as its foundation.

6.RESULTS AND DISCUSSION

All portions of the proposed system have been built and thoroughly tested. Figures 5–11 depict various views of the prototype and the results of the tests conducted on it. There are a total of five intelligent trash cans spread out across the area. The circuitry of the finished smart bin is shown in Figure 5. All of the modules are linked together by means of the Arduino Mega. Solar panels provide regulated DC electricity for the trash can's various compartments. See Figure 6 to see how the green, yellow, and red LEDs attached to the smart bin light up to indicate whether the bin is empty, halfway full, or completely full. A fill level indicator is also displayed on the LCD screen. Each smart bin will confirm to the control room administrator via SMS that the bin is truly full, as shown in the screenshot from Smart Bin1 (SB1) in Figure 7. In Figure 8, we see a visual representation of the smart bins' fill level measurement in the form of a progressive bar chart. Diagrammatically, we can see that while SB1, SB3, SB4, and SB5 are all at full capacity, SB2 is only halfway full. Information about a particular bin, such as its bin id and location, can be accessed by clicking the View Details icon to the right of the relevant progress bar. When a smart bin's collected data indicates that it is about to reach 90% capacity, the associated web application will issue a filling alert warning on the corresponding map, as shown in figure 9. This results in web-based and short message service (SMS)-based fill level alerts being sent to the control station. Figure 10 depicts how an administrator can generate the most efficient route for trash collectors on a map, which can then be viewed on a mobile device. Two medium-sized robotic vehicle kits equipped with AVLS are used as trash collectors in this research. Figure 11 depicts a possible way for the administrator to shadow the trash collector as they gather trash and dispose of it. As can be seen in the diagram, WC1 is out collecting garbage throughout the shortest route map, while WC2 is tasked with maintaining the vehicles. .

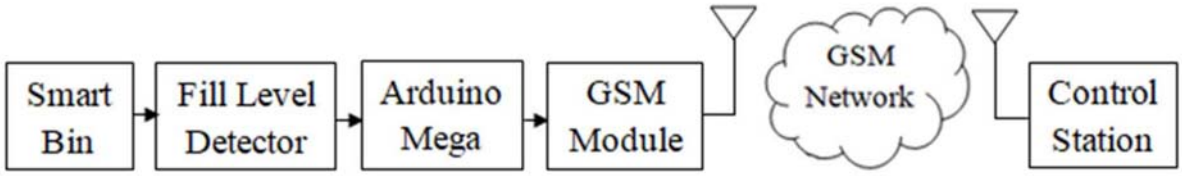

Figure 4: Block diagram of the implemented SMS notification system

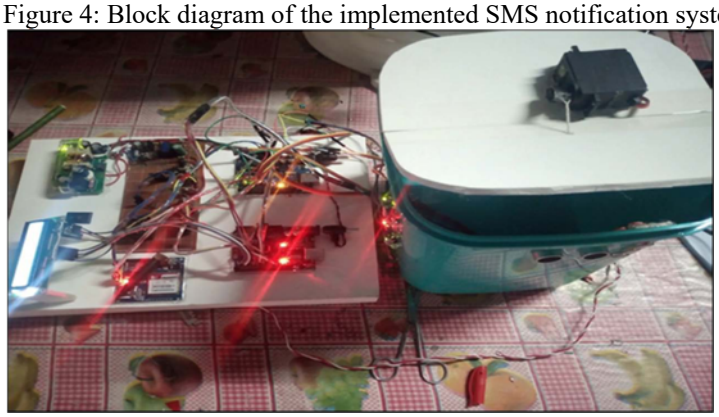

Figure 5: Circuits inside an implemented Smart sBin

(a) (b) (c)

Figure 6: Empty, half loaded and full loaded condition of the smart bin indicated by (a) Green, (b) Yellow, and (c) Red LED respectively

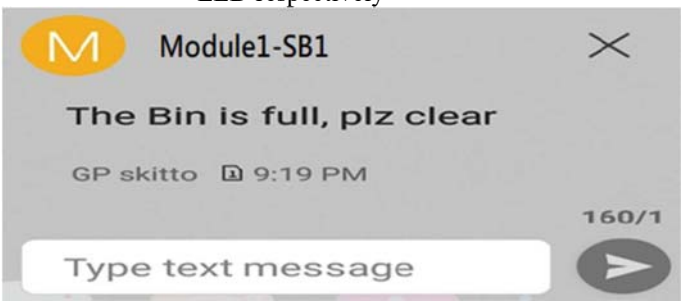

Figure 7: Admin received SMS at control station from Smart Bin1 (SB1) during full loaded condition

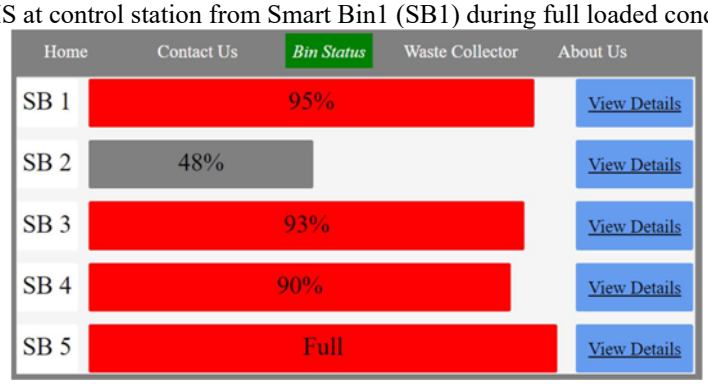

Figure 8: Real time filling level status of the smart bins at the control station

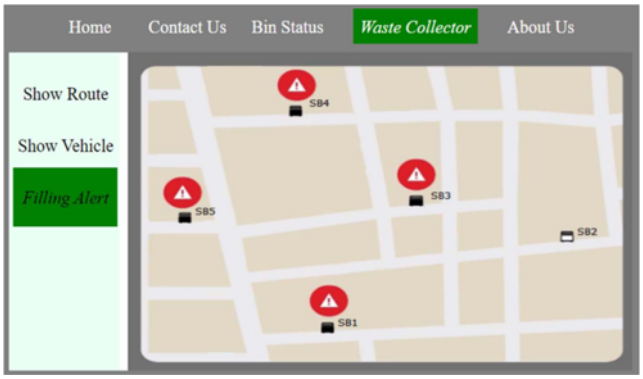

Figure 9: Filling alert notifications from different smart bins at the control station

Figure 10: Shortest route map generation for the waste collectors

Figure 11: Real time tracking of collection and disposal activities

7. CONCLUSION

Waste collection and disposal might undergo a radical change thanks to a recently introduced smart trash management system that makes use of the Internet of Things (IoT) and cloud computing to provide automation via cyber-physical systems. Keeping our environment clean and free of filth and debris may be as easy as implementing this proposed strategy, which may be accomplished at a reasonable cost for any municipal and urban places in both developed and developing countries. Residential and commercial spaces are equally amenable to digitalization and modernization using this approach, with the latter potentially yielding smart and environmentally friendly settings that may increase life expectancy. It may be sufficient to deploy smart bins in educational institutions, such as university campuses, hospital districts, giant retail malls, and so on, in order to preserve a healthy atmosphere. Furthermore, when waste and rubbish materials have been properly disposed of at disposal sites, the recycling industry may utilise precision sorting to convert them into valuable resources for our country.

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FEA Analysis Of Connecting Rod Using Alloy Materials

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Abstract

The static analysis of a connecting rod comprised of three distinct kinds of composite alloys is the goal of this study. In this study, the connecting rod material (structural steel) is replaced with a newly created Aluminum alloy (Silicon carbide). CATIA V5 is used to generate the connecting rod model, which is then loaded into the ANSYS 14 workbench for Static. Following the study, a comparison is done in terms of maximum primary stress, equivalent stress, and total deformation between an existing steel connecting rod and the three composite connecting rods. All of these characteristics are determined analytically and compared to FEA findings. All of these findings are within the expected range, and the values of these materials are comparable to steel. The project is broken into three stages. First, there's the notion, followed by an assessment of current information. Modeling, static analysis, and a comparison of elastic strain, total deformation, and maximal von Misses stress value in alloy connecting rods are the next three steps.

Keywords::Automobile, Engine, Finite element analysis, Static analysis, Load, Aluminum alloy (Silicon carbide).

1. INTRODUCTION

Aluminum is the most prevalent metal and the third most abundant element in the Earth's crust, after oxygen and silicon. It makes up around 8% of the Earth's solid surface by weight. Aluminum is one of the most useful metals because of its simple availability, high strength-to-weight ratio, easy machinability, durability, ductility, and malleability. It has a variety of features, including being light, strong, and long-lasting, being very corrosion resistant, being a good heat and electricity conductor, being highly reflective, being very ductile, entirely impermeable, and odourless, and being 100% recyclable. It has an atomic number of 13, a mass of 26, and a melting point of 730°C. Aluminum has a density of 2700gm per cubic centimetre at 293k and a hexagonal tight packing crystal structure. Various investigations on metal matrix composites have been conducted in the past. The most widely utilised particulates to strengthen metal or alloy matrixes of aluminium or iron are SiC, TiC, WC, and B4C, but research on SiC in ADC-12 alloy is still uncommon and limited. However, since only a few research have been published, the knowledge and data on mechanical characteristics are restricted, making this work particularly important. Furthermore, no study has been done on SiC reinforced ADC-12 composites that were manufactured using an ultrasonic aided stir casting method [1]-[5]. As a result, this study topic is still underdeveloped, and a lot more work may be done in this area. In this study, ultrasonic aided stir casting was used to create and treat SiC particles reinforced ADC-12 composites test samples. As a result, the mechanical behaviour of treated specimens was investigated using the parameters of varying wt. percent SiC addition in the ADC-12 alloy [3]. A 3D model of the connecting rod for a single cylinder 4-stroke Petrol engine was used for further static analysis. The model was created using solid modelling software (CATIA) and then analysed with HYPERWORKS 11 to calculate Von-Mises and Shear stresses for the specified loading situation [6]-[10].

2. MATERIAL PROPERTIES

Aluminium is a chemical element that belongs to the boron group and has the atomic number 13 and the symbol Al. It's a soft, ductile silvery white metal. In the Earth's crust, aluminium is the third most plentiful element (after oxygen and silicon) and the most abundant metal. It makes up around 8% of the Earth's solid surface by weight.

Table 1.1 Properties of Aluminium powder

1	Molecular formula	AL
2	Atomic number	13
3	Element category	Other metal sometimes considered a metalloid
4	Odor	Odourless
5	Standard atomic weight	26.9815385
6	Density	2.70g.cm^{-3}
7	Melting point	933.47 k,660.32°C,1220°C,4478°F
8	Boiling point	2743 K,2470°C,4478°F

9	Solubility in water	Insoluble
10	Solubility	Insoluble in diethyl ether,practically insoluble in ethano
11	Thermal conductivity	237W.m^{-1}.K^{-1}
12	Youngs modulus	70GPa
13	Shear modulus	26GPa
14	Bulk modulus	76GPa
15	Micron size	200mesh(74μm)
16	Poisson ratio	0.35

The chemical properties of silicon carbide are stable, and it has a high thermal conductivity, a modest coefficient of thermal expansion, and strong abrasion resistance. Heat shock, compact size, light weight, and high strength, energy saving effect, made of sophisticated refractory materials. Low-grade silicon carbide (approximately 85 percent SiC) is an effective deoxidizer that may speed up the steelmaking process, enhance chemical composition control, and improve steel quality.

item	SiC	Fe2O3	F.C	proportion
I	≥97%	≤1.2%	≤0.3%	3.2g/cm3
II	≥90%	≤1.5%	≤0.5%	

There are around 250 different crystalline forms of silicon carbide. Silicon carbide in a glassy amorphous state is also generated by pyrolysis of preceramic polymers in an inert environment. Polytypes are a vast array of comparable crystalline structures that define SiC polymorphism. They are two-dimensional versions of the same chemical substance that vary in the third dimension. As a result, they may be thought of as layers piled in a certain order.
The most frequent polymorph is alpha silicon carbide (-SiC), which is generated at temperatures over 1700 °C and has a hexagonal crystal structure (similar to Wurtzite). At temperatures below 1700 °C, the beta modification (-SiC) with a zinc blende crystal structure (similar to diamond) is created. The beta form has had few commercial applications until recently, but due to its greater surface area than the alpha form, it is increasingly gaining popularity as a support for heterogeneous catalysts.

SiC is colourless in its purest form. Iron impurities give the industrial product its brown to black hue. The crystals' rainbow-like brilliance is caused by the thin-film interference of a silicon dioxide passivation layer that grows on the surface.

3. INTRODUCTION TO CAD/CAM/CAE

Without computer intervention, the modern world of design, development, manufacture, and so on, into which we have walked, would be unimaginable. Computers have become such a vital element of various areas due to their widespread use. In today's global market, rivalry exists not just in terms of price, but also in terms of quality, consistency, availability, packaging, stocking, and delivery. So, rather than local forces causing companies to adapt better methods like CAD/CAM/CAE, etc., are the necessities compelling industries to embrace current techniques?
The use of computer Aided Engineering (CAE), Computer Aided Design (CAD), and Computer Aided Manufacturing (CAM) setup is a possible fundamental technique for companies to have high quality goods at reasonable prices. In addition, a number of technologies have been added to help simplify and meet the needs. CATIA, PRO-E, and UG are just a few examples.
This penetration of method concern has aided producers in a) increasing productivity, b) shortening lead times, c) reducing prototype costs, d) improving quality, e) designing better goods, and f) reducing costs.
Computer Aided Designing (CAD) is a technology that allows you to develop, modify, analyse, and optimise designs using a computer.
Computer Aided Engineering (CAE) is a technology that analyses, simulates, or studies the behaviour of a computer-generated CAD model.
Computer Aided Manufacturing (CAM) is a technology that uses computers to plan, monitor, and control manufacturing operations.
CAD, CAE, AND CAM ARE REQUIRED The use of CAD, CAE, and CAM has revolutionised the way industries appear and generated healthy, fair competition.

4. INTRODUCTION TO CATIA

CATIA is a powerful programme that allows you to build detailed and sophisticated designs. The course's objectives are to teach you how to use CATIA to create components and assemblies, as well as how to create basic drawings of those parts and assemblies. This course focuses on the core skills and ideas needed to build a strong foundation for your designs. Mechanical design software is called CATIA. It's a parametric solid modelling design tool with a feature-based graphical user interface that's simple to pick up. You may develop fully associative 3-D solid models with or without restrictions, and utilise automated or user-defined relations to express design intent. This allows you to get your product to market faster and with higher quality. In general, it has resulted in a more rapid approach and innovative thinking.

Modeling in Solids:

In CAD systems, a solid model is the most comprehensive sort of geometric model. It includes all of the wireframe and surface geometry needed to completely define the model's edges and faces. Solid models not only carry geometric information, but also their topology, which connects the geometry. Identifying which faces (surfaces) meet at which edges is an example of topology (curves). This intelligence facilitates the addition of features. If a model needs a fillet, for example, you just choose an edge and set a radius.

5. WORKBENCHES

Workbenches feature a variety of tools that you may require throughout the development of your component. The following two methods may be used to swap between any principal workbenches:

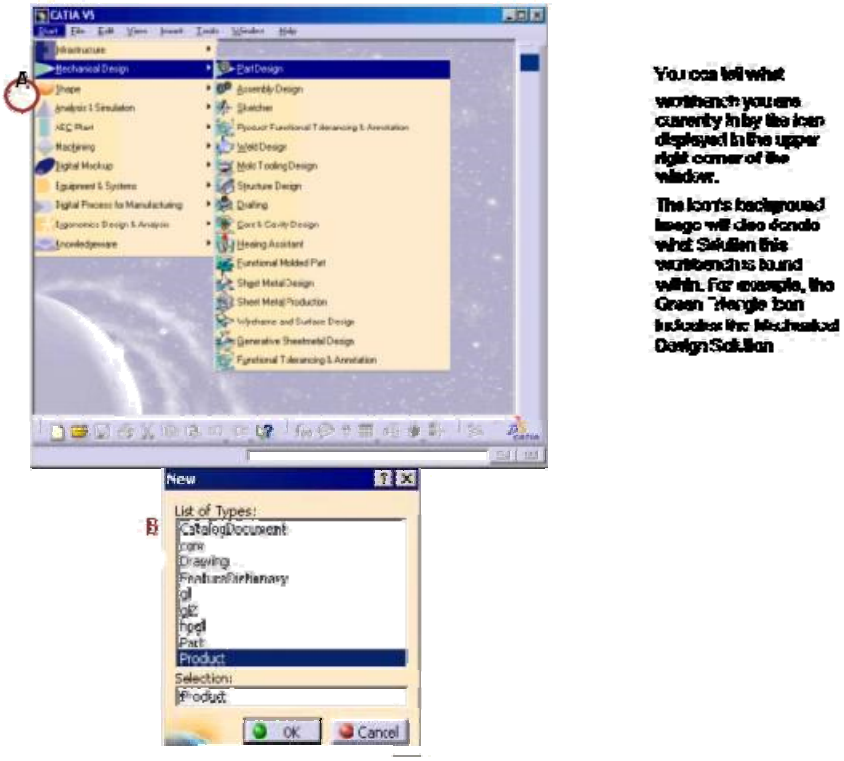

Figure.1. New Document of Workbench

GENARALLY ALL CAD MODELS ARE GENERATED IN THE SAME PASSION GIVEN BELOW


: Enter CAD environment by clicking, later into part designing mode to construct model.

- 
: Select plane as basic reference.

- 
: Enter sketcher mode.

Figure.2. CAD Models

IN SKETCHER MODE

: Tool used to create 2-d basic structure of part using line, circle etc

: Tool used for editing of created geometry termed as operation

: Tool used for Dimensioning, referencing. This helps creating parametric relation.

: Its external feature to view geometry in & out

: Tool used to exit sketcher mode after creating geometry.

Figure.3. Sketcher Mode

2D DRAWING OF CONNECTING ROD

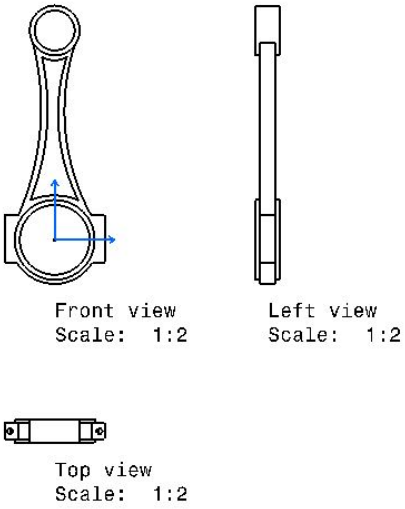

Figure.4. Connecting Rod

5. ANSYS

ANSYS is a general-purpose programme that engineers may use to model interactions across several fields of physics, including as structural, vibration, fluid dynamics, heat transport, and electromagnetics. As a result, ANSYS, which allows you to simulate testing or working settings, allows you to test in a virtual environment before making product prototypes. Furthermore, 3D simulations in a virtual environment may be used to identify and improve weak areas, compute life, and predict potential issues.

ANSYS IMAGES

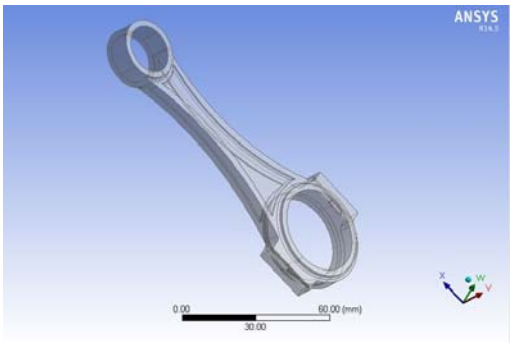

Figure.5. Ansys Image

6. RESULT AND DISCUSSION

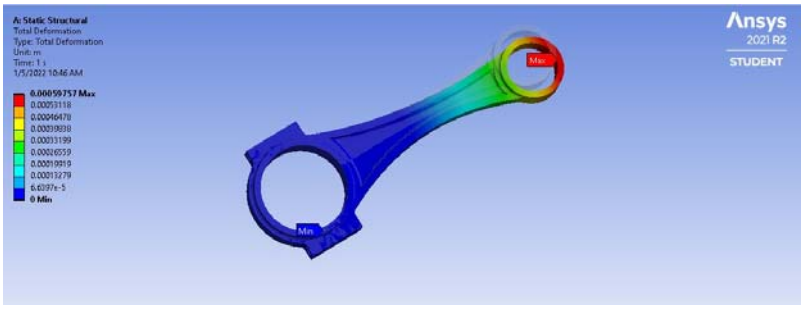

Figure.6. Total deformation of connecting rod using steel

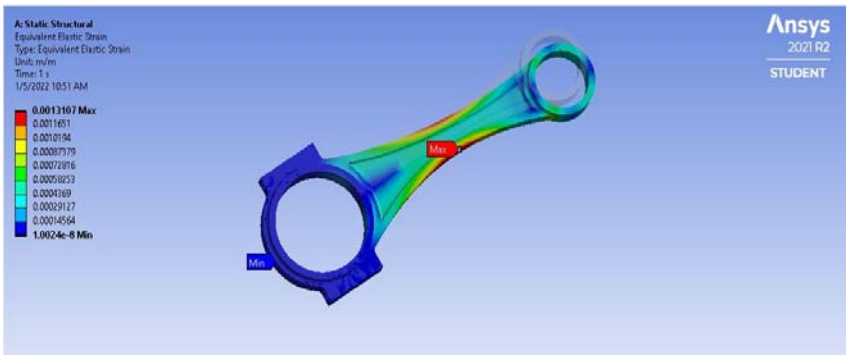

Figure.7.Equivalent elastic strain of connecting rod using steel

Table.2. Comparision of connecting rods with three different materials

Materials	Structural steel	Al+si ca
Total deformation	0 to 0.0005975	0 to 0.0001474
Equivalent stress	1.002e-8 to 0.00131	2.83e-9 to 0.0003235
Equivalent elastic strain	611.44 to 2.621e8	745.23 to 2.6205e8
Max principle elastic strain	2.07e-7 to 0.001295	6.2172e-10 to 0.00031983

7. CONCLUSION

The study's findings show that the connecting rod may be built and optimised for a load range that includes compressive load as one extreme load and tensile load as another. The weight of the existing steel connecting rod may be lowered by switching to alloy materials. According to the results of the aforementioned analysis, the alloy material of Aluminum + Silicon carbide produces superior results than other alloy materials. The new optimised alloy-based connecting rods are much stiffer than the previous generation.

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Comparison in Thermal Analysis Of Piston By Using Different Aluminum Alloy Materials

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ABSTRACT

This study's main objective was to figure out how stressed the pistons were under actual engine settings. In this study, we investigate variables including pressure, heat, and mechanical work. The research made use of the operating gas pressure, temperature, and material properties of the piston. However, since the majority of pistons are constructed of forged aluminium and low carbon steels, we will employ thermal analysis to look at the different aluminium alloys used to make pistons in this study. An internal combustion engine cannot run correctly unless the piston is in great working condition due to its importance. Most piston failures are caused by mechanical or thermal stresses. Piston analysis makes use of boundary conditions such operating pressure on the piston head and the temperature difference between the piston head and skirt. The top surface of the piston may get cracked or broken due to temperature changes during working conditions, which might be very expensive and labor-intensive to repair. To protect them from higher heat, we coat their tops with ceramic. The CAD model is created using CATIA. The ANSYS programme must then be used to import the CAD model for geometry and meshing. For the FEA, ANSYS 14.5 was utilised.

Keywords: Automobile, Engine, Temperature withstand, Thermal analysis , Aluminium alloy , aluminium 7068 , aluminium 2024.

1. INTRODUCTION

An internal combustion engine's piston is a component that produces power via reciprocating motion. It is the part that moves and is enclosed in a cylinder, which is sealed by piston rings. A piston rod's job is to transfer the force created by the expanding gas in the cylinder to the engine's crankshaft. Pistons may get exhausted when they are exposed to cyclic gas pressure and inertial stresses while working [1]–[5]. This damage may lead to side wear, fractures in the piston head, and other similar events. Because of this, the piston design optimization process demands strict consideration to a number of factors. The pressure force acting at the piston's top as well as a thermal analysis of the piston at different temperatures and stroke lengths are utilised as parameters in this project. If this study contributes to improvements in the piston design process, design engineers may benefit. In this study, we compute the various stresses using pressure analysis, temperature analysis, and thermo-mechanical analysis in order to identify the potential regions of piston damage. Finding the ideal piston design via analysis is straightforward. [6]-[10].

2. MATERIAL PROPERTIES

The chemical element aluminium has the atomic number 13 and the symbol Al. It is a member of the boron group. It is a ductile, silvery white metal that is soft. After oxygen and silicon, aluminium is the third most common element and the most common metal in the Earth's crust. According to Table 1, its weight accounts for around 8% of the Earth's solid surface. With a silvery to dull grey appearance that changes depending on surface roughness, aluminium is a soft, strong, lightweight, ductile, and malleable metal.

Table.1. Aluminium Material Properties

1	**Molecular formula**	**AL**
2	Atomic Number	13
3	Standard atomic Weight	26.9815385
4	Density	2.70 g•cm−3
5	Melting point	933.47 K, 660.32 °C,1220.58 °F
6	Boiling point	2743 K, 2470 °C, 4478 °F
7	Thermal conductivity	237 W·m -1·K-1
8	Young's modulus	70 GPa
9	Bulk modulus	76 Gpa
10	Poisson ratio	0.35

Because a thin coating of aluminium oxide accumulates on the surface of aluminium when it is exposed to air, this metal may have high corrosion resistance. Due to galvanic interactions with alloyed copper, even the strongest aluminium alloys have a lower corrosion resistance.

Aluminium is oxidized by water to produce hydrogen and heat:

$$2\ Al + 3\ H_2O \rightarrow Al_2O_3 + 3\ H_{2alu}$$

2.ALUMINIUM 2024 ALLOY

Table.2. Mechanical Properties

Density	2780	Kg/m3
Ultimate tensile strength	469	Mpa
Yield tensile strength	324	Mpa
Modulus of elastisity	73.1	Gpa
Shear modulus	28	Gpa
Shear strength	283	Mpa
Fatigue strength	138	Mpa

3. METHODOLOGY

Computer Aided Designing (CAD) is a technique that enables you to use a computer to create, edit, analyse, and optimise designs.

Computer Aided Engineering (CAE) is a technique for analysing, simulating, or studying the behaviour of a CAD model created by a computer.

Computer Aided Manufacturing (CAM) is a manufacturing system that use computers to plan, monitor, and manage activities.

ANSYS is a programme for mechanical design. It's a simple-to-use parametric solid modelling design tool with a feature-based graphical user interface. You may utilise automated or user-defined relations to capture design intent while creating entirely associative 3-D solid models with or without limitations.

4. WORKING PRINCIPLE

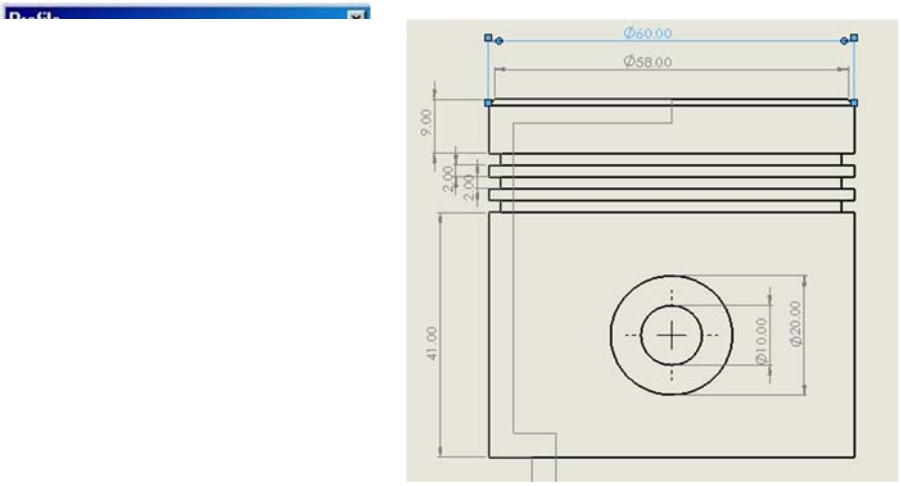

Figure.1. 2D diagram of piston using AUTO CAD

5. 3D IN ANSYS

ANSYS can take CAD data and turn it into geometry thanks to its "preprocessing" features. In the same preprocessing step, a finite element model, or mesh, is created, which is required for subsequent computing. The outcomes of establishing loadings and conducting analysis may be inspected using numerical and graphical representations.

Because of its extensive range of contact approaches, time-based loading characteristics, and nonlinear material models, ANSYS is able to complete complicated engineering studies rapidly, safely, and realistically.

In engineering, transferring heat from one place to another and between various bodies is a typical operation. A difference in temperature (a temperature gradient) causes this movement, which goes from hotter to colder places.

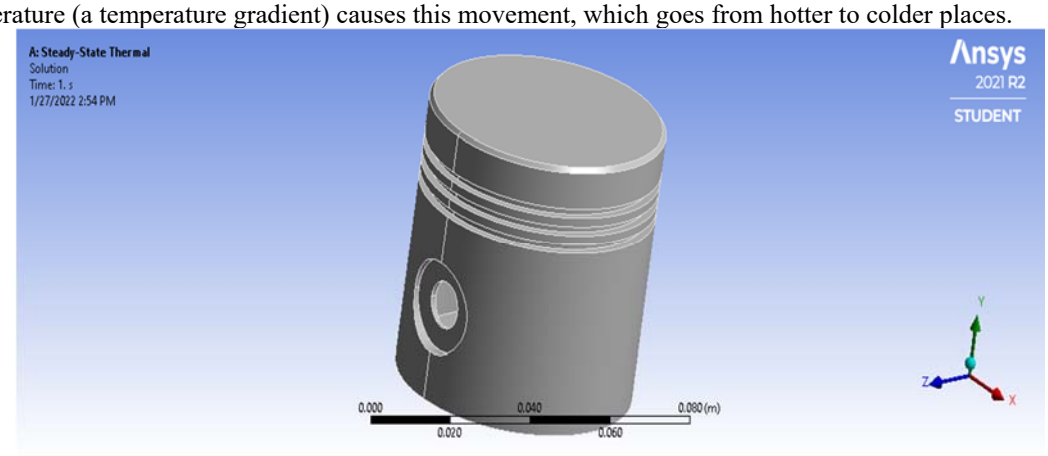

Figure.2. 3D diagram of piston

ANSYS Workbench is a platform that combines simulation and parametric CAD technologies with unmatched automation and performance. The excellence of ANSYS Workbench is due to the creators' considerable knowledge of the ANSYS solver algorithms. Additionally, the goal of ANSYS Workbench is to assure and improve the virtual environment of the product.

Because of its extensive range of contact approaches, time-based loading characteristics, and nonlinear material models, ANSYS is able to complete complicated engineering studies rapidly, safely, and realistically.

In engineering, transferring heat from one place to another and between various bodies is a typical operation. Because of the temperature differential, this transmission flows from warmer to colder places.

Temperature fluctuations induce mechanical stresses and strains in bodies owing to the coefficient of thermal expansion (sometimes abbreviated CTE in engineering literature)

The rate of heat transfer is related to the temperature differential between the two surfaces as well as the materials' thermal resistance.

6. THERMAL ANALYSIS OF ALUMINIUM 2024 ALLOY PISTON

Figure.3. Total heat flux of Aluminium 2024 piston

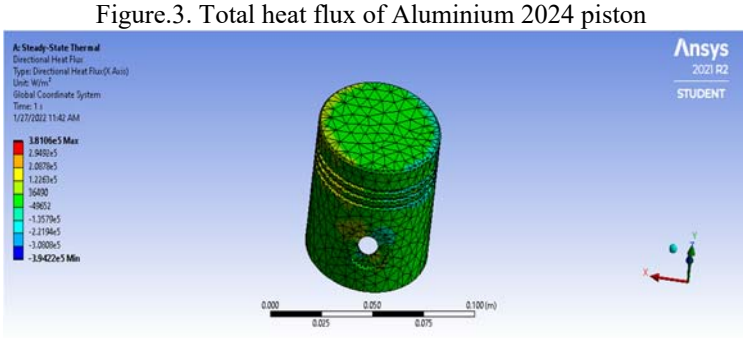

Figure.4. Directional heat flux of Aluminium 2024 piston

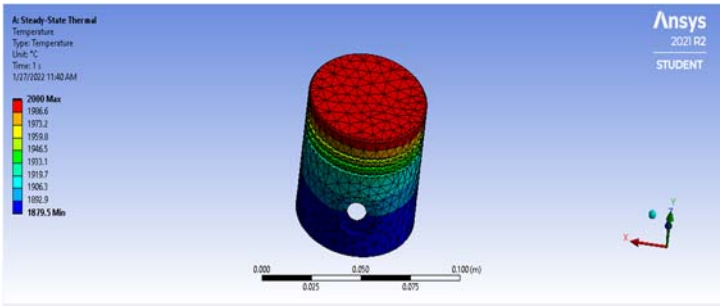

Figure.5. Temperature distribution of Aluminium 2024 piston

7. CONLCUSION

The data obtained is used to create three-dimensional piston models. The 3D model was created using CATIA V5R20 software. The piston's thermal analysis will be conducted using ANSYS WORKBENCH 14.5 once these models have been imported. We used a 10mm element size and a relevance of 100 while constructing the mesh, which results in an extremely tiny mesh. The input temperature is supplied into the top of the piston for thermal analysis, and convection is applied to the whole piston surface. After that, the total heat transfer, directional heat flow, and temperature distribution are all calculated. The findings are compared, and the aluminium 7068 alloy is demonstrated to produce superior outcomes depending on the criteria.

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Design And Analysis Of Four Stroke Engine Fins And Compared With Modified Design

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ABSTRACT
The engine cylinder, which is exposed to extreme temperature changes and thermal stresses, is the heart of the automotive components. The primary goal of this study is to investigate the thermal characteristics.

Keywords:- Structural steel, Aluminium alloy and Magnesium alloy.

1.INTRODUCTION

It is well knowledge that hot gases are produced during the combustion of air and fuel inside the cylinder of an internal combustion engine. In the range of 2300-2500 degrees Celsius, the gases will be at their hottest. Piston seizure, piston ring seizing, compression ring seizing, oil ring seizing, and the welding together of other moving parts are all possible outcomes of this extraordinarily high temperature. The cylinder's material might be compromised by prolonged exposure to high temperatures. Therefor, the temperature has to be lowered to between 150 and 200 degrees Celsius, where the engine operates most efficiently. [1]-[8]. Too much cooling is not recommended since it reduces thermal efficiency. Therefore, the purpose of the cooling system is to keep the engine at an optimal operating temperature. It's important to keep in mind that a cold engine is far less efficient than one at operating temperature, thus the cooling system is designed to shut off during the engine's warming up phase and restart after the engine has achieved its optimal operating temperature. Heat transfer rates are sensitive to wind speed, engine surface geometry, external surface area, and ambient temperature. This study analyses the function of the engine block's fins. When calculating the indoor temperature by means of conduction and convection [9, 14], the researchers did not account for the speed of the air. Motorcycle engines are designed for a certain operating temperature range, however overcooling is seldom considered since it decreases performance. Therefore, it is evident that minimal cooling requirements exist. Cylinder housings are often built separately in air-cooled engines. Motorcycles with inline engines, which have two, three, four, or even six air-cooled cylinders in a single block, are an outlier. Only a small number of water-cooled engines are much more complex. Ducati converted their V-twin engine from air cooling to water cooling while maintaining the basic architecture that made it so successful. You may alternatively utilise separate casings for each cylinder, although that makes the cooling system more involved [15–17].

2.METERIAL PROPERTIES

Aluminium alloy

Aluminium alloys are used for fin material because of aluminum's thermal conductivity.
Alloys are more expensive. Aluminium is the finest material for manufacturing numerous car components due to its unique features. It possesses high strength and ductility, as well as great corrosion resistance and machinability.

Structural steel

Structural steel is a kind of steel that is used to create a wide range of building materials. Many structural steel forms are in the shape of an extended beam with a specified cross section profile. In most developed nations, structural steel forms, sizes, chemical composition, mechanical attributes such as strengths, storage procedures, and so on are governed by standards.
Most structural steel designs, such as I-beams, have significant second moments of area, which implies they're stiff in relation to their cross-sectional area and can withstand a lot of weight without drooping.

Magnesium alloy

Table.1. Material Properties

Properties	Metric	Imperial
Tensile strength	260 MPa	37700 psi
Yield strength (strain 0.200%)	200 MPa	29000 psi
Compressive yield strength (at 0.2% offset)	97 MPa	14100 psi
Ultimate bearing strength	385 MPa	55800 psi

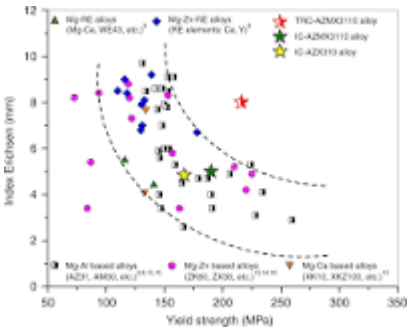

Figure.2. Strength of the Materials

The excellent strength-to-weight ratios, superior machinability, and inexpensive cost of magnesium alloys make them attractive materials. In comparison to other popular alloys such as aluminium or steel alloys, they have a low specific gravity of 1.74 g/cm3 and a low Young's modulus (42 GPa).

3.METHODOLOGY

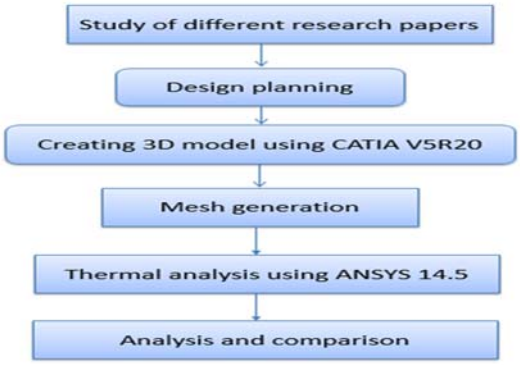

Figure.3. Flowchart of the Analysis

Figure.4. Design Of Normal Engine Fins

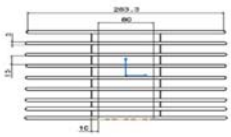

Figure.5. 3D design of normal engine

CAD: Computer Aided Designing (Technology to create, Modify, Analyze or Optimize the design using computer.
CAE: Computer Aided Engineering (Technology to analyze, Simulate or Studybehavior of the cad model generated using computer.
CAM: Computer Aided Manufacturing (Technology to Plan, manage or control the operation in manufacturing using computerANSYS is a general purpose software, used to simulate interactions of all disciplines of physics,structural, vibration, fluid dynamics, heat transfer and electromagnetic for engineers.

Need for CAD, CAE & CAM

Technology like computer-aided design (CAD), computer-aided engineering (CAE), and computer-aided manufacturing (CAM) has revolutionised business and sped up innovation in many sectors. In most cases, it has led to a more agile methodology and creative solutions.

Solid modeling:-

In computer-aided design (CAD) software, a solid model is the most precise geometric model that can be created. To specify the model's edges and faces, both the wireframe and the surface geometry are incorporated. A solid model stores not just its geometry but also its topology, which specifies the connections between the geometry. Simply put, what does it mean when we talk about topology? An examination of the interplay between the edges of various surfaces (curves). As a result of this intelligence, adding new features is simpler. Select an edge and enter the desired radius to add a fillet to your model.

4.WORKING

Workbenches provide a variety of tools that you may require throughout the component creation process. The following two methods may be used to swap between any principal workbenches:

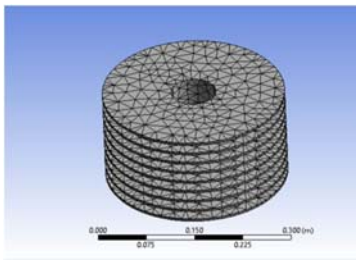

Figure.6. Meshed images of normal engine fin

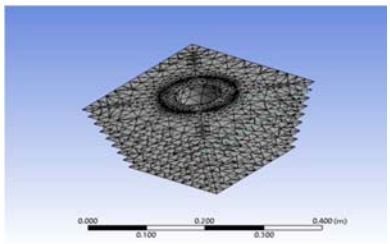

Figure.7. Meshed images of modified engine fin

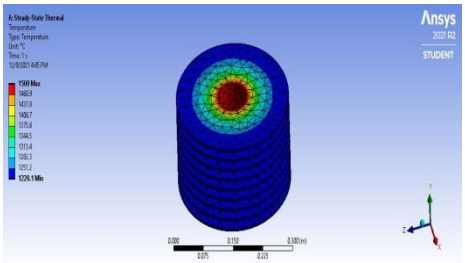

Figure.8. Temperature distribution of Aluminium engine fin

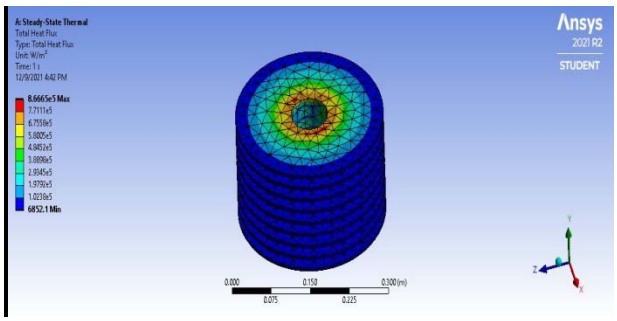

Figure.9. Total heat flux of structural steel

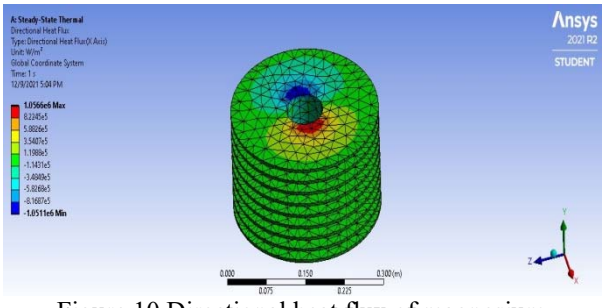

Figure.10.Directional heat flux of magnesium

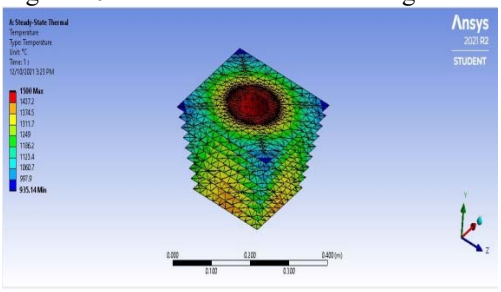

Figure.11.Temperature distribution of Aluminium engine fin

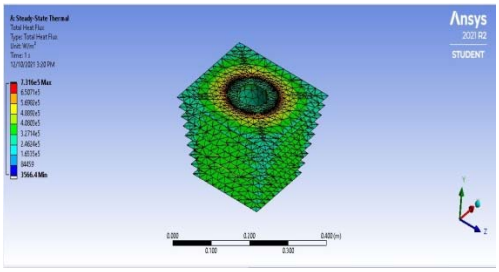

Figure.12. Total heat flux of structural steel engine fin

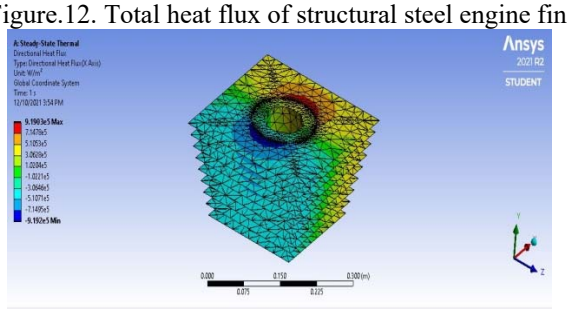

Figure.13.Directional heat flux of Magnesium fin

 : Enter CAD environment by clicking, later into part designing mode to construct model.

-  : Select plane as basic reference.
-  : Enter sketcher mode.

Figure.14. CAD Model

The "preprocessing" features of ANSYS allow it to accept CAD data as input and then produce a geometry. A finite element model, also called a mesh, is constructed as part of the same preprocessing phase. The numerical and graphical representations of the results of defining loadings and performing analysis are available for inspection.

The sophisticated engineering studies that ANSYS can undertake be carried out quickly, safely, and realistically due to the software's wide variety of contact techniques, time-based loading characteristics, and nonlinear material models.

•

It is common practise in engineering to move heat from one location to another, or between different bodies. Heat travels from warmer to cooler areas; temperature gradients power this exchange. • Temperature differences induce mechanical stresses and strains in bodies due to the coefficient of thermal expansion (sometimes abbreviated CTE in engineering literature).

Heat transfer rate is proportional to the temperature difference between the two surfaces and the thermal resistance of the materials used.

•

In engineering, these three mechanisms stand out as the most important:

In other words, 1 - conductance

secondly, convection

Relating to: 3, Radiation

Below is the layout of the elements of the standard CATIA application.

A. Menu Commands
B. Specification Tree
C. Window of Active document
D. Filename and extension of current document
E. Icons to maximize/minimize and close window
F. Icon of the active workbench
G. Toolbars specific to the active workbench
H. Standard toolbar
I. Compass
J. Geometry area

Different types of engineering drawings, construction of solid models, assemblies of solid parts can be done using inventor.

Different types of files used are:

1. Part files: .CATPart
2. Assembly files: .CATProduct.

Table.2. Comparison Results Of Normal Engine Fin

S.No.	Content		Steel	Mg alloy	Al alloy
1	Temperature	Max	1500	1500	1500
		Min	1220.1	1194	918.04
2	Total heat flux	Max	8.6665e5	1.13644e6	1.16e6
		Min	6852.1	9907	110186
3	Directional heat flux	Max	7.956e5	1.0566e6	1.0826e6
		Min	-7.987e5	-1.0511e6	-1.076e6

Table.3. Comparison Results Of Modified Engine Fin

S.No.	Content		Steel	Mg alloy	Al alloy
1	Temperature	Max	1500	1500	1500
		Min	509.33	886.28	935.14
2	Total heat flux	Max	7.316e5	1.0174e6	1.0441e6
		Min	3566.4	7991.4	8622
3	Directional heat flux	Max	6.7347e5	9.1903e5	9.423e5
		Min	-6.736e5	-9.192e5	-9.426e5

5. CONCLUSION

We modified the fins' design to make them as small as possible, which lowered the engine's operating temperature to an acceptable level. Furthermore, we were able to lower the engine's minimum operating temperature by replacing AL 6063 with an aluminium alloy (Al + Silicon carbide), which is superior than structural steel and magnesium alloy in terms of performance and efficiency. Aluminum silicon carbide increases engine temperature distribution, total heat flux, and directional heat flux by up to 20%. Aluminum silicon carbide, according to the results of the thermal analysis, is the material of choice for engine fins since it provides the best cooling results.

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Design and Analysis Of Universal Joint

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ABSTRACT

The rapid development of technology over the last several decades has decreased the price of materials and made them lighter. The adapted strategy is widely used in academic and corporate settings. Due to this, both the number of accidents and the overall level of safety have decreased. Universal joints are used in many industrial systems and are constructed from structural steel, magnesium, and copper. It is proposed that cast iron be modified into a composite polymer material. The proposed approach has several advantages over existing systems, such as its potential to reduce complexity, guarantee the highest level of safety, and minimise negative effects on the environment. The study of the system shows that all of the required qualities are met, and that the universal joint is well-designed and well-analyzed enough to withstand normal operating circumstances without failing. Because of this, modelling and analysis of universal joints under specified circumstances are carried out. The universal joint was modelled in CATIA 3D software, and then analysed using Finite Element Analysis (FEA). Polymer is being considered because its characteristics are so close to metal that it may be mistaken for it. Composite polymers may be formed in many different ways. Because of technical advancements made in the previous year, stress and anxiety levels have decreased.

Keywords:Universal joint, FEA, ANSYS, CATIA

1. INTRODUCTION

Joints play an important role in the mechanical and automotive sectors, and their permanence or transience depends on the nature of the task at hand. Power transmission and motion transfer applications often use temporary joints such bolted joints, cotter joints, sleeve cotter joints, universal joints, and universal joints. The steering rod and pinion of the steering gear are connected through a universal joint. It is the only possible connection between the two mechanical parts since their action axes cross and lie on different planes. Maintaining a flexible approach to manufacturing technologies is essential for the plant to operate at peak efficiency [1]-[5]. A universal joint is used to unite two rods that will be subjected to tensile stress. This joint can accommodate for some angular misalignment between the rods and, if used correctly, can even tolerate some compressive force. These joints are used for a variety of applications, including tie rods and tension links in bridge construction. Both the forked end and the unforked end of one of the rods have eyes on them. A pin (universal pin) is placed through the rod-end and fork-end eyes, and is secured with a collar and a split pin. It is crucial to design universal joints that can withstand strain without failing [6]-[10] due to the potential for accidents if a universal joint fails.

2. INTRODUCTION TO UNIVERSAL JOINTS

When two cylindrical rods with parallel axes need to be joined together, a universal joint is the mechanical coupling of choice. A little amount of rotational freedom is provided by the space between the cylindrical rods (in their plane). Tensile strength is a design priority, thus it was constructed accordingly. A mechanical connection between two intersecting spinning shafts is called a universal. They may represent speed, strength, or both. The Yoke Joint, sometimes called a Hooke Joint, is the most common and easiest kind of joint. You may see the condition shown in Figure 1. The Spider, an intermediary device in the form of a cross, connects the two yokes on the shafts. The angle created by the two shafts is known as the operational angle. The flexibility of the joint is achieved by the use of two U-shaped yokes joined by a cross-shaped hub. With the U-sections at right angles to one another, one yoke is secured to the distal portion of the split shaft and attached to the cross hub. The widespread usage of this material in vehicles such as automobiles, buses, and trucks has brought it widespread recognition.

Figure.1. Universal Joint

A typical universal joint has the following parts

1. Fork end
2. Eye end
3. Universal pin
4. Collar

5. Taper pin

3. RELATED WORK

Softwaresused :CATIA, ANSYS

CATIA Definition : CATIA (Computer Aided Three Dimensional Interactive Application) is a multi platform software used for computer aided design and manufacturing and 3D modelling of a product.

ANSYS Definition : ANSYS is a general purpose, finite element modelling package for numerically solving a wide variety of mechanical problems. ANSYS has been found at the year 1970 and it is in corporated in the year 1994.

4.METHODOLOGY

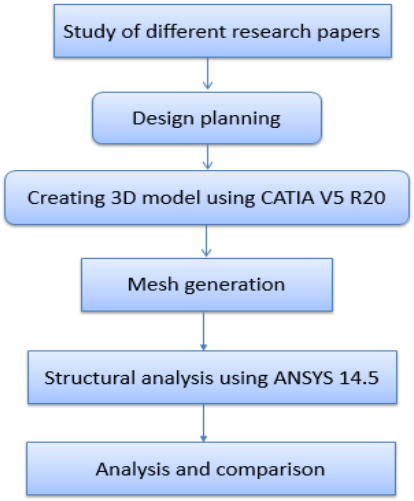

Figure.2. Methodology

5. GREY CAST IRON

Castings made from this kind of iron, which gets its distinctive grey hue from the presence of graphite, are known as grey cast iron. The graphite flake structure created by the carbon in grey iron after cooling sets it apart from regular iron.

Grey iron is the product of both the chemicals used and the casting process. Simply defined, the properties of grey iron are set by the combination of components and the method they are cast (it is primarily the cooling part of the process that defines the characteristics of the cast part versus other parts of the process.).

Under a powerful microscope, the graphitic microstructure of grey iron, which allows it to be easily identified, becomes visible. Gray iron castings can have tiny black graphite flakes embedded inside them. These flakes cause the material to fracture and take on a grey hue. Mechanical properties of grey iron, which may be tested using ASTM standards, are determined by the size and shape of graphite flakes present in the microstructure.

More grey iron castings than any other kind of casting are produced each year. Disc brakes on your automobile and almost all manhole covers are likely made of grey iron. The following are some more applications for grey iron: Gears

Fluid power: hydraulics

Suspensions for automobiles

Equivalent shares of the plough

Pumps

Linkages

Components for Cooking Appliances

Chopsticks for the wheel

Agriculture machinery and equipment components

Valves

Suspension parts for trucks

Extra truck components

Cases for wind generators.

There are both weights and counter-weights.

Fabrication of a solid foundation for heavy machinery.

Although it has the same compressive strength as low and medium carbon steel, grey cast iron is weaker in tensile strength and more easily damaged by shocks than other castings and even steel. These mechanical properties are set by the size and shape of the graphite particles in the microstructure.

Table.1. Composition Of Grey Cast Iron

Iron Family	Grey	Ductile	CGI	Malleable	White
Carbon	2.5-4.2	3.0-4.0	2.5-4.0	2.2-2.8	1.8-3.6
Silicon	1.0-3.0	1.8-3.0	1.5-3.0	1.2-1.9	0.5-2.0
Manganese	0.15-1.0	0.1-1.0	0.10-1.0	0.15-1.2	0.15-0.8
Sulfur	0.02-0.25	0.01-0.03	0.01-0.03	0.02-0.2	0.02-0.2
Phosphorus	0.02-1.0	0.01-0.1	0.01-0.1	0.02-0.2	0.02-0.2

Aluminum (chemical symbol: Al, atomic number: 13) is a member of the boron group of elements. It's a white metal that bends and shapes easily and is rather malleable. After oxygen and silicon, aluminium is the most common metal in the Earth's crust. It accounts for around 8% of the mass of the Earth's crust.

Natural aluminium specimens are very rare and can only be discovered in extremely decreasing environments. On the other hand, it might be present in over 270 different minerals. The mineral bauxite is the primary source of aluminium production.

Description

Aluminum is unique due to its low density and the phenomenon of passivation, which makes it corrosion-resistant. Aluminum and its alloys are widely used for manufacturing aircraft and transportation industry structural components. Aluminum oxides and sulphates are the most practical aluminium compounds.

Aluminum salts are widespread in nature, yet no known organism can use them metabolically. Because of its widespread presence, it is not surprising that plants and animals tolerate aluminium well. Because aluminium compounds are so ubiquitous, researchers are always curious about their potential beneficial or harmful effects on living organisms.

Structural steel is a type of steel that is fabricated into many different types of construction hardware. Many structural steel shapes have the form of an extended beam with a predetermined cross section profile. Most industrialised countries have established norms for structural steel that regulate its shape, size, chemical make-up, mechanical properties (such as strength), storage methods, and so on.

Most I-beams and other structural steel designs have large second moments of area, which means they are quite rigid and can support a lot of weight without bowing.

Table.2. Properties Of Aluminium

1.	**Molecular formula**	**AL**
2.	Atomic Number	13
3.	Element category	other metal sometimes considered a metalloid
4.	Odour	Odourless
5.	Standard atomic weight	26.9815385
6.	Density	2.70 g•cm−3
7.	Melting point	933.47 K, 660.32 °C, 1220.58 °F
8.	Boiling point	2743 K, 2470 °C, 4478 °F
9.	Solubility in water	Insoluble
10.	Solubility	insoluble in diethyl ether, practically insoluble in ethanol
11.	Thermal conductivity	237 W·m -1·K-1
12.	Young's modulus	70 GPa
13.	Shear modulus	26 GPa
14.	Bulk modulus	76 GPa
15.	Micron size	200 mesh (74µm)
16.	Poisson ratio	0.35

6. WORKING PRINCIPLE

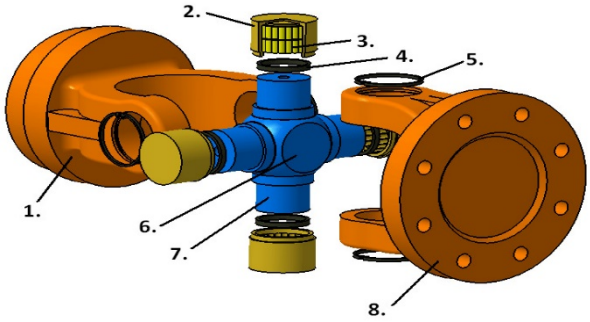

Figure.3. 3D model of universal joint

Figure.4.. Universal joint coupled with shaft

The universal joint is designed to allow the angle between the connected components to change within a predetermined range, much like the joints in a human leg. To accommodate and meet the power produced by the car's running variations due to the Angle, the axle shaft of front-wheel-drive vehicles is often attached to a shared universal joint between the wheels and the axle. Constant speed universal joints are often used to reduce vibration, wear on moving parts, and noise pollution, but a single universal joint cannot make the output shaft and the shaft entering the shaft of the instantaneous angular velocity are identical. This is because of limitations in axial size. Each half shaft, prior to the introduction of drive motor vehicles, used two patterned constant speed universal joints: one within the universal joint near the transaxle and another inside the universal joint near the lateral axle. The drivetrain of a rear-wheel-drive vehicle, comprising the engine, clutch, and gearbox, is installed in a rigid mounting bracket and connected to the frame and drive axle through flexible suspension. Drive a car powered by a double universal joint, which is to have a universal joint on both ends of the transmission shaft, its role being to make the shaft ends of equal Angle, so as to guarantee the instantaneous anguish. This is because the gearbox output shaft and the Angle between the drive axle and the main reducer input shaft can change depending on the road surface, the amount of weight being transferred, and the number of assemblies installed.

7. RESULTS

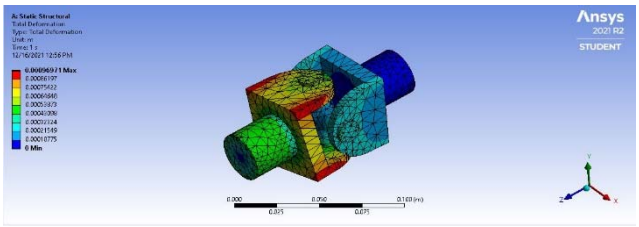

Figure.5. Total deformation of structural steel universal joint

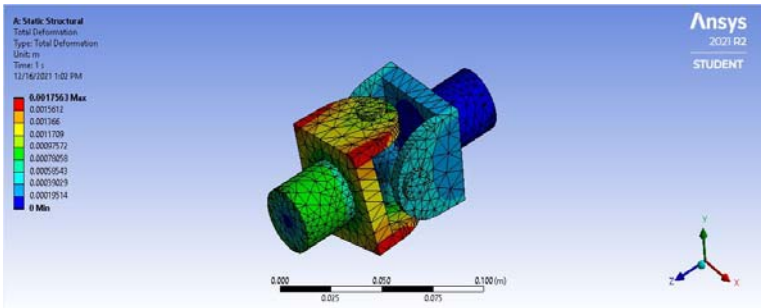

Figure.6. Total deformation of Grey castiron universal joint

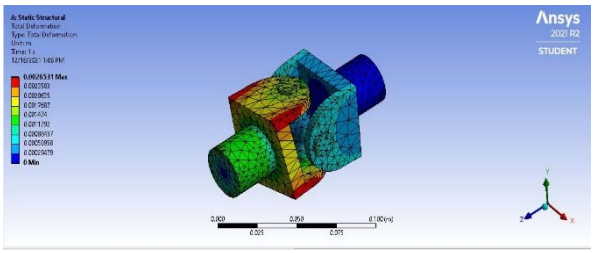

Figure.7. Total deformation of aluminium universal joint

8. CONCLUSION

These three images from ANSYS depict testing performed on steel, greycast iron, and aluminium. Values in the analysis reports vary, despite their seeming similarity. .

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Design and Analysis Of Knuckle Joint By Using FEA Structural Analysis Method

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ABSTRACT
Knuckle joints are connections between two parts that only allow motion in one direction. There are two rods connected by a hinged joint. Two rods with parallel axes are joined at the knuckle joint. Common applications include the connection between the steering rod and pinion on tractor trailers, roof truss tie rods, suspension bridge link joints, and steering systems. A mishap may occur if the knuckle joint fails. Therefore, the knuckle joint requires suitable design and analysis to withstand operational circumstances without failing. This concludes the modelling and study of the knuckle joint in a number of different states. A knuckle joint was modelled in CATIA and analysed using Finite Element Analysis (FEA). The problem was fixed using ANSYS version 15, a commercial finite element tool. Stresses in excess of 201 MPa are generated at the knuckle joint, whereas the highest allowable stress in 30C8 material is 400 MPa. The conclusion is that Design is safe. The research found that a 25mm pin could resist a 50KN strain without breaking.
Keywords: - Knuckle joint, FEA, ANSYS, CATIA.

1. INTRODUCTION

Joints play an important role in the mechanical and automotive sectors, and their permanence or transience depends on the application. Power transmission and motion transfer applications often use temporary couplings such the screwed joint, cotter joint, sleeve cotter joint, universal joint, or knuckle joint [1].

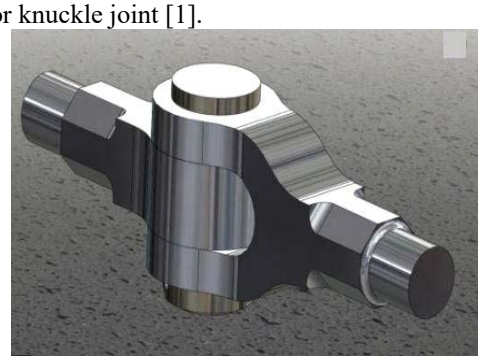

Figure 1. 3D View of Knuckle joint.

Knuckle joints are used in steering systems to connect the steering rod to the pinion of the steering gear. This is the only joint that will allow us to maximise plant output, since the lines of the action axes of both mechanical pieces cross and lie in distinct planes.

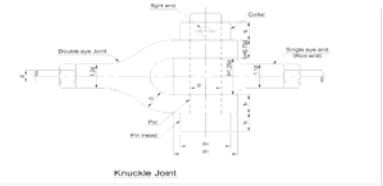

Figure 2. Sectional View of Knuckle Joint.

Figure 2 shows a cross-sectional image of a knuckle joint. The Knuckle Joint consists of the single eye, the fork (double eye), the knuckle pin, the collar, and the tapper pin. One of the rods has an eye at the end that fits into the fork's jaws, while the other rod is shaped like a fork. A cylindrical pin is placed through the fork and eye holes. A tapper pin, split pin, or tiny nut tightened against the pin's shoulder serves as a locator. The ends of the rods are octagonal so that they may be held securely. Load action usually occurs along axial or linear axes [2, 7].

One end of the rod creates a single eye, while the other end forms a pair of eyes. Each set of eyes, whether single or double, is joined by a tiny pin inserted into the pupil. There is a taper pin on one end of the pin and a head on the other. When separated, the pin holds the two eyes together. The solid rod part of the joint is much more sturdy than the hollow section the pin passes through. There are three possible causes of knuckle joint failure.

Shear failure of the pin 1 (Single Shear).

Second, the pin is squished by the rod.

#3: Flat-end bar breaks under tension.

It is important to build knuckle joints that can withstand load without failing since a failure might lead to an accident. Good design requires an understanding of the expected behaviour of a mechanical device or assembly. The designer had to calculate the loads placed on the system as it worked.

We know that pins are exposed to a lot of stress while they're functioning. Pins are utilised because they are a versatile, replaceable component. As a result, we may use pin for analysis. Then we use ANSYS software to examine the knuckle pin [8]-[10].

2. RELATED WORK

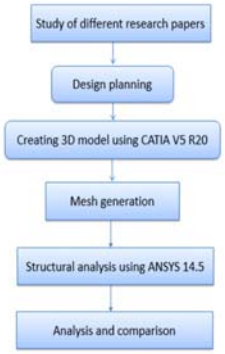

Figure.2. Methodology

3. MATERIAL PROPERTIES

As a result of graphite fractures, grey cast iron (also known as grey iron castings) takes on a bluish-grey colour and look when cast. What distinguishes grey iron from other forms of iron is the presence of graphite flakes, which form when the carbon in the iron crystallises out during cooling.

Grey iron is the outcome of the materials utilised as well as the casting technique. The components fused together to flow into the mould and the casting process both contribute to the resulting grey iron's varying properties (it is primarily the cooling part of the process that defines the characteristics of the cast part versus other parts of the process.).

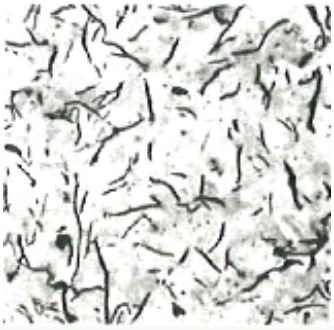

Figure 3. Grey Iron Magnified to Show the Flakes of Graphite

As a result of graphite fractures, grey cast iron (also known as grey iron castings) takes on a bluish-grey colour and look when cast. What distinguishes grey iron from other forms of iron is the presence of graphite flakes, which form when the carbon in the iron crystallises out during cooling.

Grey iron is the product of both the raw ingredients and the casting process. The components fused together to flow into the mould and the casting process both contribute to the resulting grey iron's varying properties (it is primarily the cooling part of the process that defines the characteristics of the cast part versus other parts of the process.).

4. INTRODUCTION TO CAD/CAM/CAE

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Grey iron is the product of both the raw ingredients and the casting process. The components fused together to flow into the mould and the casting process both contribute to the resulting grey iron's varying properties (it is primarily the cooling part of the process that defines the characteristics of the cast part versus other parts of the process.).

ANSYS Workbench is a platform that combines simulation and parametric CAD systems with unparalleled automation and performance. The strength of ANSYS Workbench derives from years of expertise with ANSYS solver algorithms. In addition, the goal of ANSYS Workbench is to verify and improve the product in a virtual environment.

5. RESULT AND ANALYSIS

5.1. STATIC STRUCTURAL ANALYSIS OF STRUCTURAL STEEL KNUCKLE JOINT

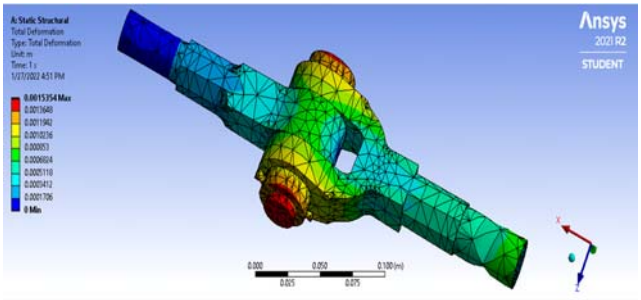

Figure 4. Total Deformation of Structural Steel Knuckle Joint.

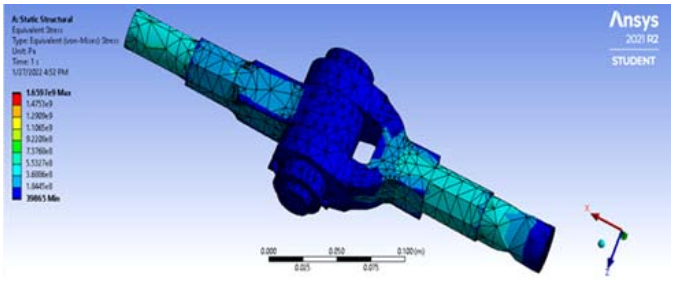

Figure 5. Equivalent stress of structural steel knuckle joint

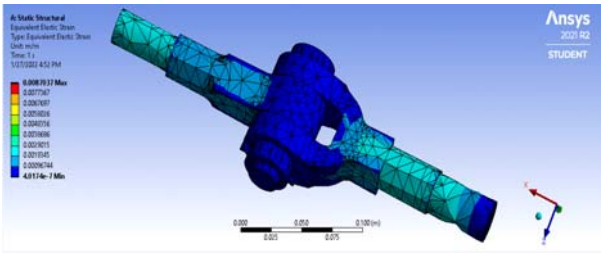

Figure 6. Equivalent elastic strain of structural steel knuckle joint

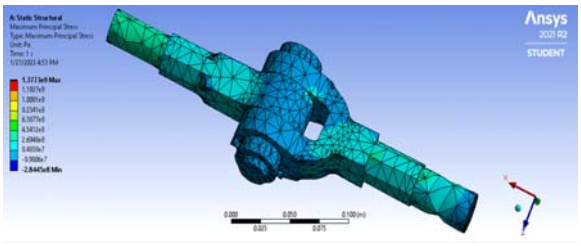

Figure 7. Max principal stress of structural steel knuckle joint

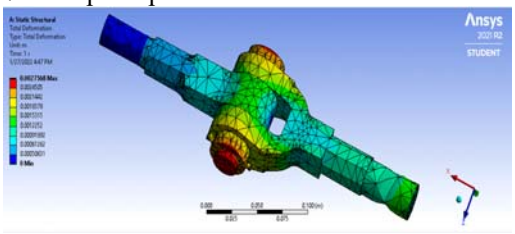

Figure 8. Total deformation of greycastiron knuckle joint**.**

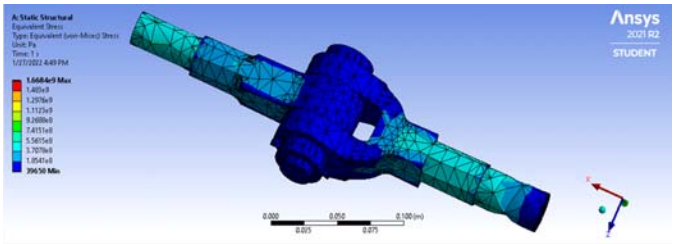

Figure 9. Equivalent stress analysis of greycastiron knuckle joint.

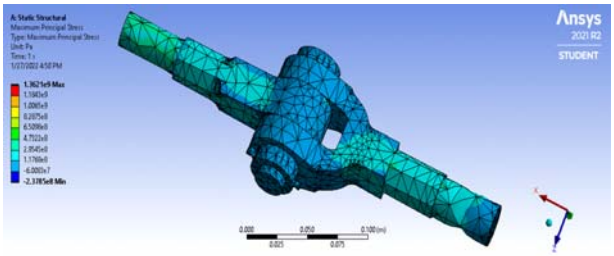

Figure 10. Maximum principal stress of greycastiron knuckle joint.

STATIC STRUCTURAL ANALYSIS OF ALUMINIUM KNUCKLE JOINT

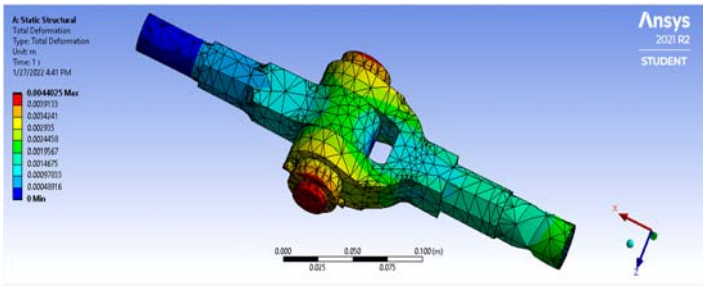

Figure 11. Total deformation of aluminium knuckle joint.

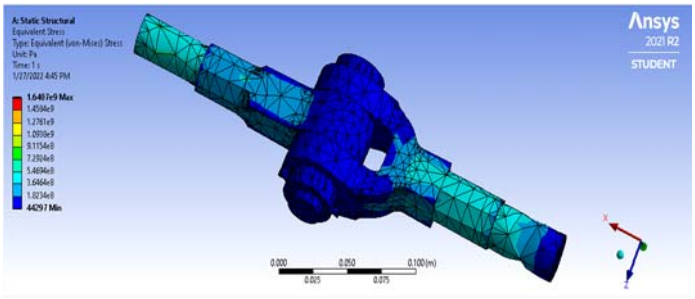

Figure 12 . Equivalent stress of aluminium knuckle joint.

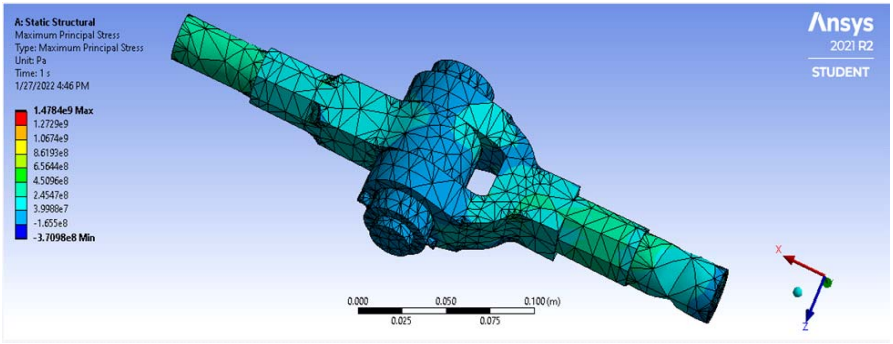

Figure 13. Max principal stress of aluminium knuckle joint.

6. CONCLUSION

The results reveal that the knuckle joint may be built and optimised to withstand a wide variety of loads, including both compressive and tensile loads. By using alloys, the knuckle joint's weight might be reduced. The analytical findings suggest that the alloy material combined with structuralsteel performs better than the alternatives. Connecting rods made from the latest generation of optimised alloys are much more rigid than their predecessors.

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Design, Comparison and Analysis Of APropellerShaftAutomobileFatigueLife

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Abstract

Because of their better particular stiffness and strength, composites are preferable over metal when it comes to structural support. Fibre reinforced polymer composites have emerged as a possible answer to the increasing need for lightweight building materials. The broad interest in these chemicals may be due to their application in a variety of market areas, including vehicles, aeroplanes, sports equipment, healthcare, and household goods. The goal of this research is to figure out how various propeller shaft materials work as power transmitters. Because of its better specific stiffness and strength, composites have significant benefits over metal for structural applications. This study investigates the possibility of replacing standard steel propeller shafts in vehicles with a composite propeller shaft consisting of Aluminum alloy (2024) and Titanium alloy (TI6AL4V). Propeller shafts are often made out of sm45 c steel. The goal of the project is to reduce the driving shaft's weight. This research used finite element analysis to analyse deflection, stresses, and natural frequencies under applied loads (Ansys). FEA was used to provide a more detailed comparison between the two loads. Between steel and composite drive shafts, optimal and stress intensity factor comparisons were also made.

Keywords: Automobile,Powertransmission,forgedsteel,Strength,aluminium2024,titaniumTI6AL4V,Load,Stress,Intensityfactor,Universalcoupling,Differential, Axles,Natural frequency,Rearwheel axis,Hooke'slaw

1. INTRODUCTION

The propeller shaft, which is a spinning shaft, transmits the power from the engine to the wheels. The propeller shaft must be flexible enough to handle the changing angle between the blades. The transmission anaxle is a component of it. In building, high-quality steel (Steel SM45) is often employed. Because of the following correlations, producing a shaft in two sections out of steel increases its fundamental bending natural frequency: The specific modulus is proportional to the square root of the shaft's length, and the bending natural frequency is inversely related to the square of the beam length. Three universal joints, a cross-centre supporting bearing, and a bracket make up the two-piece steel propeller shaft. Any component sandwiched between two pieces of steel may be dismantled using drive shafts. Composites' modulus of elasticity is also much lower than that of biological materials. When the driveline experiences torque maxima, the driveshaft may operate as a shock absorber, reducing strain on the drive train and increasing its life. Hybrid drive shafts and the techniques utilised to link them to universal Joint yokes have been the subject of many studies. To counteract this, this research examines the design from a variety of perspectives. Because of their high specific strength (strength/density) and specific modulus (modulus/density), composites manufactured from sophisticated materials like graphite, carbon, kevlar, and glass with the correct resins are often utilised. Modern composites seem to be tailor-made for usage in scenarios requiring lengthy power driver shafts (propeller shafts), with elastic qualities that may boost both torque bearing capacity and maximum permitted rotation speed. Drive shafts are utilised in a broad range of vehicles as well as in the aerospace, aviation, and automotive industries. In actuality, the heavier the car, especially while travelling in the city, the more fuel it will need. [1]-[5].

Aluminum is a chemical element that belongs to the boron group and has the symbol Al. Silver is a white, soft, ductile metal. Aluminum is the most prevalent metal in the Earth's crust and the third most frequent element (after oxygen and silicon). It accounts for around 8% of the planet's overall mass.

Because aluminium is a highly reactive metal, it is difficult to find pure examples in nature.

Only extreme circumstances of reduction may be used. It's more likely to be found in one of over 270 mineral combinations. The main resource used to make aluminium is bauxite.

Aluminum is unusual because of its low density and the corrosion-resistant passivation phenomena. Aluminum and its alloys are used extensively in the manufacture of aeroplanes, as well as in other transportation and construction sectors. Aluminium oxides and sulphates are the most valuable aluminium compounds in terms of weight.

Aluminum salts are abundant in nature, yet no creature has yet discovered how to utilise them metabolically. Aluminium's widespread nature is mirrored in the fact that plants and animals tolerate it well. Questions regarding the biological consequences of aluminium compounds, whether useful or detrimental, are a constant topic of interest due to their widespread usage. [6]-[10]

2. ALUMINIUM2024ALLOY

The principal alloying component in the 2024 aluminium alloy is copper. This material is used when a high strength-to-weight ratio and excellent fatigue resistance are required. Its machinability is poor, and friction welding is the only technique that works. It is frequently encased in aluminium or Al-1Zn for protection because to its weak corrosion resistance, despite the fact that this may diminish the fatigue strength. This alloy was originally known as duralumin under the trade designation 24ST, as were others in the 2XXX family.

You may also buy alclad sheet and plate in your own dimension and form, including extruded 2024. It's not often that anything gets forged (the related 2014 aluminium alloy is, though).

Table.1. MechanicalPropertiesofAL2024

Density	**2780**	**Kg/m3**
Ultimatetensilestrength	469	**Mpa**
Yieldtensilestrength	324	**Mpa**
Modulusofelastisity	73.1	**Gpa**

Shearmodulus	28	**Gpa**
Shearstrength	283	**Mpa**
Fatiguestrength	**138**	**Mpa**

Because of its high strength and fatigue resistance, 2024 is extensively used in aircraft, notably in tensioned wing and fuselage components. Because the material is susceptible to thermal stress, 2024 is also used to validate liquid penetrant tests done outside of standard temperature ranges.

3. TITANIUMTI6AL4VALLOY

Ti-6Al-4V (UNS number R56400), often known as TC4, Ti64, or ASTM Grade 5, is a high-specific-strength alpha-beta titanium alloy with excellent corrosion resistance. It's one of the most widely used titanium alloys, with applications in aviation and biomechanics that need low density and good corrosion resistance (implants and prostheses).

The Watertown Arsenal, which eventually became the Army Research Laboratory, started researching titanium alloys for use in body armour in the 1950s.

Because of its low modulus, high biocompatibility, and superior corrosion resistance, titanium alloys are used as biomaterials. In contrast to stainless steels and cobalt-based alloys, which are more often used. The popularity of these materials may be linked to their desired qualities, which led to the early introduction of (cpTi) and (Ti—6Al—4V) alloys, as well as the creation of novel Ti-alloy compositions. Biocompatibility and elastic modulus reduction are both improved, as is strain-controlled and notch fatigue resistance. Titanium alloys have not been extensively employed in the medical industry due to their low shear strength and wear resistance. While b-Ti alloys outperform ab alloys in terms of wear resistance, a better knowledge of the wear processes is required before orthopaedic titanium alloys can be extensively employed as wear components..

Table.2. TI6AL 4V alloy mechanical characteristics

Density	**4429**	**Kg/m3**
Ultimatetensilestrength	1170	**Mpa**
Yieldtensilestrength	1100	**Mpa**
Modulusofelasticity	114	**Gpa**
Yieldcompressivestrength	1070	**Mpa**
Poissonsratio	0.33	**-**
Shearmodulus	44	**Gpa**
Shearstrength	**760**	**Mpa**
Specificheatcapacity	**0.5263**	**J/g c**
Thermalconductivity	6.7	**W/mk**
Meltingpoint	**1660**	**C**

- Implantsandprostheses(wrought,castorbyAdditiveManufacturing(AM))
- AdditiveManufacturing.
- Partsandprototypesforracingandaerospaceindustry.Usedextensivelywithinthe Boeing 787aircraft.
- Marineapplications.
- Chemicalindustry.
- Gasturbines.
- FirearmSilencer.

Table.3. Mechanicalpropertiesof SM45Csteelalloy

Density	**7600**	**Kg/m3**
Ultimatetensilestrength	686	**Mpa**
Yieldtensilestrength	490	**Mpa**
Modulusofelasticity	205	**Gpa**
Poisonsratio	**0.29**	**-**

Shearmodulus	**80**	**Gpa**
Specificheatcapacity	0.486	**J/g c**
Thermalconductivity	**49.8**	**W/mk**

4. INTRODUCTIONTOCATIA

CATIA is a powerful tool that makes it easier to create intricate and complicated designs. The objectives of this course are to teach students how to use CATIA to design and build parts and assemblies, as well as to create basic drawings of these components and assemblies. This course will teach you the principles needed to build a strong foundation for your designs.

CATIA is a well-known mechanical design program. It's a simple-to-use parametric solid modeling design tool with a user-friendly interface. To capture design intent, fully associative 3-D solid models may be created utilizing either automatic or user-defined relations. To further understand this definition, more clarification of the italicized phrases will be supplied.

A solid model is the most detailed geometric model that a computer-aided design (CAD) system can produce. The model's edges and faces are defined using all of the required wireframe and surface geometry. A solid model's topology, which connects the geometry, is also carried by the model. Determining which edges link which faces (surfaces) is an example of topology in action (curves). This intelligence facilitates the addition of additional features. If your model requires a fillet, for example, you may simply make one by picking one edge and radiusing it.

5. WORKBENCHES

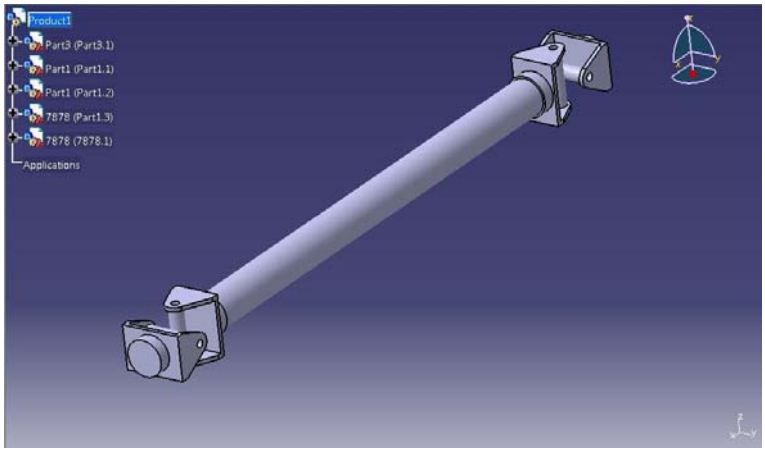

Figure.1.3Dmodelofdriveshaftusing CATIA

Table.4. TAITANIUMTI6AL4VRESULTS

	Minimum	**Maximum**
Totaldeformation	0	**0.007143**
Equivalentelasticstrain	2.7413e-6	**0.011922**
Maximum principalelasticstrain	-4.1732e-7	**0.011394**
Equivalentstress	93652	**1.1303e9**
Maximum principalstress	**-3.768e8**	**1.6506e9**

Table.5. ALUMINIUM2024ALLOYRESULTS

	Minimum	**Maximum**
Totaldeformation	0	**0.011022**
Equivalentelasticstrain	3.9215e-6	**0.018821**
Maximum principalelasticstrain	-1.5756e-5	**0.018245**
Equivalentstress	**87628**	**1.1436e9**

Maximum principalstress	**-3.5198e8**	**1.6396e9**

6. CONCLUSION

When compared to traditional steel shafts, the use of composite material has resulted in a weight reduction of 24-29 percent. The study's goal was to figure out how to cut the fuel consumption of vehicles and other devices that used drive shafts. The use of aluminium alloys and other lightweight composites is common. The aluminium alloy composite stands out as the material most likely to replace steel in terms of weight savings, deformation, shear stress generated, and resonance frequencies. The mission also involves design optimization, such as the transition from a two-piece steel drive shaft to a single-piece light-weighted composite drive shaft. However, a final examination of the three alloys reveals that steel is the best and most appropriate for achieving long-term effects via deformation.

A solid model is the most detailed geometric model that a computer-aided design (CAD) system can produce. The model's edges and faces are defined using all of the required wireframe and surface geometry. A solid model's topology, which connects the geometry, is also carried by the model. Determining which edges link which faces (surfaces) is an example of topology in action (curves). This intelligence facilitates the addition of additional features. If your model requires a fillet, for example, you may simply make one by picking one edge and radiusing it..

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Structural Analysis Of IC Engine Piston

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ABSTRACT

The primary objective of this research was to characterise and evaluate the stress distribution in pistons under actual engine settings. This investigation incorporates both a fea analysis and a mechanical structural examination. The research used the piston's operating load, force, and material properties. The piston is the most intricate and important part of an internal combustion engine, thus it must be in excellent working condition for the car to run smoothly. Piston failure is often caused by mechanical and thermal loads. Boundary conditions are used to analyse a piston, and these circumstances might include things like operational pressure on the piston head and uneven load distribution from the piston, both of which can cause the process to fail. Pure Aluminium Alloy, Aluminium 2024 Alloy, and Aluminium 7068 Alloy are just few of the materials that might be evaluated in this comparative research.

Keywords: Aluminium , Aluminium 2024 alloy , Aluminium 7068 alloy , structural analysis.

1. INTRODUCTION

The piston is an integral part of internal combustion engines that use reciprocating motion to power the engine. The cylinder and the piston rings contain and seal off the moving portion. Piston rods in internal combustion engines are responsible for transferring the force generated by the expanding gas in the cylinder to the crankshaft. Pistons may sustain fatigue damage at work from being exposed to cyclic gas pressure and inertial forces, such as piston side wear, piston head fractures, and so on. Therefore, several parameters must be addressed in optimising the design of the piston. This study employs a thermal analysis of the piston at different temperatures in different strokes [1]-[5] and a piston analysis with a pressure force acting at the top of the piston. Design engineers might benefit from this study if it leads to improvements in the piston design process. In this study, we compute the various stress estimates using pressure analysis, temperature analysis, and thermo-mechanical analysis to pinpoint the potential areas of piston damage. Optimization of the piston design through analysis is a breeze. One of the most important aspects of piston design is predicting how heat will spread over the piston's surface so that we can optimise the piston's thermal characteristics at a lower price. The thermal expansion coefficient of the aluminium alloy used to make most of the pistons is 80 percent better than that of the cast iron cylinder bore material. Therefore, there are slight deviations from design clearances in actual operations. Because of this, it is essential to comprehend the piston's thermal behaviour in order to build a more effective compressor. Piston design should prioritise a tight seal between the piston and cylinder. High-speed machines benefit greatly from lighter pistons because of the decreased inertia they provide. Because of temperature-induced expansion, the piston's diameter must be less than the cylinder's. The necessary clearance is calculated by taking into account the piston's coefficient of thermal expansion and the temperature difference between the cylinder and the piston [6]-[10].

2. RELATED WORK

A piston may be found in reciprocating engines, reciprocating pumps, gas compressors, and pneumatic cylinders, among other things. The cylinder and the piston rings contain and seal off the moving portion. Piston rods and connecting rods in an engine serve to transfer the force generated by the expansion of the gas in the cylinder to the crankshaft. In a pump, the fluid in the cylinder is compressed or discharged by means of force delivered from the crankshaft to the piston. The piston may also serve as a valve in some engines by covering and uncovering perforations in the cylinder.

This section of a piston from an internal combustion engine displays the gudgeon pin.

The pressure of expanding combustion gases in the combustion chamber space at the top of the cylinder acts on an internal combustion engine. The connecting rod then transfers the force to the crankshaft. A swivelling gudgeon pin links the connecting rod to the piston (US: wrist pin) (US: wrist pin). There is no piston rod or crosshead as in a steam engine, and this pin is housed within the piston itself (except big two stroke engines).

The pin, which is composed of hardened steel and is attached in the piston but free to move in the connecting rod, is fixed in the piston. Some designs use a "completely floating" layout, in which one or both parts are free to move about. To prevent any of the pins from moving laterally or burrowing into the cylinder wall, a circlip is utilised.

Figure.1. Pistons for the Trunk

When it comes to trunk pistons, the length you get is directly related to the diameter you use. Both the piston and the crosshead, they are cylindrical in shape. Since the connecting rod is at an angle for most of each rotation, the piston exerts lateral force on the cylinder wall. With a longer piston, this is made easier. Trunk pistons have been widely used in engines since since the invention of the internal combustion engine. Once common in both gasoline and diesel engines, slipper pistons have now been shown to be more efficient at high speeds. Most trunk pistons, particularly those used in diesel engines, include a groove for an oil ring below the gudgeon pin, in addition to the rings between the gudgeon pin and the crown. The phrase "trunk piston" was originally used to describe an early kind of nautical steam engine known as a "trunk engine." As a first, these were the first engines to integrate the gudgeon pin into the piston, reducing the overall size. To reduce the bulk, they did away with the piston rod and crosshead seen in traditional steam engines. There was no resemblance between the trunk piston and these engine pistons, which were unusually large in diameter and double-acting. Their "trunk" was really just a little cylinder in the middle of the piston.

Large, low-speed Diesel engines may have side strains on the piston and may benefit from additional reinforcement. Commonly employed in such motors are crosshead piston designs. A second, smaller piston is created by extending a massive piston rod downward from the first piston. Piston rings and gaskets are moved around by the main piston, which also acts as a seal. A mechanical guide, the smaller piston's only purpose. The gudgeon pin is housed in a little cylinder that also acts as a guide for the trunk. Since the crosshead's lubricating oil is shielded from the combustion chamber's high temperatures, it is less likely to get contaminated with soot particles, is less likely to degrade as a result of heat, and may be thinner and less viscous than the trunk piston's oil. There may be just half as much resistance between the piston and the crosshead as there would be with a piston in the trunk. Due to the extra weight, these pistons are not used in high-performance engines.

The term "slipper piston" refers to a gasoline engine component that has been shrunk and lightened to the greatest extent possible. In the most severe example, they consist only of the piston crown, the support for the piston rings, and the minimum amount of the piston skirt necessary to leave two lands and prevent the piston from rolling in the bore. Around the gudgeon pin, the piston sides skirt away from the cylinder wall. We want to reduce the reciprocating mass as much as possible so that the engine can run at greater speeds while being easy to balance. The piston friction with the cylinder wall is larger than the fluid pressure on the piston head, hence decreasing inertia improves the mechanical efficiency of the engine. One additional benefit may be less drag on the cylinder wall, since the area of the skirt that glides up and down the cylinder will be cut in half. However, the piston rings—the pieces that fit closest in the bore and the wrist pin bearing surfaces—are the primary source of friction, which significantly lessens the benefit.

Piston rings seal off the combustion chamber, transferring heat to the cylinder wall and controlling oil consumption. Piston ring seals combustion chamber by both internal and external pressure. Inherent pressure refers to the intrinsic spring force that expands a piston ring based on the design and properties of the material used. When the diameter of a piston ring has to be reduced due to pressure, a lot of force is needed. The free piston ring gap in the absence of compression defines the inherent pressure. The free piston ring gap is the space between the piston ring's ends while the piston is at atmospheric pressure. More force is applied by the piston ring when it is compressed in the cylinder bore the larger the free piston ring gap.

To create a reliable seal, a piston ring's radial fit to the cylinder wall must be consistent and positive. Piston rings have their own internal pressure that causes the radial fit. For the piston to remain hermetically sealed, the piston ring must also do its job.

Figure.2. Piston Ring

3. **OPTIMIZATION OF PISTON**

After a precise finite element model was built, a strategy for the optimization process could be formulated. Lightening the load on the piston's bearings was a primary objective during optimization. The reason behind the goal: Cut down on the quantity of stuff you utilise. Specifically, the following limitations are in place:

I Limitations on Production (ii) Design stress or maximum allowable Vonmisses stress (iv) In order to keep the maximum vonmisses stress within the allowable limit and the factor of safety over 1.5, we performed a static structural analysis to estimate the stresses under each loading condition (v).

Thickening of the Rings, Both Radially and Axially Maximum Barrel Thickness (c) Top Land Width (d) Other Ring Land Widths (e)

Aluminum, a chemical element with the symbol Al and atomic number 13, is a member of the boron group. It is a white, malleable metal that is velvety to the touch. Aluminum is the most common metal and the third most prevalent element in the Earth's crust (after oxygen and silicon). It accounts for around 8% of the mass of the Earth's solid surface.

Natural aluminium is very rare and can only be discovered in extreme reducing environments due to its high reactivity. Rather, it is more likely to be discovered in one of more than 270 possible mineral mixtures. The ore bauxite is the primary source of aluminium production.

Aluminum is unique due to its low density and the passivation phenomenon, which gives it corrosion resistance. The aerospace industry relies heavily on aluminium and its alloys for structural components, and this is true of many other transportation and construction industries as well. At least in terms of mass, the most valuable aluminium compounds are the oxides and sulphates.

Unfortunately, no known form of life takes use of aluminium salts in its metabolism, despite their widespread presence in the environment. Aluminum is widely present, thus it seems sense that plants and animals can withstand it without any problems. Because aluminium compounds are so ubiquitous, researchers are always curious about their potential beneficial or harmful effects on living organisms.

4. INTRODUCTION TO CAD/CAM/CAE

After an accurate finite element model was built, a strategy for the optimization technique was developed. Optimizing for mass reduction was a primary focus. Role of the goal: Cut down on the resources you commit to this. Please note the following limitations:

I Produced item limitations (ii) Allowable design stress or maximum Vonmisses stress (iv) After performing a static structural analysis, stresses under each loading condition were examined, and locations where unnecessary material might be cut out to keep the maximum vonmisses stress within the allowable limit and the factor of safety at or above 1.5. (v).

Thickness of the Ring, Both Radially and Axially Maximum Barrel Thickness, Other Ring Land Widths, and the Top Land Width

The chemical element aluminium (atomic number 13, symbol Al) is a member of the boron group. Silver is a soft, ductile, whitish metal. After oxygen and silicon, aluminium is the most prevalent metal and the third most abundant element in the Earth's crust. By mass, it constitutes around 8% of Earth's solid surface.

Due to its high reactivity, aluminium is seldom encountered in its native state outside of extreme reducing environments. On the other hand, it might be present in over 270 different mineral mixtures. Most aluminium comes from a mineral called bauxite.

Passivation, a unique property of aluminium, makes it resistant to corrosion. The aerospace industry relies heavily on aluminium and its alloys for structural components, and this is true not just for aeroplanes but also for other forms of transportation and building materials. For practical purposes, the oxides and sulphates are the most important aluminium compounds.

Even though aluminium salts are widespread in nature, no known organism can use them metabolically. It seems sense that, considering how common it is, aluminium would be accepted well by plants and animals. The potential beneficial (or harmful) biological activity of aluminium compounds is of continual interest owing to their pervasive presence in modern life.

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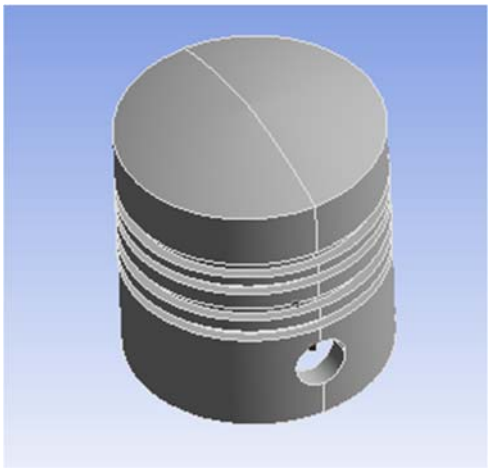

Figure.3.3D diagram of piston

Engineers use ANSYS to model interactions in various disciplines of physics, including structural, vibration, fluid dynamics, heat transport, and electromagnetics. As a result, ANSYS, which allows you to simulate testing or working settings, allows you to test in a virtual environment before making product prototypes. Furthermore, 3D simulations in a virtual environment may be used to identify and improve weak areas, compute life, and predict potential issues.

The modular nature of ANSYS software, as shown in the table below, allows users to choose just the functions they need. By integrating CAD and FEA connection modules, ANSYS may be coupled with other commonly used engineering applications on the desktop. With its "pre processing" capabilities, ANSYS can input CAD data and generate a geometry. In the same preprocessing, a finite element model (also known as a mesh) is created, which is necessary for computing. The outcomes of specifying loadings and doing analysis may be examined numerically and graphically. With its multitude of contact methods, time-based loading characteristics, and nonlinear material models, ANSYS can perform advanced engineering studies rapidly, safely, and realistically. Heat is transmitted from one point to another and between bodies in most

engineering applications. This transmission is fueled by temperature differences (a temperature gradient), and it moves from hot to cold places. Because of their coefficient of thermal expansion (sometimes abbreviated CTE in engineering literature), these temperature differences cause mechanical stresses and strains in bodies. • The amount of heat transfer is directly proportional to the size of the temperature gradient and the thermal resistance of the material(s) involved.

There are three primary mechanisms in engineering applications:

1. Conduction
2. Convection
3. Radiation

ANSYS Workbench is a platform that combines simulation and parametric CAD systems with unparalleled automation and performance. The strength of ANSYS Workbench derives from years of expertise with ANSYS solver algorithms. In addition, the goal of ANSYS Workbench is to verify and improve the product in a virtual environment.

5. RESULT AND ANALYSIS

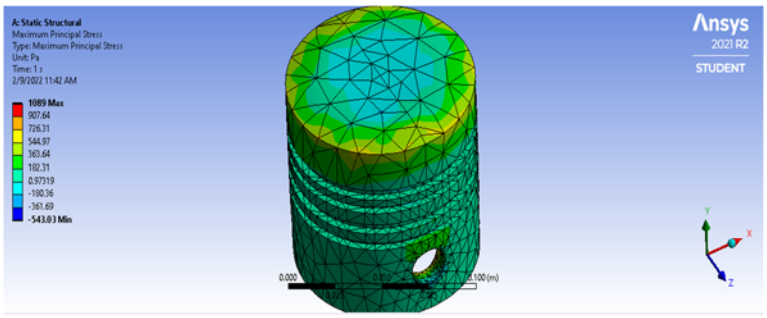

Figure.4. Max principal stress of aluminium alloy piston.

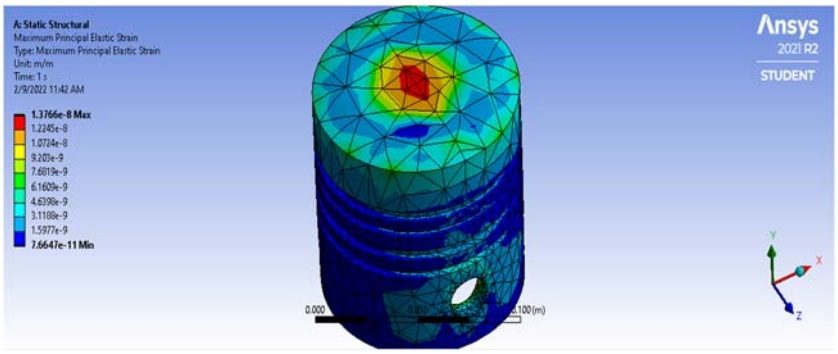

Figure.5. Max Principal Strain Of Aluminium Alloy Piston

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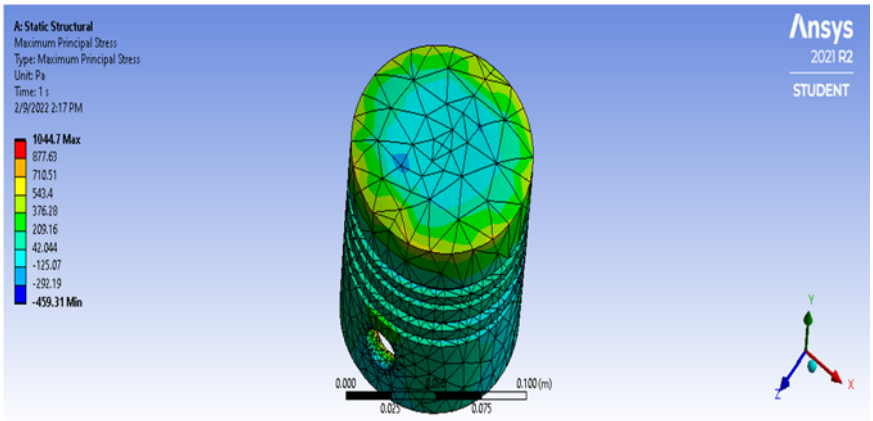

Figure.6. Fig. max principal stress of aluminium 2024alloy piston.

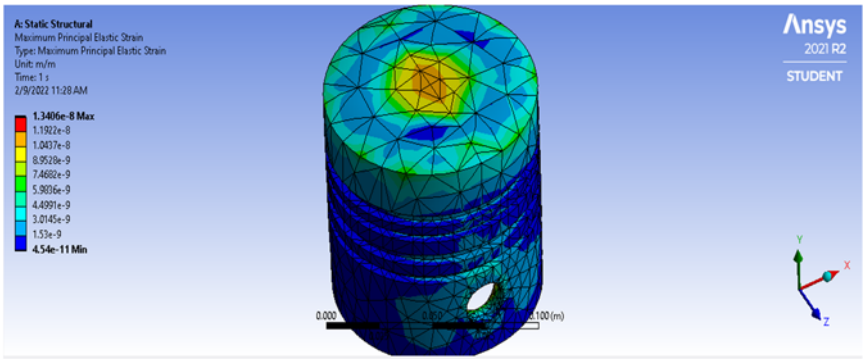

Figure.7. max principal strain of aluminium 2024alloy piston.

STRUCTURAL ANALYSIS OF PISTON USING ALUMINIUM 7068 ALLOY

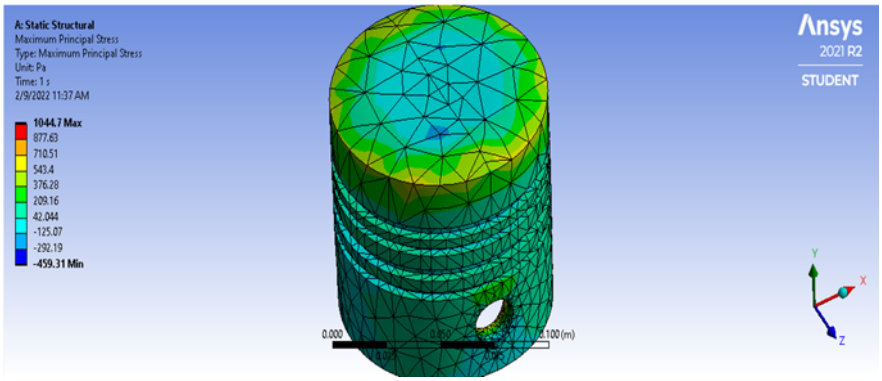

Figure.8. max principal stress of aluminium 7068alloy piston.

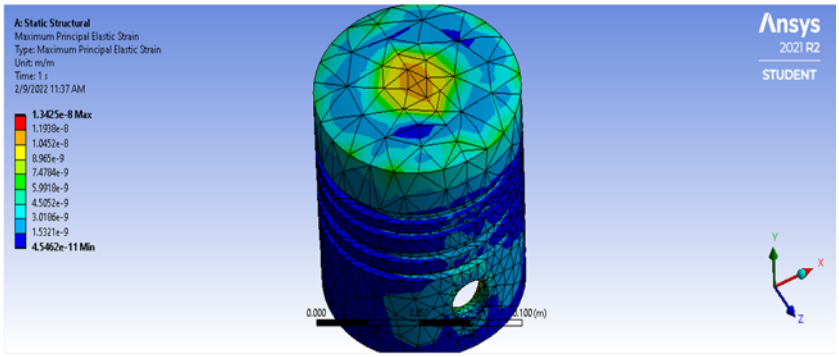

Figure.9.max principal strain of aluminium 7068alloy piston.

Table.1.COMPARISON TABLE

S. NO.	CONTENT		PISTON METAL TYPES		
			Aluminium alloy	Aluminium 2024	Aluminium 7068
1.	Total deformation	Max	2.5311e -9	2.4847e-9	2.4881e-9
		Min	0	0	0
2.	Equivalent stress	Max	1424.2	1398.9	1398.9
		Min	10.417	10.723	10.723
3.	Equivalent elastic strain	Max	2.0124e-8	1.9198e-8	1.9224e-8
		Min	2.6084e-10	2.4143e-10	2.4176e-10
4.	Maximum principal stress	Max	1089	1044.7	1044.7
		Min	-543.03	-459.31	-459.31
5.	Maximum principal strain	Max	1.3766e-8	1.3406e-8	1.3425e-8
		Min	7.6647e-11	4.54e-11	4.5462e-11

6. CONCLUSION

Three-dimensional models of pistons are constructed using the data. The CATIA V5R20 software was used to create the 3D model. The next step is to import the models into ANSYS WORKBENCH 14.5 to do a structural analysis of the piston. With a relevance of 100 and an element size of 10mm, a fine mesh is produced. To perform a structural analysis, input pressure is supplied to the piston's top, while the side holes provide support. Maximum principle stress and maximum principal strain are also determined, along with the total deformation, equivalent stress, equivalent elastic strain, and equivalent stress. These results show that, depending on the criteria, the pure aluminium alloy delivers the best results.

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GSM-Based Collision Detection And Prevention System For Automobiles

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Abstract.

Technology's recent advancements have made our lives easier and faster. The advancement of technology has resulted in an increase in transportation risks. A GSM-based accident detection and prevention system is presented in this paper to reduce accidents and save lives. One of the most typical problems that individuals strive to tackle while acquiring a vehicle. As the number of cars grows, traffic management becomes a mess, resulting in accidents. Accidents can occur for a variety of reasons other than poor traffic control, such as inclement weather, irresponsible driving, defective automobiles, or poor road conditions. For safety reasons, the vehicle's performance has been regularly checked. If an accident occurs, this system transmits an emergency alert, including the location, to the nearest hospital through the GSM module. The outcome of this paper is that accident can be prevented by utilizing sensors and help can be sent immediately after accident has occurred.

Keywords. GSM, Accidents, emergency alert, nearest hospital

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1. INTRODUCTION

Since the demand for automobiles is increasing every day, traffic is increasing. As a result, transportation has to be improved since, as demand grows, there will be more opportunities for automobile accidents. One of the most common causes of death is motor vehicle accidents. If individuals can't seek help when they need it, there will be serious consequences. Poor emergency response might be a key contributor to our country's high fatality rate. According to crash analysis research, road accidents may be avoided if this innovative life-saving technique was used. The design focuses on giving emergency contacts with basic information about the accident scene. A valuable life may be saved as a consequence of the prompt assistance. During this project, a three-axis accelerometer was used. The approach identifies accidents faster and reports them to the appropriate authorities. Transportation development has been the generating force for citizens to possess the greatest civilization over all organisms on the planet. The automobile is quite important into our way of life. It has the potential to cause us harm and even death through accidents. One of the most essential and fundamental risk factors in driving is speed. It has an impact not just on the severity of a collision, but also on the likelihood of being engaged in a severe collision. Despite the numerous efforts made by various governments and nongovernmental groups throughout the world via various initiatives to raise awareness about irresponsible driving, accidents continue to decrease on a regular basis. However, many lives may be spared if emergency personnel could receive the necessary information in a timely manner. This paper proposes GSM-based collision detection and prevention system for automobiles. The paper is organised as follows. Section II contains related works. Section III outlines the approach. Section IV presents the experimental data, and Section V wraps up.

2. RELATED WORKS

Several studies have been conducted previously that have led to the development of accident detection systems [1] - [3]. Accelerometers have been used in previous projects to detect changes in the car's axis, which then triggers a short message to the predetermined number with details of the accident. Various forms of technology have made our lives easier. Like every coin has two sides, technology is not without its downsides either. With technological advancements, road accidents are occurring at an increasingly rapid pace, which has resulted in a significant increase in fatalities. In our nation, there are insufficient emergency services, thereby causing the problem to worsen. Our initiative aims to provide a solution to this problem.

In addition to the increased use of automobiles, the risk of automobile accidents also increases. The most common causes of automobile accidents are high speeds, driving while intoxicated, distracted minds, overstress, and technological failures. An accident detection system in the study is developed to detect accidents occurring as a result of the driver's inattention. This system is designed to notify the owner of the vehicle. Once an accident has occurred, the system will send instructions to the registered cellphone number to assist with the recovery.

Whenever a person is unable to control the vehicle or when an internal failure occurs, an accident occurs. There are a number of sensors that can be used to aid in the safety of vehicles, whether they are private or public. There is a rapid increase in the number of road accidents. The paper describes several systems that are designed to detect accidents and notify hospitals and medical services. In order to dispatch medical assistance immediately, we can use this method to pinpoint the location of an accident. We are developing a vehicle accident monitoring system that incorporates GPS, and GSM technology for the purpose of delivering messages. The system uses a microcontroller, GPS, and GSM module to deliver messages. Ultrasonic sensors detect movement, falls and accidents with the ultrasonic sensor. GSM [Latitude, Longitude] will be included in the Short Message, which provides vehicle location information

3. PROPOSED METHOD

An accident may be detected using the vehicle's speed, and GPS data is processed by a microcontroller to tell the Alert Service Center of the accident's position and time over the GSM network. Figure 3.1 depicts the proposed system’s block diagram.

Temperature sensor, door lock sensor, brake failure indication, ultrasonic sensor, GSM module, LCD, Motor driver, and DC motor are all part of the proposed system. The thermal condition of the car is monitored using a temperature sensor. Whenever this system detects a brake failure, the vehicle is brought to a complete stop using the break failure sign. The pollution is detected by an ultrasonic sensor, which sends the information to a mobile phone through the GSM module. When an utilized individual tries to enter the car door, the door lock sensor transmits information to the owner's mobile phone. When a car accident happens, the gadget sends a message to the predetermined numbers with the GSM module's information so that assistance may be sent. This system is equipped with a GSM module, and when an accident is detected, the system sends emergency information to the server through the GSM module. On the LCD Display, all of the parameters are presented. It is hoped that this technique would reduce the number of deaths by making better use of the time it takes for an ambulance to get at the hospital. The primary purpose of this paper is to employ sensors to identify accidents. Using GPS and GSM modules, an ambulance and two members of the victim's family can pinpoint the car's exact position. GPS coordinates are used to find the vehicle using a mobile application for theft detection, and the position is then sent to the cloud. Embedded systems may be used to do this, which is a revolutionary technology that will exceed all others. This integrated technology allows us to automate everything around us, therefore decreasing the need for human contact while preserving product quality. When an accident is detected, the LCD may show the current condition.

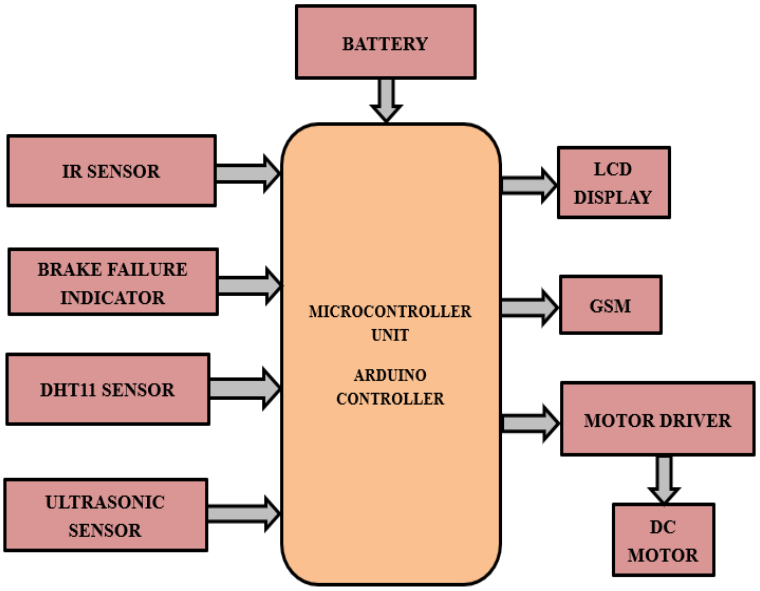

Figure 3. 1. Proposed System Block Diagram

3.1. GSM Network

GSM is a digital modulation-based second-generation cellular technology that uses digital modulation to deliver voice and data services.

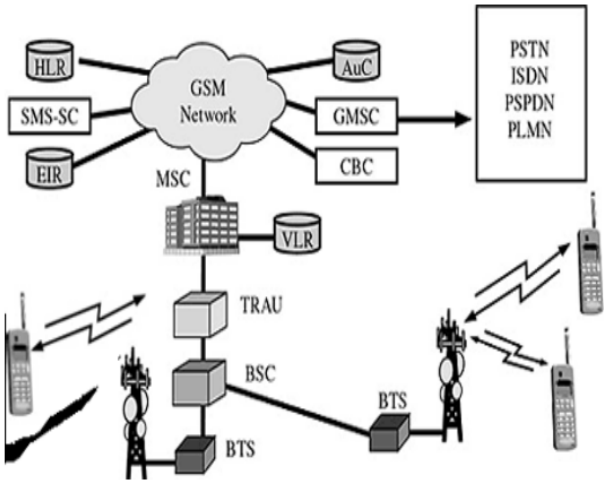

Figure 3.2. GSM Network

There are eight 25 kHz time slots for each 200 kHz channel in a circuit-switched GSM system. 900 MHz and 1800 MHz are used to transmit mobile data all around the world. It supports data speeds ranging from 64 kbps to 120 Mbps. Basic to sophisticated phone and data services are available with GSM, along with roaming services. Before sending data along a

channel, GSM encrypts and compresses it before distributing it, along with two other time-slotted streams. The GSM Network is depicted in Figure 3.2.

The purpose of it in this paper is to send a short message to the predefined number if an accident occurs along the coordinates of the accident's location. This way, help can be dispatched as soon as the accident occurs, saving people's lives. We do not need to wait for someone else to contact the ambulance, since the predefined number is automatically notified.

3.2. Arduino

The Arduino Uno microcontroller board is powered by an ATmega328P processor. The 14 digital input/output pins on this device include an ICSP header, USB, an importance jack, and a push button. The starter kit includes everything you'll need to get started with the microcontroller. To power it, you may either use an AC-to-DC converter or a battery connected to a computer through USB. It is used here in the project, so that it can connect all the different sensors and the battery with the LCD display and GSM module. By doing so, all these work in synchronization, to indicate a fault in the vehicle through LCD display and an accident by sending message to the predefined number. All these can happen only if the coding is done in Arduino, since all of these are embedded into the system.

3.3. DHT11 sensor

Digital temperature and humidity sensors, such as the DHT11, are easy to use. It uses a capacitive humidity sensor and a thermistor to monitor the air's temperature and generate a digital signal. It is used here in the project, so that it can monitor the heat of the vehicle's engine, and if the heat is more than the predetermined value, it can alert the driver through LCD display, indicating the vehicle needs to be stopped for the engine to cool down.

3.4. Ultasonic Sensor

Ultrasonic sensor can estimate the distance to an item. In a simple-to-use design, it provides good range accuracy and reliable readings. It is used in the project, so that it can cover the distance between any objects or vehicles surrounding the vehicle, and can transmit a beep sound through buzzer if the vehicle is so close to another vehicle or if it has collided with any other vehicles, it can transmit message through GSM to send message to predefined number.

It is a flat-panel display or other electronic visual display that takes use of the light-modulating properties of liquid crystals (LCDs).It is used in the project, so that it indicates what problem has occurred in the vehicle and we can act to rectify that problem. A buzzer is used here, so that when any of the sensors detect any faults/ failures, the buzzer indicates us by sending off high beep sound.

4. EXPERIMENTAL RESULTS

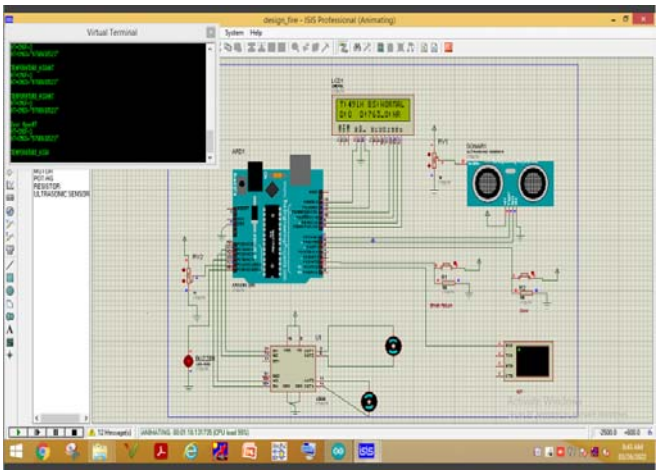

Figure 3.3. Circuit Diagram

By using the Arduino Ide, the necessary code for the above circuit diagram has been coded, which is shown in Figure 3.3. And after successful execution of the code, it has been inserted into the Arduino microcontroller. Then the microcontroller is connected with the required sensors and GSM module, to it all interactive with each other. By making all these components interactive, in case an accident or fault occurs in the vehicle it is indicated to the owner of the vehicle as well as emergency medical services. If the driver notices of the fault through the display, he/ she can avoid accident occurrence. The indication is done through GSM module with a Short Message Service (SMS) and for internal fault occurrence in the vehicle, it is displayed through the LCD display. By implementing this system, human lives can be saved, since the message is sent immediately after accident occurrence along the co-ordinates to the emergency number.

5. CONCLUSION

Several technologies have been analyzed that have reduced traffic risks while highlighting current concerns in the transportation sector. The main focus of the proposed system was on accident detection and prevention. With the suggested method, traffic officials could track incidents through GSM Modules and intervene before they become a tragedy. Several strategies are presented in the project that can be used to detect accidents. As part of the majority of the solutions outlined, the driver has the option of turning off the alarm if the accident is not significant or an erroneous accident detection has occurred. Typically, these solutions are either primarily connected to hardware, such as sensors, that is installed inside the vehicle, or they require a smartphone to be installed inside the vehicle. Using such hardware may seem more cost-effective, but it has the disadvantage

that it may be destroyed in an accident, resulting in erroneous or nonexistent measurements. The result is a technique independent of any sensor or physical device. If a camera is connected to the controller module, the project can be further enhanced, so that a snapshot of the accident site can be taken, making tracking even easier. This problem becomes more serious when drivers lose control and fail to react in an emergency situation. In the future, this system could be used for fleet management, restaurant service, traffic infraction cases, and vehicle rentals.

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Dealz Smart - AI Deployment for Business System from a Sociotechnical Strategic Perspective

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Abstract.
Socio-Tech AI is an interagent Android TV application between consumers and the local shops. It displays the current offers and updates on product information that is available in the local market ventures and suitable for the user's preferences. Features such as up-to-date news and reviews of the tech products, which satisfies the user can buy the product or request a product demo. The user had a stress-free purchase, which breaks the normal human fatigue due to the infinite search for the product. It can generate revenues using the partnership with local sellers, purchase percentages, advertisements, subscriptions, etc...
Keywords. AI, Android TV, application, news and reviews, demo, human fatigue, subscriptions.

1. INTRODUCTION

The conceptual model is a Socio-Tech AI agent that can provide a hands-free shopping experience for tech products and allow users to explore up-to-date notifications on portals. It establishes an automated interaction between the consumer and the dealer in order to close the purchase at a reasonable price and in a convenient location [1]. It shows the current deals and product information updates available in the local market ventures that are appropriate for the user's tastes. If the user is satisfied, he or she can purchase the product or the model, can request a product demo [2]. The shopkeeper can either sell the product or arrange a timeframe for the user to try it out, according to the user's preference.

This proposed framework facilitates in the review of present market stock scenarios involving similar products. In addition to these insights, the framework can bring these things to the user's house for a hands-on feel [1]. As a result, the consumer endured a stress-free purchase, which reduces the time it takes for identical products from different place to arrive, breaking the normal mortal fatigue caused by an endless hunt for a product [3, 4]. This model includes noteworthy elements such as tech product improvements revealed by day-to-day gadget technology advancement. It gives notifications to the hands with the most recent tech launches and product news, as well as past year's tech news. Hence Partnerships with local sellers, purchase percentages, adverts, subscriptions, and other methods can all be used to create cash for a Socio-Tech AI agent [5].

User had a stress purchase, which they are in fatigue due to infinite search for the product and it also leads to time loss, energy loss, money loss. In e-commerce sites, they have the monopoly rule - which one specified product is sold by a specific merchant, results in loss to others, especially in local markets. Consumers can be easily made aware and avail of online deals, but in local shops, it is very difficult to identify them at the right time. In shops too, they don't have the higher budget for advertising, thus the lower budget product is not reachable for the purchase.

The existing system doesn't have the all features integrated as a single Android TV application as one solution. It has a separate specification for separate work like delivery, product recommendation, tech news, videos, demo system, behaviour pattern on customer purchase, etc...

2. SYSTEM MODEL

The proposed system provides the user a stress-free purchase reducing the normal human exhaustion due to infinite search for the product and also reducing the time of delivery of similar products from different states [2, 3]. It displays the current offers and updates on product information that is available in the local market ventures and is suitable for the user's preferences. It has up-to-date news and reviews of the tech products, which it satisfies, the user can buy the product or request a product demo [6].

2.1. The need for the system model

- The user had a stress-free purchase, which breaks the normal human fatigue due to the infinite search for the product;
- It can generate revenues using partnerships with local sellers, purchase percentage, advertisements, subscriptions, etc...;
- one of the main advantages of using the local market is the delivery will be done faster than expected;
- The sale of defective products will be reduced;
- The user purchase products news will be recommended for the user;
- The selection of product choices increases due to the recommendation system based on specifications and reviews;
- AI-based delivery and demo optimization system;
- Increase the local seller market as much as other state sellers.

$$A_0 = \frac{\mu_0 \omega I_0}{4\pi} = 10^{-7}\omega I_0$$

3. ARCHITECTURE

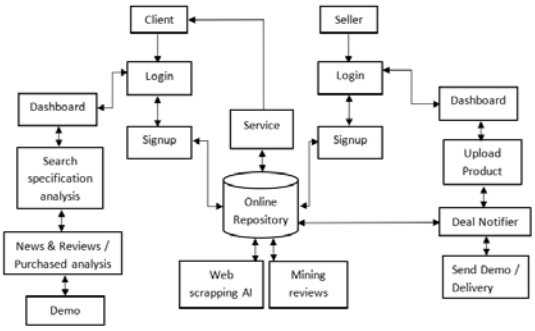


Figure 1. System model architecture for process flow

3.1. Methodology

Architecture Methodology will be used in making a project Android TV application that aims to develop great software that will be easy to maintain and repair as well as give additional code or reduce code. In the process of developing an AI-based e-commerce system-based Android TV platform, each layer in the architectural methodology will be implemented differently such as firebase database serves as a model, based on the Android TV platform will be the user interface view uses flutter, and other algorithms for the suggestion and nearby delivery (KNN Algorithm), deal notifier using chatbot and feedback check (KNN Algorithm) or review check (NLTK) for recommendation products by specs and reviews.

3.1.1. ClientSide

This is the user-side work plan. It contains the user login, user signup pages designed using flutter and user data are collected and retrieved using Firebase Database. After the login success, you can navigate to the Dashboard page which shows the deals of the product, product suggestions [5, 8] for the user using KNN and NLTK algorithm. The deal specification analysis is used to specify the deals of the product using KNN, SEO, and Text Processing using NLTK algorithms [10]. News and Reviews are pages that display reviews from our tech team and the latest trends on tech and other products.

3.1.2. Database

This Android TV application uses a firebase database. The database contains the product deals and product of the seller, seller details, and user details. It contains the product sales count. The data of the product from the seller can reflect the client's suggestion and product showing [5, 9]. It also collects the searched product details of the client and analysis them using a search engine optimization algorithm to give suggestions for the client using KNN, NLTK algorithm [4].

3.1.3. Seller Side

Seller side contains Seller login and Seller signup pages designed using flutter and user data are collected and retrieved using Firebase database. After the login success, you can navigate to the Dashboard page which shows upload the products and deals of the product the seller has. The data of the product and deals of the product are stored in the firebase database. The demo request from the client is shown to the seller as a notification and as well as on the dashboard page [7, 8]. The AI also request to send the suggested product as a demo [4]. This request will be approved by the seller.

3.2. Mining Review Algorithms

3.2.1. Beautiful Soup Algorithm

In Flutter the package used for the beautiful soup algorithm is called beautifulsoup: ^0.0.1. We collect all the links of apps and use these for feature extraction. The URLs are forwarded to a web scraping algorithm, which extracts data from the original file. Pass each link from the directory where we stored the crawled data. Get the features using a suitable library.

It parses through HTML to find information through tags and HTTP headers. After the reviews are gathered, we use natural language processing to classify reviews. we programmed the natural language processing to include positive and negative reviews that have a positive sentiment score. Then it passes through to the NLTK and KNN for recommendation system.

Syntax: s = Beautifulsoup (r. content, 'html5lib')

Parameters:s=soup

r. content: It is the raw content.

HTML. Parser: Specify the HTML parser we want to use.

3.2.2. NLTK

In Flutter the package used for the Text processing NLTK algorithm is called lemmatizer: ^1.0.0 and stemmer: ^2.2.0. NLTK is a powerful package that consists of the most algorithm that helps to analyze, pre-process, and understand the written text. It analyzes the beautiful soup scores and use it to process the reviews.

- The first step in text analytics is tokenization where the process of breaking down a text paragraph into smaller chunks.
- The lemmatizer package is used to reduce words to their base word, which is linguistically correct lemmas.
- It transforms root words with the use of vocabulary and morphological analysis.
- Stemmer works on a single word without knowledge of the context.

3.2.3. KNN Algorithm

In Flutter the package used for the KNN algorithm is called Flutter package: dart_ml: ^0.0.4. K-NN is a non-parametric approach for categorizing objects based on nearest training. It is a sort of lazy learning.

This main task for the K-nearest neighbours is to mining review from the given data set of review [5]. we can easily differentiate between fake and original reviews in the given data set [1]. It gives the recommendation to the users for products.

After training, the next step is to predict the output of the model on the testing dataset, and a confusion matrix is generated which classifies the review as positive or negative [1]. We are defining as Fake the set of reviews that are identify to be False (False Positive or False Negative) and defining as Real the set of reviews that are identify to be True (True positive and True Negative).

- True Positive: True Positive Reviews in test data correctly classified by the model as Positive (P).
- False Positive: False Positive Reviews in test data are incorrectly classified by the model as Positive (P).
- True Negative: Real Negative Reviews in the testing data correctly classified by the model as negative (N).
- False Negative: Fake Negative Reviews in the testing data incorrectly classified by the model as negative (N).

Table1. The matrix of confusion

	True		False	
True	(TN)True Reviews	Negative	(FP)False Reviews	Positive
False	(FN)False Reviews	Negative	(TP)True Reviews	Positive

Fake Positive Review Rate $= \frac{FP}{FP+TN}$ (a)

Fake Negative Review Rate $= \frac{FN}{TP+FN}$ (b)

Real Positive Review Rate $= \frac{TP}{TP+FN}$ (c)

Real Negative Reviews Rate $= \frac{TN}{TN+FP}$ (d)

Accuracy $= \frac{TP+TN}{TP+TN+FN+FP}$ (e)

Precision $= \frac{TP}{TP+FP}$ (f)

For this algorithm different Performance evaluation andconfusion matrix.

Here the performance and confusion matrix evaluation are based on the best price fit finding using the KNN algorithm. In this algorithm, we consider comparing four different shops offering different prices and offers which need to find the best price fit for the client. The KNN algorithm analyses the four prices and offers to evaluate which shop produces the high accuracy for the best price fit. The Android TV application provides the best price fit for the client using the KNN algorithm. The performance evaluation produces the 4 different confusion matrixes also. The final best accuracy is referred to the client for the best price fit. The four different shops are considered Madras Mobiles, IFlyies Shopy, HiT Mobiles, and Indigo Mobiles.

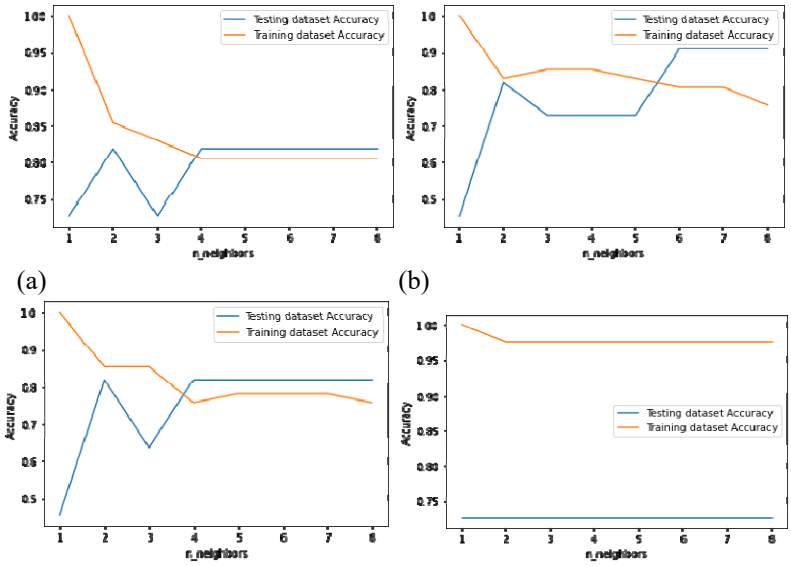
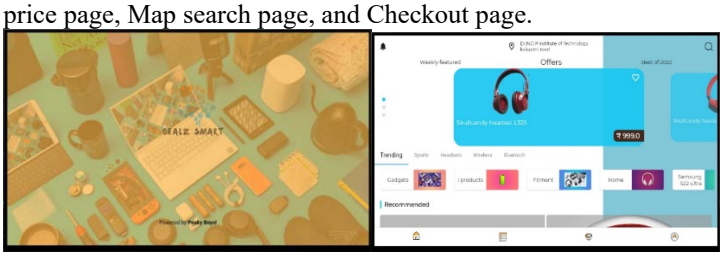


Figure 2. KNN testing &training dataset accuracy: (a) Madras Mobiles, (b) IFlyies Shopy, (c) HiT Mobiles, (d) Indigo Mobiles.

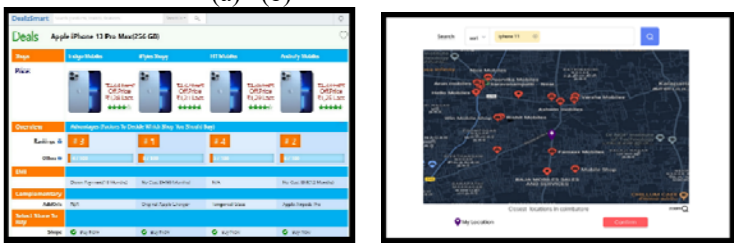
Figure 3. Best price fit comparison among four sellers

4. RESULT

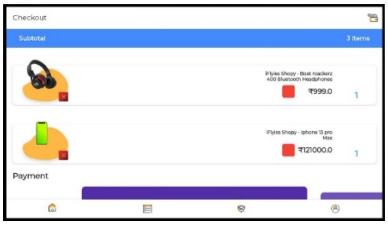
The real-world family shopping experience for larger screen applications like Android TV brings a different experience using this application. Hereby attached are the sample screenshots of the application which are the Splash screen, home screen, best price page, Map search page, and Checkout page.



(a) (b)



(c) (d)



(e)

Figure 4. Screenshots of result: (a) Splash screen page, (b) Home screen page, (c) Best price page, (d) Map search page, (e) Checkout page

5. CONCLUSION

Therefore, in the real-world scenario, such as local vendors and local clients can directly benefit from using the Android TV application. The rich and relevant user interface for both Android TV and iOS platforms enables a family-friendly shopping purchasing system. a user interfaces display and a web service which will be the controller to make sure for fast and efficient maintenance of the Android TV application.

6. FUTURE SCOPE

In future work, implementation of Augmented Reality to experience the products virtually on live and gesture control for shopping & navigate through the app. It enhances the user experience.

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NOVEL FCMA METHOD FOR INRUSH CURRENT MITIGATION

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ABSTRACT:

The idea of the project is to overcome the inrush current problemwe face in the transformer, we have come up with thesolutionto replace the resistor in the transformer with reactor. The reactor or choke is an inductor it is utilized to obstruct the low recurrence of A.C in an electrical circuit. Usually in every transformer they use resistor to control the inrush current generated. Butitdoesn't have much efficiency, so we still have inrush current voltage drop problem everywhere. Now by replacing the resistors with a reactor, the efficiency of blocking the inrush current or starting current increased. So the efficiency of thetransformeralsoincreased.

KEYWORDS: Transformer-Inrush current-Voltage drop-Efficiency.

1. INTRODUCTION

The project is used in transformer to reduce the inrush current attained in it. The reactor is an inductor. It is used to block thelow level frequencies of the alternating current. This helps us to increase the life span of the transformer. By using this we canreduce the voltage drop produce across the transformer. It is a new improvised system. Reduction of inrush current in Transformer is a project to enhance the performance of Transformer. The heat dissipated in the transformer while this process wi**l** alsoless compared to the existing one.

2. EXSISTING SYSTEM

In transmission of power supply the transformer plays a major role in our daily life. The existing transformeraregoodintransmission of the power. In the existing systemthe inrush current reduced by the resistors but the resistors might not be efficient allthetime. As a result of this high 3 voltage drop occurs which directly affects the transformer and its respective loads.

3. PROPOSED SYSTEM

In existing systemwhen the power fromthe source while entering through the transformer inrush current will be attained. This inrush current can be minimized by using the resistor. By using this resistor inrush current can be reduced minimally.This leadsto the heat dissipation will be in larger amount. The efficiency and the life span of the transformer also will be reduced. In proposed systemwhen the power fromthe source before directly entering into the transformer it goes into the control contactorandpo wer contactor. The timer or relay are connected with contactors. This will work normally close and normally open vice versa within given sort of time. Fromthe control contactor the current goes into the FCMA (FluxCompensated Magnetic Amplifier) as itis an inductive load it blocks the inrush current fromthe source. After few seconds of time will the help of the timer powercontactorgets energized and then the control contactor will be de-energized. So now the current flows travel through the power contactortothe transformer then to the load.

4. CONTROL CIRCUITRY BLOCK DIAGRAM

MAIN BLOCK DIAGRAM

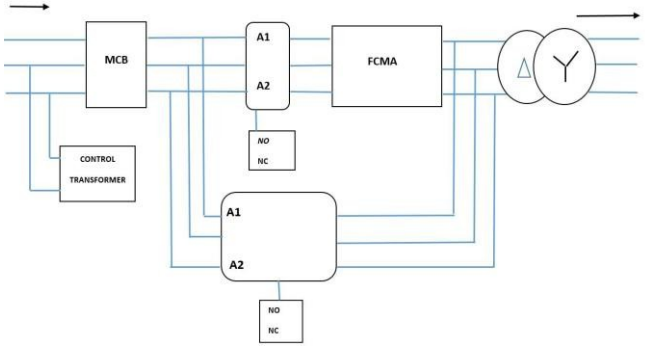

Fig.1

The above block diagramexplains the overall working of the propose system. Where the control andpowercontactors areconnected to the timer or relay switches. The input fromthe source is connected to MCB and its output to the contactors.Thecontrolcontactor to FCMA Reactor to the transformer. The power contactors input from MCB and its output to the transformer. Fromtransformerto the respective load.

OPERATION

The operation of this project begin by turning the power source ON. Once after the MCB turned ON, the MCB allows thepowerto travel to the control contactors since its timer is normally closed. The power fromthe control contactorgoes intothereactor(FCMA-FluxCompensated Magnetic Amplifier). After few seconds before de-energizing the control contactor the power contactorwi**l** be energized as its timer will be normally close. Then the control contactor will be de-energized. So that the power will be travelled through the power contactor to the transformer and its respective loads.

CONTACTOR

In this project we are two types of contactors. They are control contactor and power contactor. It is a lever which is controlled electrically for toggling the electric circuit. The contactor is operated using a power source. We have used 22- Amps control contactor and 65-Amps power contactor. It is used to allow the flow of current to the reactor.

Fig 2. Power contactor

Fig 3. Control contactor

TIMER RELAY

A Timer Relay is a control circuit that combines an electromechanical output relay and a timer. The contacts will open and close before and after a time interval that you choose. Time Relay are started or set off by one of the two techniques. Whenan incoming voltage supply is connected, the device will either start or prepare to start when a trigger sign is registered. Applyingatriggersign is utilized to start the unit after the information voltage has been applied.

Fig.4 TIMER RELAY

Timer Relays separate the first circuit and second circuit when one involves in contact with source. The Timer Relay key hastwo operations common, open and close:
Common=It is the moving piece of the key
OPEN = This key and common is come in contact when transfer loop is open or ON
CLOSE =This key and common is come in contact when the transfer loop is CLOSE.

TRANSFORMER

For this project any kind of transformer was suitable, so we use 60kVA Isolation Transformer in this project. An isolation transformer is a transformer used to transfer electrical power from an AC mains to certain devices or instrumentswhilealsoisolating the powered equipment fromthe mains, usually for safety reasons. Isolation transformers give galvanic separation;noconductive way is available among source and burden. This detachment or isolation transformer is utilized to secure against electric stun,to stifle electrical commotion in touchy gadgets, or to move power between two circuits which should not beassociated.Atransformer sold for disengagement is frequently worked with unique protection among essential and optional, and isdeterminedtowithstanda high voltage between windings. Isolation transformers cutoff the transmission of the Direct Current componentinsignals fromone circuit to the other, but allow AC components in signals to pass. Transformers that have a ratio of 1:1 between the primary and secondary windings are often used to protect secondary circuits and individuals fromelectricalshocks betweenenergizedconductors and earth ground. Reasonably planned Isolation transformers block obstruction brought about by ground loops. Detachment transformers or Isolation transformers with electrostatic s afeguards are utilized for power supplies for delicate gearlikePCs,clinical gadgets, or research facility instruments.

Fig.5 60 kVA ISOLATION TRANSFORMER

REACTOR

A Reactor is also known as choke. It is used an inductive load. Flux Compensated Magnetic Amplifier is a type of modulated inductive impedance. If the FCMA connected to the transformer, it reduces the inrush current to a low value.
The voltage drop will occur after the occurrence of inrush current in the transformer. The FCMA is always linear in unsaturated zone. Thus the sinusoidal values such as inrush current and voltage are without harmonics. So that theseelements canbeneglected when we consider about the harmonics effect. The motor torque and load torque is used to adjust the minimumvalue of inrush current value.

Features of FCMA Reactor:

1. Suitable for extreme weather conditions- EPOXY caste unit.
2. No electronic component.
3. Staring a Transformer with the limited kVA.
4. No external or internal cooling system required.
5. Harmonic free.
6. Less maintenance.
7. Run indoor and outdoor models in line or in phase model is available.

Fig.6 FCMA REACTOR

ADVANTAGES

1. It reduces the voltage drop produced.
2. Heat produced is comparatively less.
3. Life span of the core and coil be increased.
4. Inrush current can be blocked comparatively.

DISADVANTAGES

1. It produces heat during the process.
2. Building cost is comparatively high.

4. RESULT

As we compared to the existing systemour proposed idea will give increased life span to the transformers. The efficiency of the transformer can be increased upto 20% more than the existing type method. So that only this method willgivethebetterperformance and the larger life span to the transformers using this type of reduction method.

5. CONCLUSION

As we all know that transformer plays a vital role to the commercial and day to day life. By our method we can able assure yo u to protect the transformer and its respective loads for the various productive future. This more efficient way for minimization ofthe inrush current by comparing to the existing system.

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A Hybrid Image Encryption Using Digital Image Fusion With Standard Encryption

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Abstract-Rows-columns diffusion, the 3Dscale-invariantmodularchaoticmap, and Hilldiffusion are the three key phases in this study. Using rows-columns diffusion and Hill diffusion, pixels are substituted and the plain image's adjacency pixels are combined. 3Dscale-invariantchaoticmaps are used to overmute picture pixels without restricting the image size. When at least two rounds of significant stages are repeated, the suggested encryption system approaches. It's also particularly sensitive to little differences in the plainimage and the secretkey. As a consequence, selected/known plaintextassaults are successfully thwarted. Experiments have shown that the suggested approach works..

IndexTerms–*Chaotic map, hill diffusion,encryption.*

I.INTRODUCTION

Advances in information technology (IT), especially in communication and social networks, have made it feasible to offer digital multimedia material to a huge number of individuals in the online world. However, a rising variety of digital materials, such as image, video, and audio processing environments, as well as Internet access through personal computers, are now accessible globally. Smartphones have established a perfect way for distributing and sharing multimedia material that is overly overwhelming. The most important. For this, the present task is to safeguard intellectualpropertysecurityriskstomultimediacontentontheinternet. As a result, security is becoming more important in today's public Internet gateway of information.

Information and multimedia security is the activity of preventing unauthorised access, use, disclosure, interruption, alteration, inspection, recording, or destruction of information[4].

The three most critical aspects of information security are confidentiality, integrity, and availability. To accomplish these aims, security mechanisms like as encryption, authentication, and authorisation, to mention a few, are utilised. Symmetric publickey (asymmetric) cryptography and shared key cryptography are the two most common forms of encryption methods. In the case of data or information, symmetric or sharedkeyencryption techniques are reliably utilised. In most cases, publickeyencryption is used to offer security. Integrity, non-repudiation, and authenticity services employing digital signatures Multimodaldata confidentiality, including picturesecrecykeyencryption approaches, are used due of the speed of cryptography.

II. RELATEDWORK

One of the key concerns of users is the security and safety of data and multimedia, such as photographs, throughout processing, storage, and transmission. Digitalimagecryptographyis one of the most well-known strategies for maintaining image secrecy and integrity across an unsecured public channel like the internet [16]. Due to the vulnerability of public Internet routes to assaults, effective cryptography methods are required for safe data and multimedia transfer[13]. From the perspective of an image cryptanalyst, ProfessorChengqingLiandetal. examined papers and research on picture encryption techniques and algorithms offered in 2018. Various digital picture encryptions that have been suggested in the literature will be evaluated in this section.

2.1.Standardcryptography

Strictly speaking, there are three types of encryption methods: symmetricblockcipher, symmetricstreamcipher, and asymmetric cypher.

DES and AES are the most widely used symmetric block cyphers for encrypting data and pictures.

An image encryption software based on AES in cypher block chaining (CBC) mode was built using Clanguage by YongZhang inref[5].

V.M.Silva-Garca et al.expand the block cypher tripleDES(3DES) to a 96-bit encryption dubbed Triple-DES-96, which is used to encrypt colour images.

ManjuKumarietal has examined and developed the majority of encryption techniques and algorithms based on symmetric block cypher (DES, AES, 3DES) and symmetric stream cypher (RC4,RC6). [9]. Because asymmetric encryption techniques like RSA and ECC are slow, picture encryption is employed seldom. Theintegrityandauthenticationwiththehelpofwatermarkingandsteganographytechniquesandsoonarethemostcommonusesofthis typeofencryption.

2.2.Non-standardcryptography

According to the comments made in the introduction section, nonstandard picture encryption algorithms are extensively used nowadays, and a lot of research is being done in this field. ProfessorChengqingLietal.divide Chaosbased, DNAencoding, transformationdomain, signal processingin the encryption domain, and Generatingcipher-imagesin other application scenarios are the five core types of non-standard methods. Themostimportantofthesearesfollows: GeJiao and colleagues suggested a technique for picture encryption based on the

crossdiffusion of two chaotic maps. The keygeneration, which has a bigger security key space than a single one, uses two chaotic sequences, notably the Logistic map and the Chebyshev map.
Furthermore, thesetwosequencesareusedforfurtherimageencryptiondiffusion, which greatly reduces the correlation of nearby pixels [12].
RasulEnayatifarandet al. have developed a fast and secure multiple-image encryption (MIE) technique based on DNA sequences and image matrix indexes. Because theMIEalgorithm considers several pictures, one major worry is the algorithm's speed. Multiple plain-images are joined together to generate a single picture in the first step of this procedure. This picture is then transformed to a one-dimensional array. To permute all of the pixels' positions, half of the array indexes are employed. The sameindexesareassociatedwithDNAsequencetodiffusethe pixelsgreylevelduringthepermutation[11].

III.PROPOSEDSYSTEM
Theencryptionalgorithm includesthreemajorsteps.The firststepisusedtogeneratethechaoticsequences.Second stepconfused thepixelvalues andthirdstepshuffledthepixel position toproducetherequiredencryptedimage.Letfbean imageofsizeM$\times N$.Thepixeloffisdenotedbyf(i,j),whereiandjisintherangeof1≤i≤Mand1≤j≤N.Now,f(i,j) denotes thegrayvalueatthe pixelposition(i,j) oftheimage f. Theinitialcondition forthelogisticmapisextractedfromthe secretkeyof256bits(32characters) taken inASCIIform denotedas$k = k_1 k_2 k_3 \cdots k_{32}$ (Ki denotesthe8-bitkeycharacterinthei-thkey position).Thevalueoftheinitialconditionforthelogistic mapisgivenby,

3.1 Digital Image Fusion
The stepby step procedure of the algorithm is discussed below.

Step1:Transformtheimageofsize M×Npixelsintoanarray of $P_i = \{P_1, P_2, P_3 \ldots P_n\}$, wherei=1,2,3…n, andn=M×N.Nextconvertthepixelvaluestounsignedintegerintherangeof0 to255usingmodoperation.

Step 2:Generate n numberof chaoticsequence$x_i = \{x_1, x_2, x_3 \ldots x_n\}$in the range 0 to 1 using the logistic map mention in Eq. (1) with initialcondition$x_0$andtakingtheparameterr=3.999.Nextconvert$x_i$intounsignedintegerintherangeof0to255usingmodoperation.

Step3:Generatethesequence$C_i = P_i \oplus x_i$ forconfusingthe pixel value. The sign ⊕ indicates bitwise XOR operation.

Step4:Transformthe $C_i = \{C_1, C_2, C_3 \ldots C_n\}$toanarray ofsizeM×Ntogettheimagef'.Nextaddonetothe unsigned integersequence$x_i = \{x_1, x_2, x_3 \ldots x_n\}$andtransformitintoanarrayof sizeM×Nto getX.
Step5:Finallyexecutethefollowing twostepsforpixel shufflingtogetherequiredencryptedimagef.Herejandk varies from 1 to 255. Thesymbol⇔indicatestheinterchange the values between two pixel positions of f ′.

3.2Standard Encryption
In our system we used Hill cipher as a standard encryption scheme which encrypts the digital fused image to encrypt efficiently.Hill cipher was developed by the mathematician Lester Hill. The core of Hill cipher is matrix manipulations. For encryption, algorithm takesm consecutive plaintext letters and rather of that backups m cipher letters. In Hill cipher, each character is assigned a numerical value. The system can bedescribed as follows

$$C_1 = (K_{11}P_1 + K_{12}P_2 + K_{13}P_3) \bmod 26$$
$$C_2 = (K_{21}P_1 + K_{22}P_2 + K_{23}P_3) \bmod 26 \quad \ldots (1)$$
$$C_1 = (K_{31}P_1 + K_{32}P_2 + K_{33}P_3) \bmod 26$$

This case can be expressed in terms of column vectors and matrices or simply we can write as

$$\begin{pmatrix} C_1 \\ C_2 \\ C_3 \end{pmatrix} = \begin{bmatrix} K_{11} & K_{12} & K_{13} \\ K_{21} & K_{22} & K_{23} \\ K_{31} & K_{32} & K_{33} \end{bmatrix} \begin{pmatrix} P_1 \\ P_2 \\ P_3 \end{pmatrix} \quad \ldots (2)$$

C=KP,where C and Pare column vectors of length 3, representing the plaintext andciphertextindependently, and K is a33 × matrix, which is the encryption key. All operations are performed 26mod then. Decryption requires using the antipode of matrix K. The inverse matrix K-1 of a matrix is defined by the equationthen I is e Identity matrix. But the antipode of the matrix doesn't always live, and when it does, it satisfies the equation. K-1 is applied to the ciphertext, and also the plaintext is recovered.
For encryption,

$$C = E_k(P) = K_p \quad \ldots (3)$$

For decryption
Still, there are m 26 different m letters blocks possible, each of them can regarded as a letter in a

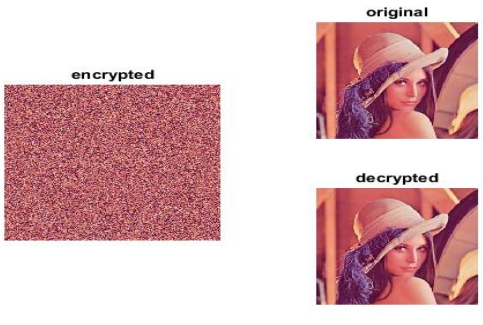
$$P = D_k(C) = K^{-1}C = K^{-1}K_p = P \quad \ldots (4)$$

IV.RESULTS AND ANALYSIS

In MATLAB 2015 a, our approach was simulated, and different parameters were analysed and compared to current algorithms. The analysis' findings are detailed here. Our approach was used to encrypt and decode a variety of photos, which are seen below.

Table 4.1Performance analysis of existing system-digital imagefusion

IMAGE	LENA	JELLY BEANS	HOUSE
ENTROPY	7.7599	6.5835	7.0686



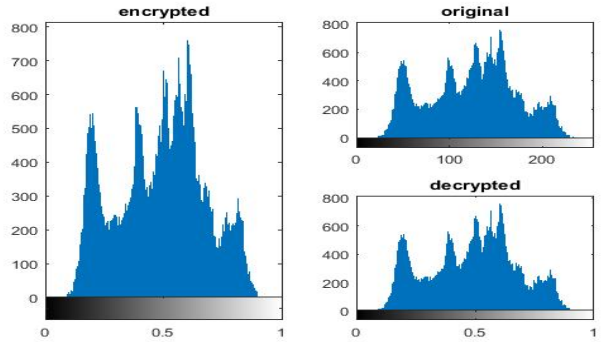
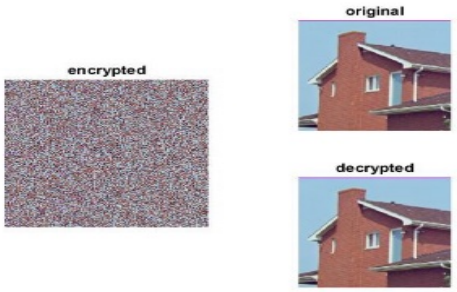


Fig:4.1(a) Encrypted, original and decrypted images of LensFig: 4.1(b)Encrypted, original and decrypted histogram imagesofLena



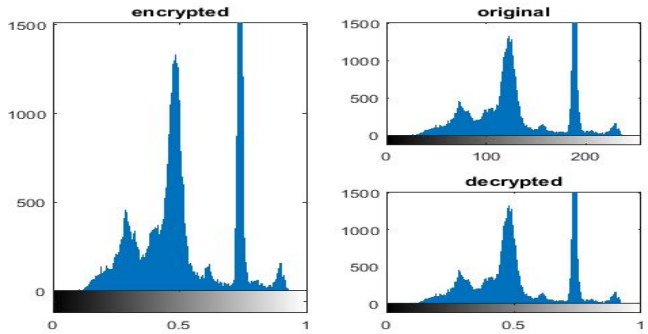


Fig: 4.2(a)Encrypted, original and decryptedimagesofhouse

Fig: 4.2(b)Encrypted, original and decrypted histogram imagesofhouse

Table 4.2Performanceanalysisofproposedsystem–Hybridimage encryption with digital image fusion with hill cipher

IMAGE	LENA	HOUSE
ENTROPY	7.9899	**7.9868**
MSE	17522	**210312**
PSNR	5.6949	**4.9022**
UACI	**48.455**	**53.9360**

IV.CONCLUSION

Digital picture security has become more critical for communication across open networks including the internet. The current chaos-based picture encryption techniques have been described and studied in this survey study to confirm their efficacy against various sorts of assaults. To summarise, all of the encryption techniques are beneficial for real-time picture encryption, and each scheme is distinctive in its own manner, making it suitable for various applications. Having numerous chaoticmaps for image encryption may improve security. As a result, encryption, which can be described as a scientific art that is always developing and rapidly expanding, must always demonstrate a high level of security.

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Design and Analysis of S Parameters for Tri-Band Band Pass Filter

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Abstract - In this study, a tri-band band pass filter was built using a multi-mode stub loaded resonator. The pass band has three frequencies: 0.92, 2.08, and 3.59 GHz. Open stubs were coupled together to provide a triple pass band pass filter while also condensing the circuit footprint. A pass band has been constructed with insertion losses of 0.41, 1.39, and 1.97 db and return losses of over 27.7, 12.3, and 16.2 db, respectively.

Keywords –tri-bandfilter,insertionloss,returnloss.

I.INTRODUCTION

The Tri-bandbandpassfilter BPF is one of the key frontend elements of multiband wireless communication systems. In order to meet the need, further studies on dualortri-bandbandpassfilters[1–9] have been published. [1.] describes dual-band bandpass filters using stub-loaded resonators. A Tri-band response may be produced by combining openstubs with DGSin[2]. Three pairs of degradation modes are used to characterise a tri-band response from a single ring resonator in [3]. On the other side, the passband locations are not reachable in this way. The employment of several resonators in these topologies leads to larger circuit sizes, despite the fact that passband frequencies may be individually modified using SLRs in[4-6]. The additional loaded stubs are provided with simple controllability of each passband in order to create the tri-band filter[7]. Unique resonators were employed to create tri-band feedbacks in [8],[9]. Many intriguing methods for creating balanced multi-band filters have been developed, including the stepped-impedance resonator (SIR) [10], stubloaded resonator [11], coupled-step-impedance resonator [12], and asymmetrical coupled lines [13]. This is because balanced filters can offer greater immunity in noisy environments. Even so, it's possible that the common-mode suppression of these balanced filters is inadequate, necessitating the addition of a lumpedelement to increase common-mode suppression between resonators. On the basis of earlier works[1],[11], a tub-loaded resonator with multiple mode characteristics to achieve triple-band BPFi is described here. The even-odd-mode technique is employed to investigate its resonance properties. With the use of even-odd-mode analysis and EM full-wave simulations, the attitude of the whole passband may be seen. Theresonatoraswellastheloadedstubsarebenttogeneratetransmissionzerotoacquirepeakskirtselectively. Tri-band BPField technology was created and is currently in use. Sustained results show higher confirmation when compared to simulated findings..

II. RESONATORANALYSIS

Figure 1 depicts the real SLR, which has four open stubs and a stub that has been sorted (a). Use the even- and odd-modes to determine if any symmetrical instructures exist..

$Y_{in,\ odd1} =$ (1)

$f_{odd1}=$ (2)

$Y_{in,even1=-jY1}$ (3)

$f_{even1}=$ (4)

$Y_{in,odd2}=jY_2$ (5)

$f_{odd2}=$ (6)

$Y_{in,even2}=-jY2$ (7)

$f_{even2} =$ (8)

$Y_{in,odd3}=-jY_4$ (9)

$f_{odd}=$ (10)

$Y_{in,even3}$=-jY4$\frac{Y1-Y4\tan\theta4\tan(\theta2+\theta3)}{Y4\tan(\theta2+\theta3)+Y1\tan\theta4}$(11)

and

f_{even}=$\frac{(2n-1)\pi}{4(L4+L2+Ls)\sqrt{\varepsilon_{eff}}}$ (12)

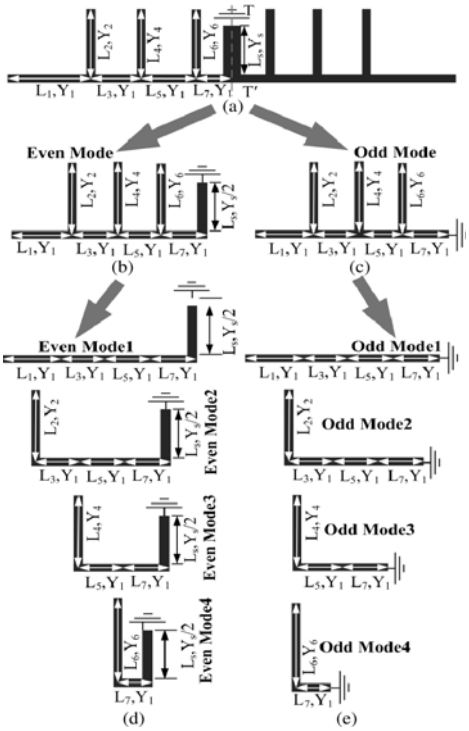

Figure 2.1 Equivalent Circuit

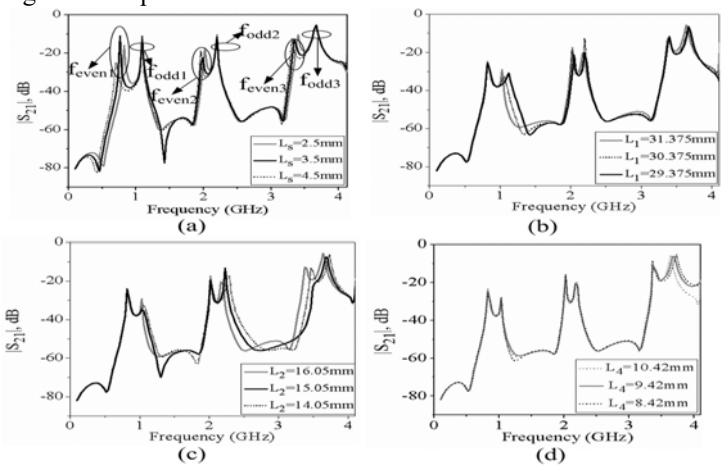

Figure 2.2 Return Loss of SLR

It has been shown that the equation (1) - (12) is only correct when there is no connection or a weak coupling. As a result, the equations are not strictly lasted, and precise parameter adjustments are needed when high coupling is encountered. Figure 2 displays the impact of various factors on the even/odd-mode resonance frequencies. The graphic demonstrates that Ls has no effect on odd-mode resonance frequencies. The first two even-mode resonance frequencies are unaffected by L1, the first two even-mode resonance frequencies are unaffected by L2, and the first two odd-mode resonance frequencies are unaffected by L4.

III. FILTER DESIGN

Based on the assessment indicated above, a tri-band BPF is created by tapping a stub-loaded resonator (SLR) with five microstrip transmission lines into a common through hole, as illustrated in Figure 3. On the other hand, the pass bands were located by varying the lengths and widths of each individual stub. The open stubs are independently linked to achieve the smallest circuit size and transmit zeros in the stop band. The filter was created using a Rogers RO4350 substrate with a width of 0.762 mm, a relative dielectric constant of 3.66, and a loss tangent of 0.004. The tri-band filter response is optimised through simulations using the 3D full-wave programme ANSYS HFSS v14.

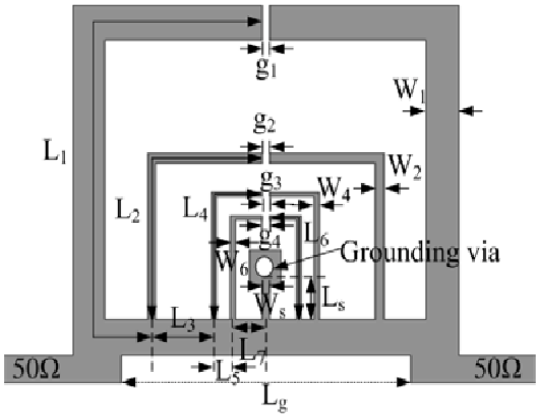

Figure3. Triband BPF.

IV.RESULT AND DISCUSSION

The BPF of this proposed tri-band is examined using a Key sight PNA N5221A network analyzer. A picture of the built-in filter may be seen in Figure 4. The proposed tri-band BPF has a total area of 30 mm2 and a weight of 0.14 g or 0.17 g, where g is the guided wavelength at the centre frequency of the lowest pass band..

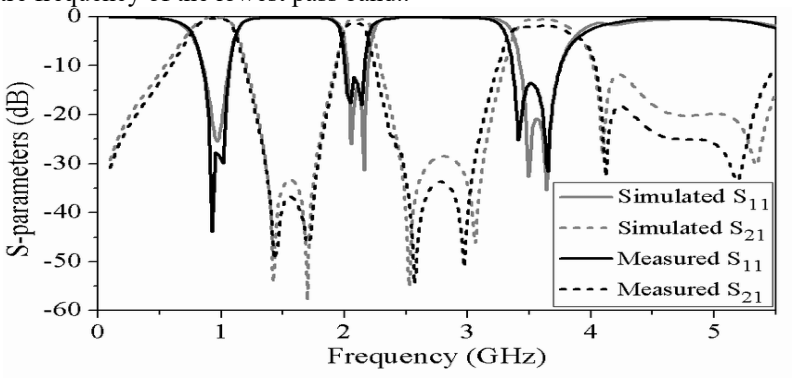

Figure.4. Proposed tri-band BPF.

Above the useful frequency range, the measured outputs logically concur with the predicted output, as seen in Figure 5. The three pass bands have 3dB split bandwidths of 40.21 percent, 10.1 percent, and 16.15 percent, respectively, and are oriented at frequencies of 0.92, 2.08, and 3.59 GHz. In the three pass band of the tri-band BPF, the estimated insertion losses (IL) and losses from two SMA connections are 0.41, 1.39, and 1.97 dB, respectively. The corresponding individual return losses exceed 27.7, 12.3, and 16.2 dB. In order to improve acute band-to-band rejection, six transmission zeros with attenuations of more than 30 dB have been found at 1.43, 1.69, 2.57, 2.97, 4.12, and 5.19 GHz. TABLE I contrasts the proposed tri-band BPF presentation with a few tri-band BPF presentations that have been published earlier and recently..

Table 4.1.Comparison of the Proposed Filter

Ref.	Frequency (GHz)	Circuit Size	TZs	3dB FBW (%)	IL (dB)
2	2.45/3.5/ 5.25	0.39×0.47	0	12.3/6.2/3.3	0.9/1.7/2.1
5	1.37/2.43/ 3.53	0.26×0.13	4	4.4/5.9/2.7	1.7/1.8/ 2.5
6	1.59/3.12/ 4.02	0.28×0.12	5	15.7/12.7/ 5.71	1.08/1.43/ 1.83
8	3.48/4.18/ 5.52	0.21×0.11	5	7/5/6	1.53/2.11/ 2.65
9	2.4/3.5/5.2	0.14×0.17	6	4.2/2.9/4.5	1.5/2.54/ 1. 16
This work	0.92/2.08/ 3.59	0.14×0.17	6	40.21/10.1/ 16.15	0.41/1.39/ 1.97

V. CONCLUSION

A small SLR-based triple-band band pass filter is required for this purpose. To create the extra pass band, four loaded open stubs were connected together. Small, the fake filter has dimensions of 30 x 37 mm2. The results of the simulation and computation are quite similar. According to its frequency response, the recommended filter has low insertion loss, high return loss, and a sharp skirt, making it perfect for 0.9 GHz GSM900, 2.1 GHz 3G, and 3.5 GHz WiMAX3.5 applications.

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FIR FILTER DESIGN BASED ON MCMA MODULE

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Abstract
In many digital signal processing and communication systems, the FIR filter is a critical component. This paper depicts the construction of digital FIR filters utilizes better version of truncated multiplier which needs lower number of multipliers and adders. Here the improvement of bit width is attained without losing frequency response and last signal accuracy. To decrease the overall space the non uniform quantization with an appropriate filter is recommended. Furthermore, the recommended digital filter is efficient with respect to space and capacity when related with present FIR filter structure

Keywords:DSP, FIR Filters, Truncated multipliers, Very Large Scale Integrated structure

1. INTRODUCTION
For screening a binary signal FIR filter circuit is used and gives an result that is one more digital signal with properties that are decided by the output of the filter. It's also used in wide range of compact applications that demand little area and energy. The following is a representation of a basic Finite Impulse Response filter of order M ,

$Y(n)=\sum_{i=0}^{M-1} a_i x(n-i)$.

With this equation ai = aM−i or ai = −aM−I the factors symmetric nature is determined which is in linear phase. The 2 standard Finite Impulse Response direct method and transposed method structures depicts Finite Impulse Response filter having a phase which is linear and uniform arrangement. The direct structure depicts simultaneous product of all postponed signals, related filter factors are executed with MCMA module.

So,values of the multiplier in Multiple Constant Multipliers/Accumulators gets postponed incoming signals x(n-i) and factors . The transposed structure depicts present input signal x(n) and factors are the values in multipliers in the MCM module. Individual constant multiplication outputs are transferred by structural adders (SAs) and delay elements.

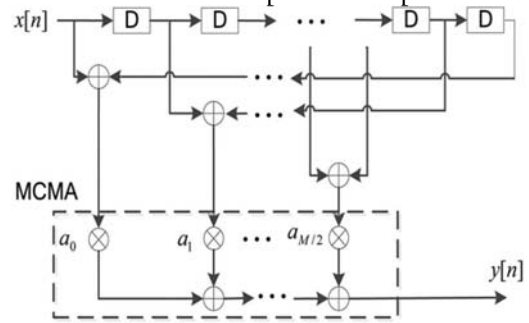

Fig 1: Finite Impulse Response filter having a phase which is linear and uniform arrangement :Direct method

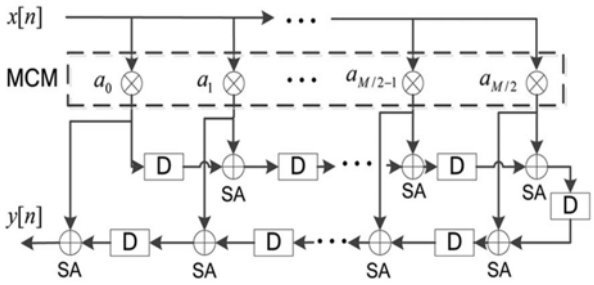

Fig 2: Finite Impulse Response filter having a phase which is linear and uniform arrangement:Transposed Method

Design of Finite Impulse Response filter has the adjustments in bit thickness of filter factors are critical,that includes serious influence in the space price of arithmetic units and registers. It is applicable to provide accurately rounding resulted in which the all faults generated by quantization and rounding has no upwards for 1 unit of final position that is the graded for LSB results. This paper offers small-range Finite Impulse Response filter designs found in direct construction as Figure.1 with accurately rounded shortened multiplier. . In that Multiple Constant Multipliers Accumulators block was designed with gathering every PP in which unwanted Partial Products bits have been deleted excluding disturbing last result accuracy.

2. LITERATURE REVIEW

[1] C. Pan, Z. Wang, and C. Sechen, "High speed and power efficient compression of partial products and vectors,".A high speed and power efficient compression algorithm for an arbitrarily shaped array of partial products and vectors is presented. A minimum hard-ware usage algorithm for an arbitrarily shaped array of vectors was developed. Finally, a new delay-based adder-type selection and CSA-tree wiring algorithm is proposed. This new compression network synthesis (CNS) algorithm was tested on several industrial DSP blocks for a variety of process technologies. [2] Mohanty, B. K., &Meher, P. K. (2013). A high-performance-energy-efficient architecture for FIR adaptive filter based on new distributed arithmetic formulation of block LMS algorithm.Itpresent an efficient distributed-arithmetic (DA) formulation for the implementation of block least mean square (BLMS) algorithm. The proposed DA-based design uses a novel look-up table (LUT)-sharing technique for the computation of filter outputs and weight-increment terms of BLMS algorithm. Besides, it offers significant saving of adders which constitute a major component of DA-based structures

3. PROPOSED WORK

This paper depicts the construction of digital FIR filters utilizes better version of truncated multiplier which needs lower number of multipliers and adders.

3.1 PROPOSED ARCHITECTURE:

Fig 3 depicts the structure for Multiple Constant Multiplier/accumulators including the shortening which deletes the irrelevent partial product bits. Indelible PPBs are indicated in the L-shape block with white circles . Gray circles represents cancellation for Partial Product bits.The crossed circles indicates, the rounding of the resultant bits after PP compression. The offset, bias constants and sign bit adjustments all are indicated in the final row of the PPB matrix.

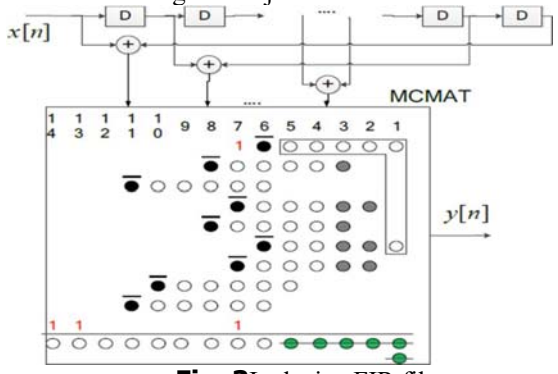

Fig. 3 Inclusive FIR filter stucture with MCMA usingproperly round off shortening

Low-price FIR filter solutions constructed with direct model are presented, having properly round off shortened multipliers. Multiple Constant Multiplier/accumulators block was created with aggregating every PP and deleting any extraneous partial product bits beyond disturbing output last accuracy. To lower hardware price while still meeting the frequency response criterion, bit thickness for every filter variables was decreased via shortened which is not uniform having different periods of word. Since space price for delay elements in flip flop was lower than transcribed version , the basic FIR structure with MCMA is used

3.4 PERFORMANCE EVALUATION

Power and area performace evaluation has depicted in the following figures

```
  Total Number Slice Registers:     363 out of 13,824    2%
    Number used as Flip Flops:                   22
    Number used as Latches:                     341
  Number of 4 input LUTs:           320 out of 13,824    2%
Logic Distribution:
    Number of occupied Slices:                       207 out of  6,912    2%
    Number of Slices containing only related logic:  207 out of    207  100%
    Number of Slices containing unrelated logic:       0 out of    207    0%
        *See NOTES below for an explanation of the effects of unrelated logic
Total Number of 4 input LUTs:       320 out of 13,824    2%
   Number of bonded IOBs:            16 out of    325    4%
      IOB Flip Flops:                               8
      IOB Latches:                                  8
   Number of GCLKs:                  1 out of      4   25%
   Number of GCLKIOBs:               1 out of      4   25%

Total equivalent gate count for design:  3,905
Additional JTAG gate count for IOBs:  816
Peak Memory Usage:  141 MB
```

Fig 4 Area of proposed work

Power summary:	I(mA)	P(mW)
Total estimated power consumption:		54
Vccint 1.80V:	26	48
Vcco33 3.30V:	2	7
Clocks:	11	20
Inputs:	0	1
Logic:	0	0
Outputs:		
Vcco33	0	0
Signals:	0	0
Quiescent Vccint 1.80V:	15	27
Quiescent Vcco33 3.30V:	2	7

Fig 5 Power of proposed work

4. RESULTS

As a result, a FIR filter is developed using a faithfully rounded truncated multiplier to save power and space in the multiplier and adder.

Table.1. Performance Parameter Results

PARAMETERS	EXISTING SYSTEM (Constant correction truncation)	PROPOSED SYSTEM (Improved version of truncation)
Gate counts	4304	3905
Area	328	320
Power	59mw	54mw

5. CONCLUSION

The improvement in coefficient bit width in finite impulse response filter has been studied in this paper.Direct FIR architectures with accurately rounded MCMAT result in a smaller area and lower power consumption. The total number of similar gate counts and power in the present truncation system are 4304 and 59mW, respectively. In comparison to the existing method, the proposed truncation system produces better results.

6. FUTURE SCOPE

In the future, the truncated multiplier will be utilised in conjunction with a 5:2 compressor to decrease the count of half adders to achieve an area reduction.

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Dynamic Performance Improvement of AFZ Converter with Improved Voltage Stability

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Abstract
The work is used to model and simulate a photovoltaic (PV)-based DC-DC Module Integrated Converter (MIC). It is proposed to use an autotransformer with type-Zeta resonant reset as a cascaded MIC. Due to its voltage raising capability, the AFZ converter is extremely versatile. It also uses a simplified autotransformer with only two windings, reducing complexity and power losses. It also has good dynamic performances, similar to those of the Forward converter. Resonant reset of the autotransformer type Zeta enables smooth transitions between modes.Time domain response of C Filter and Cascaded Filters (CF) arecompared. Experimental results validated.

Keywords:AFZ converter, PV cell, Autotransformer ,Filter, Cascaded Filter(CF), Dynamic Performance

1.INTRODUCTION

Renewable and green sources of energy are becoming more and more popular. One of the most important is photovoltaic energy. One of the biggest problems with high-power PV installations that are tied to the grid is that different PV panels on the same string reduce the amount of power that can be harvested. The word for this is "mismatching. This means that even when the sun is shining brightly and the weather is perfect, the power generated will be less. Connecting a DC-DC module integrated converter (MIC) to each PV panel is one of the most common ways to fix the mismatching problem. MICs are used, makes it possible to get the most power out of the installation, no matter how the other PV panels are working [1]–[2]. This MIC also controls the solar panel and makes sure it works at full power (MPP). The plans for this solution are called Distributed Maximum Power Point Tracking (DMPPT) [3]-[4] . Because of this, the MIC requirements for a flexible and profitable PV installation are low cost, high efficiency, and the ability to step up or step down the voltage.All of them achieve greater efficiency since the converter manages just a fraction of the energy, while the remainder is sent straight from the PV panel to the load. This sort of converters can obtain a maximum efficiency of 98 percent, as demonstrated in [5]. Other authors have achieved efficiencies of approximately 98 percent with full power processing topologies, but without the ability to perform both voltage step-down and step-up [6]-[20].

2.PROPOSED CONVERTER

This system introduces and thoroughly examines the AFZ with type-Zeta resonant converter, which aims to overcome the mismatching issue.Transitions between two major intervals are then investigated.

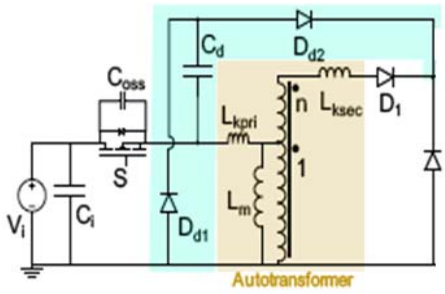

Fig 1Proposed diagram of AFZ Converter

t_{ON} $(t_0 - t_1)$
While the S is on, the converter uses an autotransformer to transfer power from the I/P to the O/P of the converter.L, Lm, Lkp, and Lks gain energy as a result of the current flow. High-frequency resonance By increasing the voltages of the capacitors, the energy transferred causes a voltage step.
t_{OFF1} $(t_2 - t_3)$

When the Lks delivers its energy to the Co and Cd and the ILkp equals theIm, t_{OFF1} subinterval begins.The S and D1 diode reach their maximum voltages at the end of this subinterval, when Imis zero amperes.

t_{OFF2} (t_3 - t_4)

The second part of the Type-Zeta resonant reset occurs during t_{OFF2}. The capacitors return the stored energy to the Lm.

t_{OFF3} (t_4 - t_5)

Because the Co and Lkp are orders of magnitude smaller than the Cd and Lm, they are ignored in the design.

t_{ON-T}(t_5 - t_6)

When the S is turned back on, the transition interval between the t_{OFF} and t_{ON}occurs,It is denoted by the symbol t_{ON-T}. The current flows through the S during this transition.

$$\Delta_m = \frac{Ts-0.5\,Tr}{Ts} = \frac{2.fr-fs}{2fr}$$

$$f_r = \frac{1}{2.\pi\sqrt{(L+Lk).(Cd+Co)}}$$

Table1: Switching Period Intervals

	Interval
ON	t_{on}
OFF-T	t_{off-T}
OFF	t_{off}
OFF1	t_{off1}
OFF2	t_{off2}
OFF3	t_{off3}
Re	t_{off1} &t_{off2}
ON-T	t_{on-T}

Pmagnetic denotes magnetically processed power, whereas Pnmagnetic denotes unmagnetically processed power. Lmis not included because it has no effect on the energy delivered to theload.

$$P_{magnetic} = P_i.\frac{k}{1+k}$$

$$P_{n.magnetic} = P_i.\frac{1}{1+k}$$

4. SIMULATION RESULTS

AFZ converter circuit diagram Fig 3 depicts the use of C-Filter. Fig 4 depicts the I/P voltage, which is 15V. Fig 5 shows voltage across the R-load, which is 94V. Fig 6 shows the O/P voltage ripple, which is 7V.

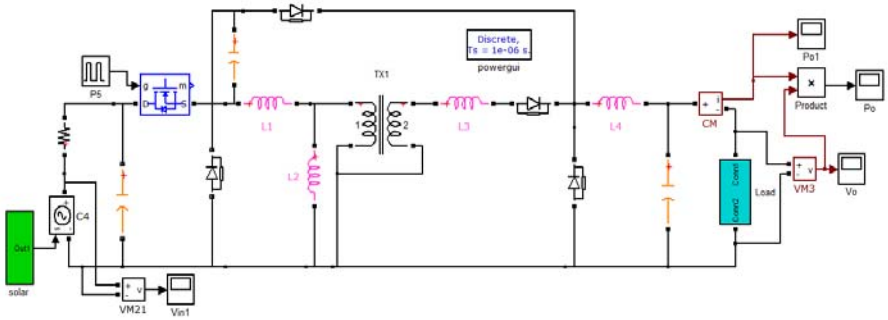

Fig 2. AFZ converter With C-Filter

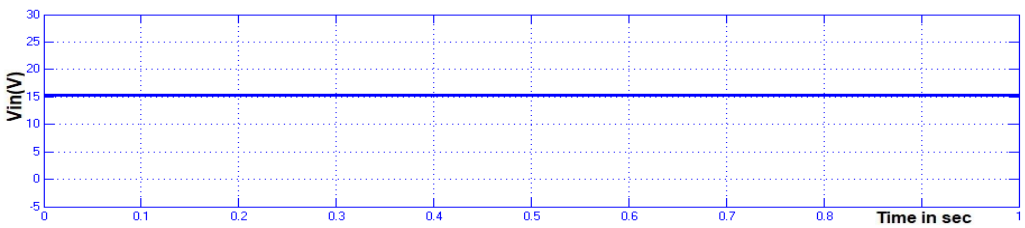

Fig 3. I/P voltage

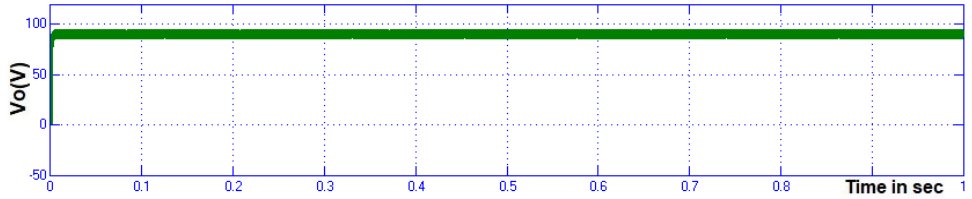

Fig 4. R-loadVoltage

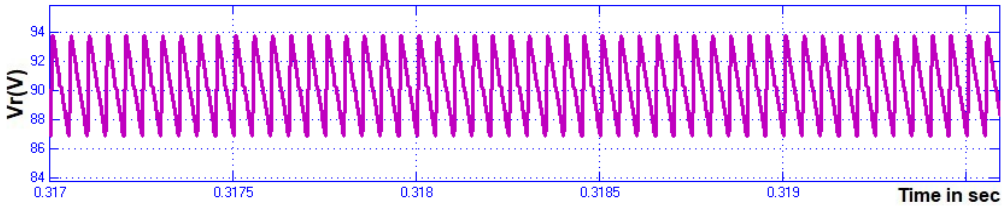

Fig 5.O/PVoltage Ripple

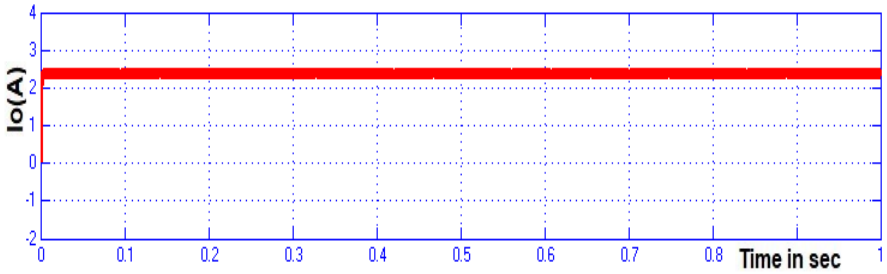

Fig 6. R load Current

Current through R load is shown in fig 7 and its value is 2.47A. O/P current ripple is shown in fig 8and its value is 1.7A. O/P power is shown in fig 9 and its value is 230W. O/Ppower ripple is shown in fig 10 and its value is 30W.

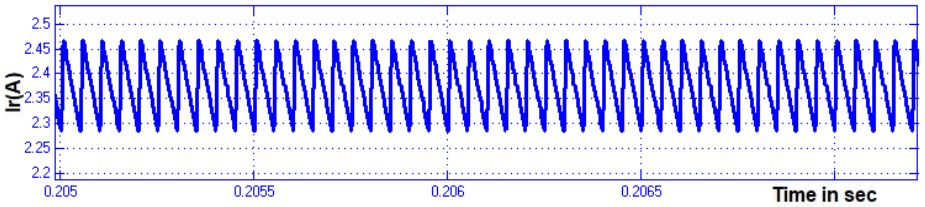

Fig 7. O/Pcurrent Ripple

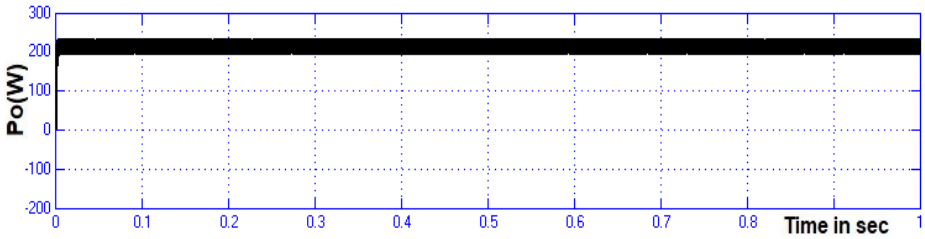

Fig 8. O/P power

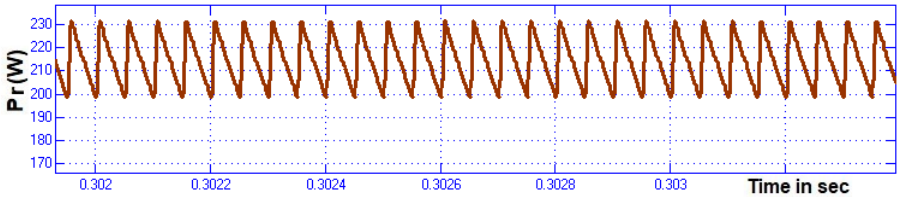

Fig 9. O/P ripple

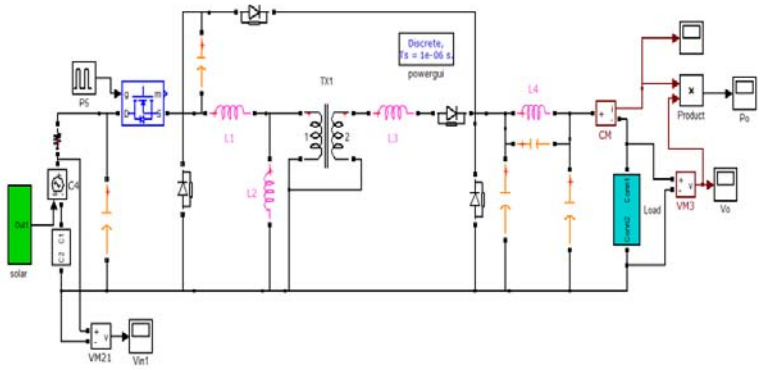

Fig 10. AFZ converter With Cascaded-Filter

AFZ converter With CF is shown in fig 11. The I/P voltage is shown in fig 12 and its value is 15V. Voltage across R-load is shown in fig 13 and its value is 94V. O/P voltage ripple is shown in fig 14 and its value is 0.03V.

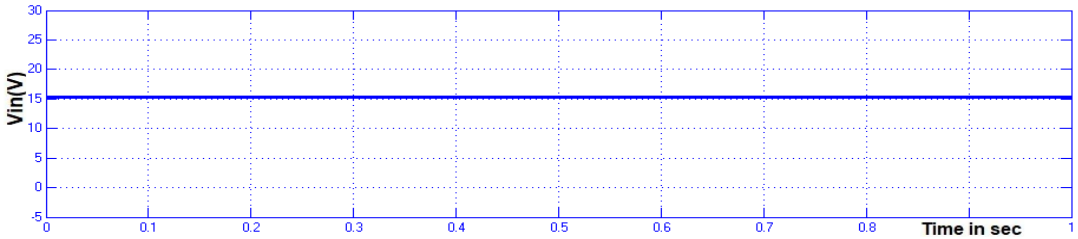

Fig 11. I/P voltage

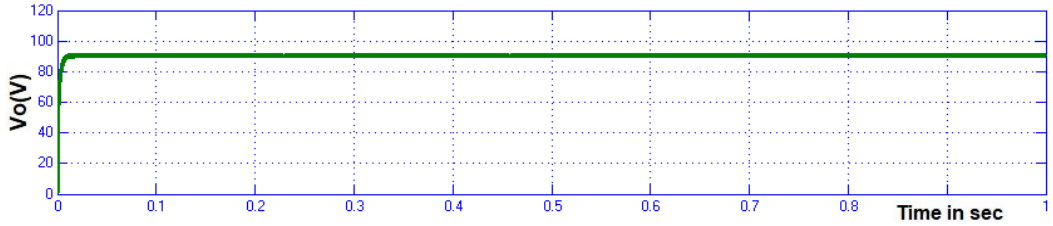

Fig 12. R-load Voltage

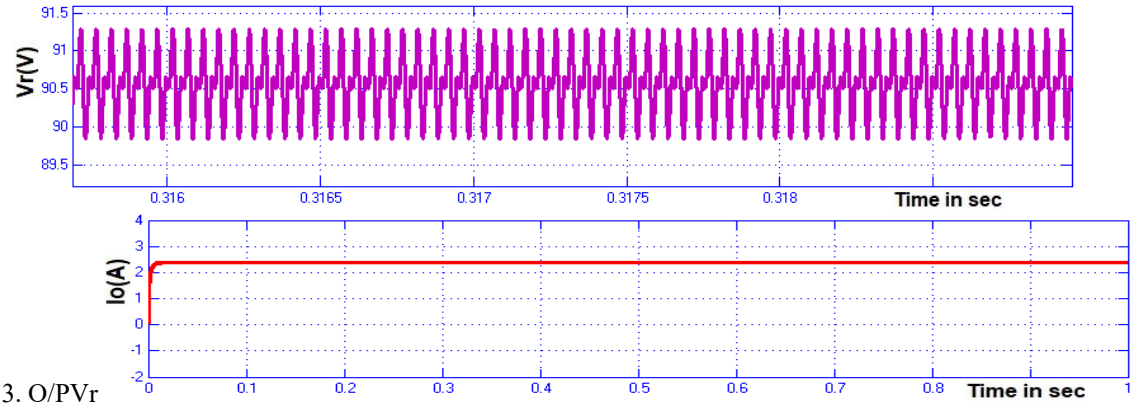

Fig 13. O/PVr

Fig 14. R load Current

Current through R load is shown in fig 15 and its value is 2.47A. O/P current ripple is shown in fig 16 and its value is 0.03A. O/P power is shown in fig 17 and its value is 230W. O/P power ripple is shown in fig 18 and its value is 6W.

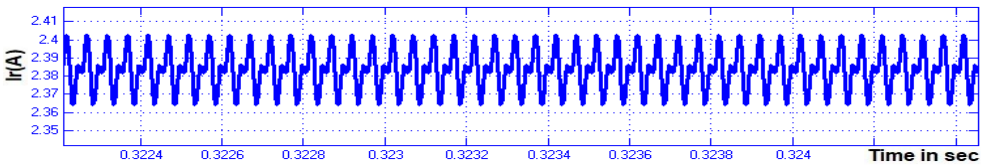

Fig 15. O/PIr

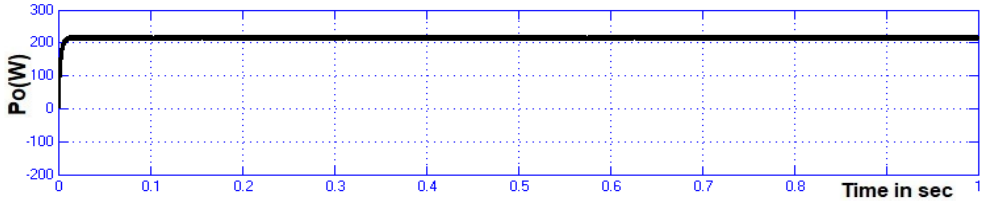

Fig 16. O/P power

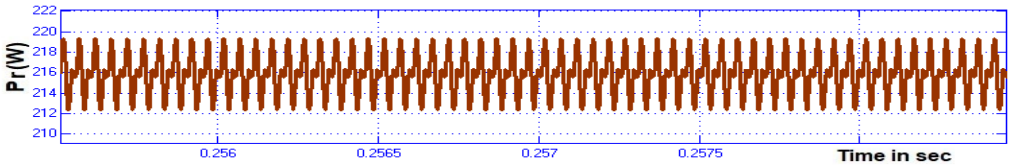

Fig 18. O/PPr

Table-2
Comparison of Parameters

AFZ Converter	Vor(V)	Ior(V)	Por(W)
C-Filter	7	0.17	30
Cascaded Filter	1.5	0.03	6

Table-3
Comparison Time Domain specifications

	tr (s)	tp (s)	ts (s)	Es (V)
C-Filter	0.52	0.67	1.14	1.82
Cascaded Filter	0.48	0.58	0.80	1.23

4.CONCLUSION

AFZ converter with C-Filter system is simulated. Circuit diagram of AFZ converter with Cascaded Filter is simulated. Above systems are compared. From Table 2 Output voltage ripple is reduced from 7V to 1.5 V by using AFZ converter with Cascaded Filter system. Output ripple current is reduced from 0.17A to 0.03A by using AFZ converter with Cascaded Filter system. Output power ripple is reduced from 30W to 6W by using AFZ converter with Cascaded Filter system. Hence the AFZ converter with CF system has better performance than AFZ converter with C-Filter system. From Table 3 Parameters observation settling time reduced from1.14S to 0.80S and Steady state Error decreased to1.23.

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Design of Reboost converter with Induction Motor Drive for Solar PV System

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Abstract

A boost converter (BC) and a re-boost converter (RBC) are Introduced for a solar photovoltaic (SPV) array fed water pumping system driven by an induction motor(IM). To compare proposed boost – Re Boost converter fed IM drive to existing systems a Buck Boost converter with suitable voltage control, DC-DC boost and buck converters are used. The BS converter combines the benefits of BC andRBC, and it emerges as an intriguing solution to problems associated with these converters in SPV applications. RBC have good switch utilization, high efficiency, RBC for open loop speed regulation based water pumping system under varying atmospheric conditions.open loop results are compared with different filter performances

Keywords:RBC,BC, solar photovoltaic (SPV) array, Induction motor drive(IM), Effective utilization of switches**.**

1.INTRODUCTION

Solar photovoltaic (SPV) energy has many benefits. In rural places and water pumping(WP) is a cost-effective use of SPV energy. A three-phase IM is used in SPV exhibit for water pumps for water system and local needs due of its appropriateness for contaminated and disconnected zones, minimal effort, consistent quality, and low support necessary. [1]-[4]. Due to the proximity of the brushes and commutator, DC motors are not recommended for water pumping. The difficult regulation of an IM and the increased efficiency of a permanent magnet synchronous motor (PMSM) have encouraged experts to employ a PMSM drive for a powerful submersible water pumping system. [5]-[10]. Several efforts have been made to pump SPV-fed water using a SyRM.It can run satisfactorily for a limited solar insolation range. An exchanging switched reluctance motor (SRM) has not gotten much attention for SPV continuous WP till recently, likely due to large torque swell and acoustic commotion[11]. In [12], SRM is utilized in an SPV-based WP system, ensuring satisfactory performance under dynamic situations. The BB converter combines the benefits of BB converters and solves SPV difficulties. The BB converter offers good switch utilization, high efficiency, and non-inverting output voltage. This research examines the startup, dynamic, and steady-state performance of an induction motor with a BB converter for SPV-based water pumping. Cascaded DC-DC boost and buck converters provide a BB converter with proper voltage management (MPPT). A DC-DC buck converter has not been employed in SPV array-fed water pumping yet; employing this converter demands a big, expensive information capacitor to get a swell free information current [13]. BB Converters have high switch use, high proficiency, non-changing information and yield voltage, and low weight[14]. -[20] Front phase of two-array SPV grid-connected inverter uses two-switch buck-support converter. A buck converter precedes a boost converter in this two-way switch buck-help converter. Setting the boost converter before the buck converter gives an SPV-fed IM driven water pump more focal points. The positioning of the boost converter at the front end of the buck converter and SPV yield makes the information current permanent.

2.PROPOSED SYSTEM

New system consists of BC and RBC system with IM Drive is shown in Fig 1.Detailed diagram is mentioned in Fig 2.

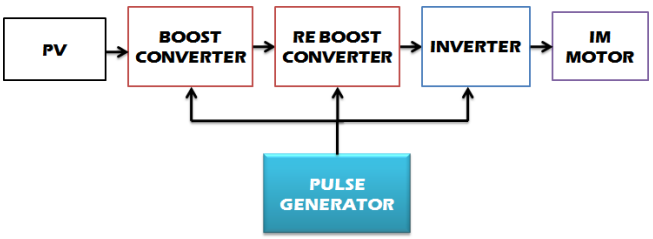

Fig 1 Block System

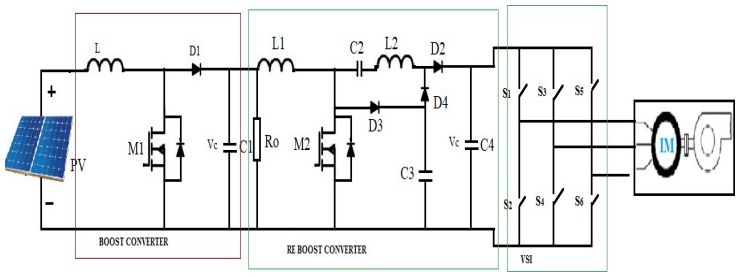

Fig 2.BC and RBC with IM Drive

The switches indicate the converter's two modes: synchronised and joined. If both switches are in the same position, the converter will be synchronised. I In consolidated control mode, a converter is controlled by one switch. Independent and controllable switches.. When sw_2 is turned off and L_1 is turned on, IL1 rises. IL_2 decreases as L_2 exchanges stored energy with the load, vd_1 decreases as C_1 is disconnected from the circuit and its release rate decreases; and when both switches are off, synchronised control mode is established. L_1 transfers energy to C_1. As L_2 exchanges energy with the load, iL_1 and iL_2decrease and vdc1 increases. Vd_2 has a similar range of variation for all possible combinations of sw1 and sw_2. Vd1 rises when L_1 and C_1 are synchronised. When sw1 is on but sw_2 is off, C1 release decreases. $V_{so}$is the SPV Voltage

$$V_{d1} = \frac{1}{1-\Delta 1} V_{so} \text{ ……..(1)}$$

$$V_{d1} = \frac{1}{\Delta 2} V_{d2} \text{ …….(2)}$$

$$\frac{V_{d2}}{V_{d1}} = \frac{\Delta 2}{1-\Delta 1} \text{……..(3)}$$

The SPV array is designed using the formula 4,5,6. The maximum current of the SPV array is determined by the array's power and voltage.

$$I_m = \frac{P_m}{V_m} \text{ …….. (4)}$$

$$N_{ms} = \frac{V_m}{V_{in}} \text{……. (5)}$$

$$N_{mp} = \frac{I_m}{I_{in}} \text{…….. (6)}$$

The voltages of the converter were used to calculate $\Delta_1$and Δ_2. As Vp = Vm, Vmpp appears as the boost converter's input voltage. $\Delta_1 and\ \Delta_2$were calculated using the formula 7,8 respectively.

$$\Delta_1 = \frac{V_{d1-Vso}}{V_{d1}} \text{……(7)}$$

$$\Delta_2 = \frac{V_{d2}}{V_{d1}} \text{……(8)}$$

3. SIMULATION RESULTS

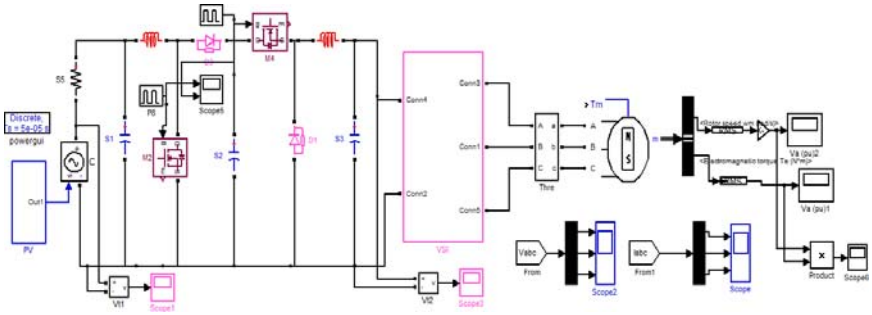

Fig 3.BB converterwith PMBLDC

Open loop diagram for BB Converter with PMBLDC is shown in fig 3. TheI/P voltage is shown in fig 4 and it is is 30V. Voltage across BB converteris shown in fig 5 anditis 64V.Ripple Voltage across boost and buckconverter is presented in fig 6 and its value is 2.3V.

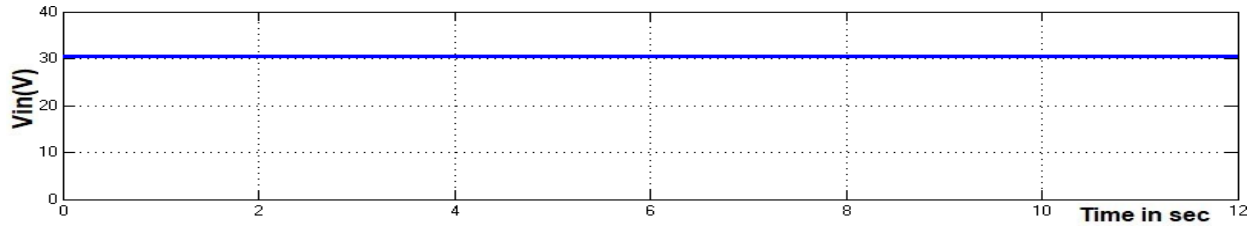

Fig4. I/P voltage

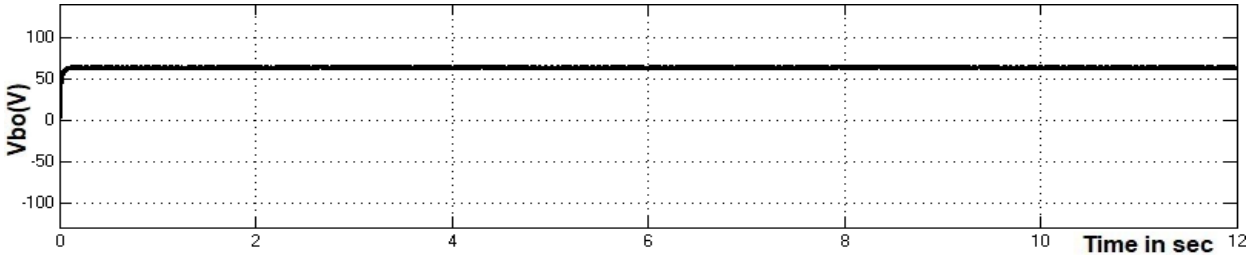

Fig 5.VoltageacrossBB converter

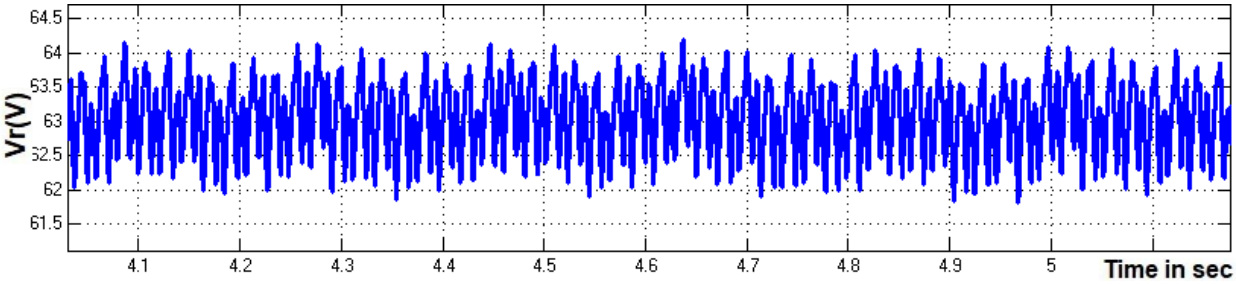

Fig 6. Ripple Voltage across BB converter

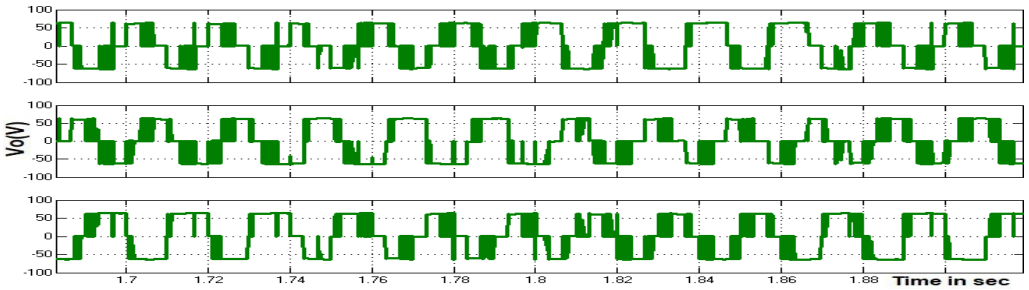

Fig7O/Pvoltageacrossinverter

Output voltage across inverter is shown in fig 7 and its value is 54V. Motor speed isshown in fig 8 and its value is 500rpm. Motor Torque is shown in fig 9 and its value is 1Nm.Mechanicaloutputpowerisshowninfig10and its power is 500 w.

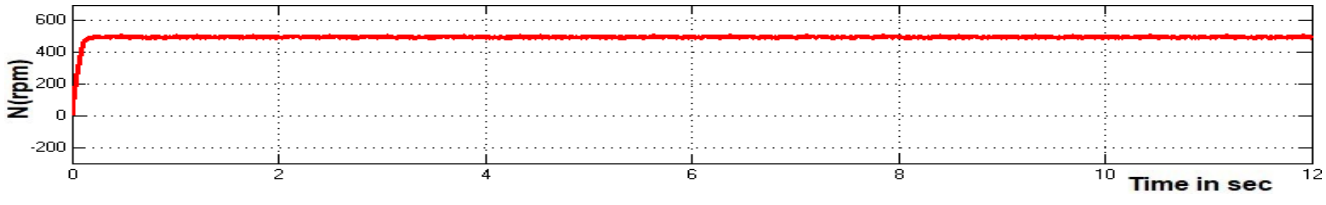

Fig8Motorspeed

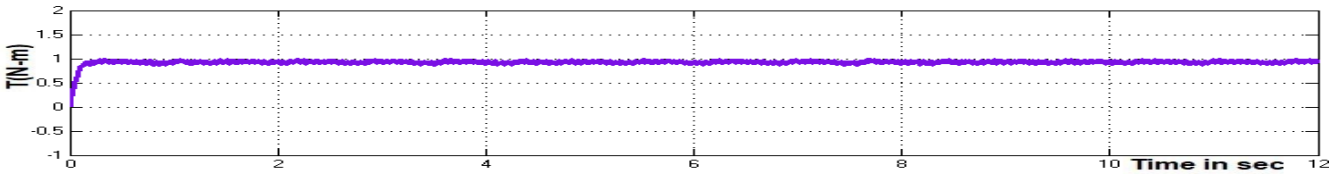

Fig 9MotorTorque

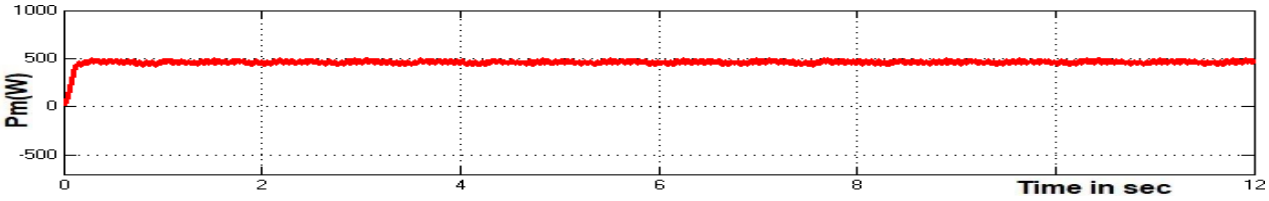

Fig 10. Mechanical output power

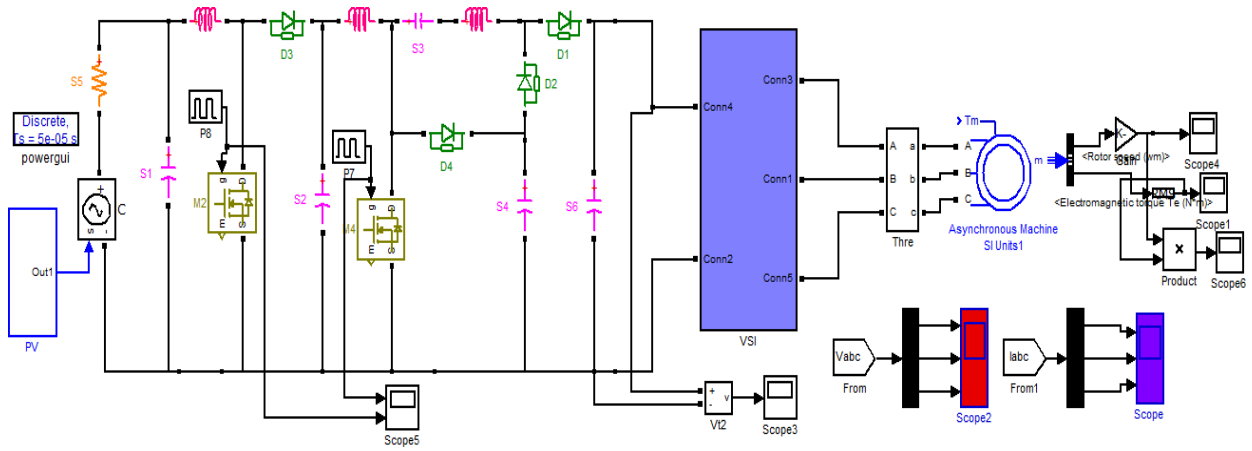

Fig.11 BC and RBC with IM drive

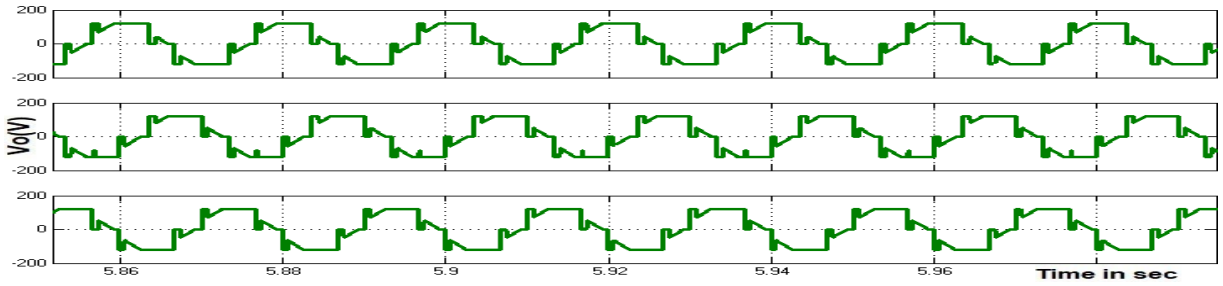

Fig 12. O/P voltage across inverter

Circuit diagram for boost and Re boost converter with IM drive is shown in Fig 11.Output voltage across inverter is shown in fig 12. and its value is 120V. Output currentthrough inverter is shown in fig 13 and its value is 9A. Motor speed is shown in fig 14 and itsvalue is 1000rpm. Motor Torque is shown in fig 15 and its value is 0.9Nm. Mechanical outputpoweris shown infig16anditsvalueis860W.

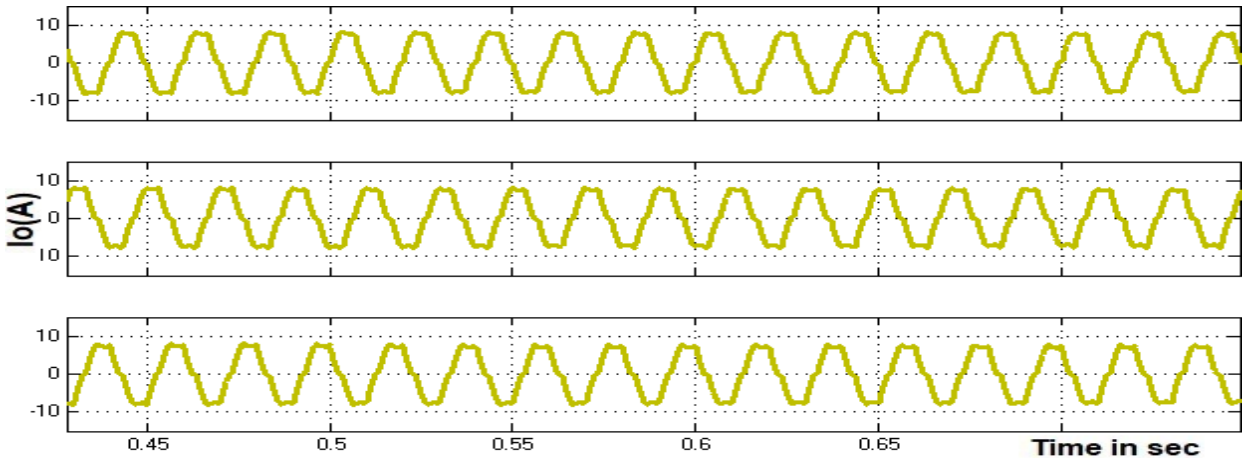

Fig13.O/Pcurrentthroughinverter

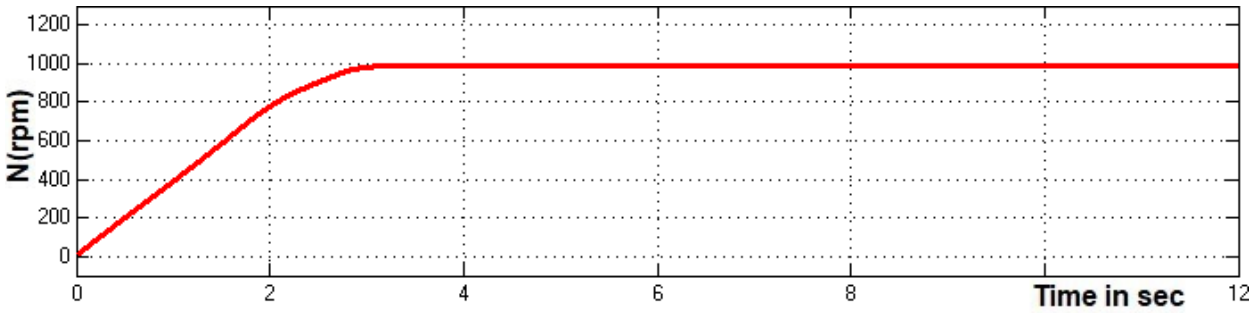

Fig 14 Motor speed

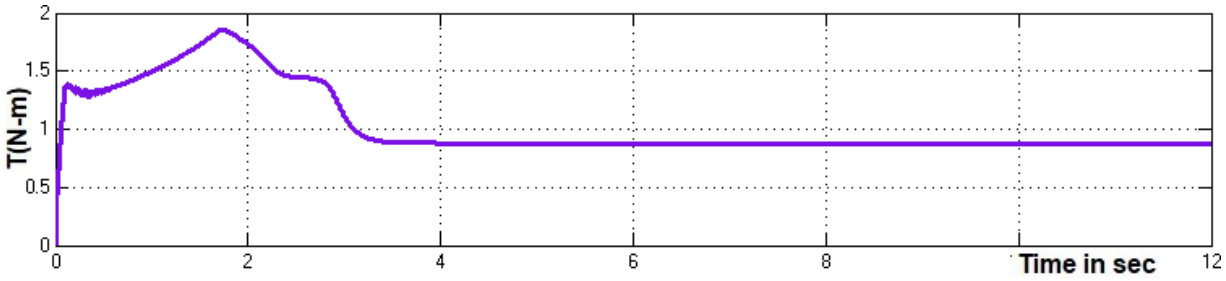

Fig 15. Motor Torque

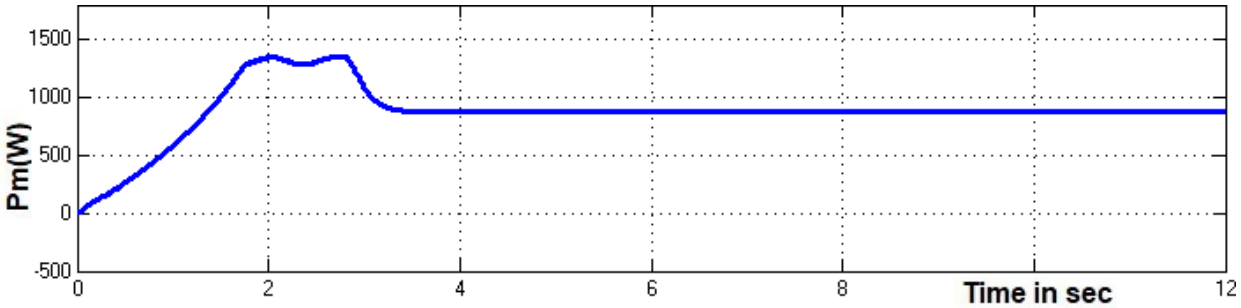

Fig 16. Mechanical output power

Table:1ComparisonofConverter Parameters

	Vo(V)	Vor(V)	N(rpm)	Pm(W)
Boost-Buckconverter	64	2.3	500	**500**
Boost-ReboostConverter	**120**	**0.20**	**1000**	**860**

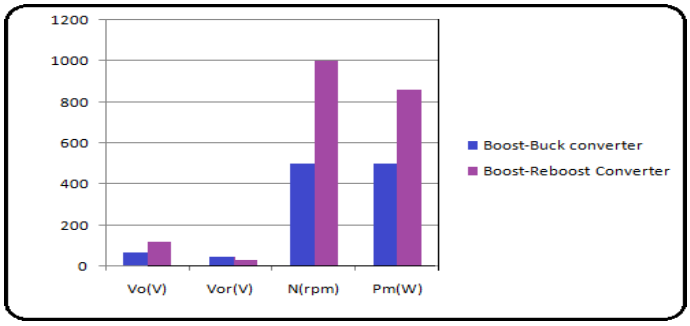

Fig.18.Barchartcomparison ofO/Pvoltage,motorspeed andMechanicalPower

4.CONCLUSION

Table compares the output voltage, motor speed, and mechanical power of PV with three-phase inverter for the existing and proposed systems.. Comparing output voltage, motor speed and mechanical power with a three-phase inverter for the existing and proposed systems is shown in Fig.18. Improvements in output voltage, ripple voltage, motor speed, and mechanical power have been made in the boost and reboost converters, which now output 120 volts and a voltage ripple of just 0.2 volts, respectively. Boost and Re-boost converter systems, on the other hand, are superior in terms of performance.

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WIRELESS VEHICLE TO HOME (V2H) TECHNOLOGY

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Abstract.

This research investigates the capabilities of EVs in Vehicle to Housing scenarios, wherein the vehicle acts as a home energy storage system and backup power in the case of a power outage or a more common power distribution system failure. Houses are one of the largest energy consumers in modern world. By employing electricity generated from renewable sources, widespread use of electric vehicles could contribute in decarbonization. The suggested method optimally schedules connected electric automobiles alongside autonomously run appliances in a real-time context.

Keywords. home energy storage system, EVs (Electric Vehicles), decarbonization, power outage, renewable sources.

1. INTRODUCTION

The electrification of transportation is a vital component in attaining global CO2 emissions reductions. The immediate consequence of such electrification will be both a challenge in terms of increasing demand for electricity and a chance in regards of converting vehicles into energetic resource that can assist the power grid. Climate change and the growing demand for oil, which is now the dominant energy source in the transportation business, are causing the automotive world and sectors to adapt.Only electric vehicles will not be sufficient to achieve the country's energy system down to lower cost for generation; renewable energy must also be explored in enabling an efficient way to generate energy.

2. WPT AND V2H TECHNOLOGY

Wireless Power Transfer (WPT): Wireless Transmission systems transfer power from a source to a load without the need of cables. WPTs are appealing for many industrial applications due to their advantages over wired designs, including as no exposed wires, convenience of charging, and efficient transmission of power.Some companies are interested in using WPTs to charge the on-board batteries of electric vehicles (EVs), and efforts are underway to develop and improve the numerous topologies required. A low-cost inductive coupling between two coils designed as the transmitting and receiving coils enables WPT.

V2H/B technology: Moreover, as renewable energy grows in popularity, fluctuating production allows for some excess power and, on rare occasions, a power need. To supplement this, electric cars can be used to receive and transmit power to homes and structures. An electric car can be used to provide electricity in the event of a power outage or blackout, in addition to providing renewable energy. It presents a solution for energy storage that helps both the EV market and grids.It is simple to set up for charging in both homes and offices. Looking at the market, V2G technology, for example, is expected to grow at a rapid rate. Given the rapid rise of electric vehicle charging stations around the world, the V2G technology market is expected to reach $17.27 billion by 2027. V2G's versatility is also expected to contribute to this expansion. The future of electric vehicle charging is smart charging.

3. THE PROPOSED VEHICLE TO HOME WPT

The proposed system in this scenario is a power transfer system from vehicle to residence, with high frequency inverters on the vehicle side by converting DC power from the EV's battery to high frequency AC power.The high frequency magnetic flux subsequently induces the high frequency power to the secondary coil. The AC is rectified to dc on the receiving end. Afterward, it's amplified and delivered to the home's battery storage system.

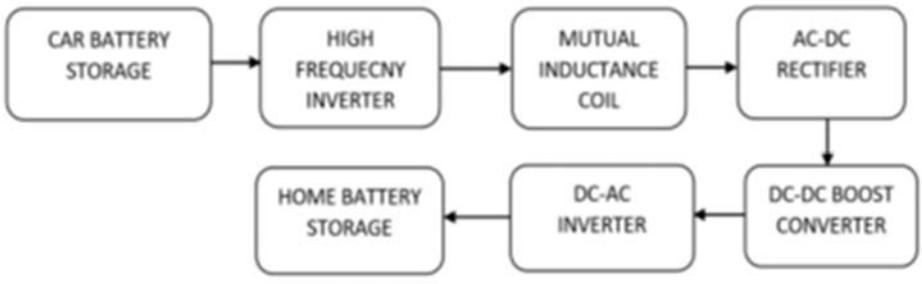

Figure 3. Block diagram of the proposed vehicle to home system.

3.1. MATLAB Simulation Model

In this MatLab simulation, a dc battery supply is present on the transmitting side, and the dc power is converted to a high frequency ac and transmitted to the primary side of the coil through a high frequency inverter.The secondary side of the coil is excited with a high frequency ac power due to mutual inductance acting between the coils, and the coil parameters are set accordingly. The high frequency ac power is supplied to the rectifier, which produces a fluctuating dc power. The fluctuating dc power is delivered to a dc-dc boost converter, which boosts the dc voltage to a stable 220V. A suitable inverter is then used to convert this voltage to a 50Hz ac voltage. The standard stabilizers of the house battery storage are given ac power of 220V, 50Hz, 2A, which can be delivered to the home/buildings during power fluctuations or power outages.

3.2. Simulation Design Parameters

Table 3. The table depicts the list of components used and their specification respectively

COMPONENTS	NO'S	SPECIFICATION
dc battery source	1	300v
IGBT switches	8	-
diode	5	-
not gate	2	-
mutual inductance	1	**L1:** 8.79e-5(H)
		L2: 1.251e-5(H)
series rlc circuit (c)	4	**C1:** 3.98e-8(F)
		C2: 2.78e-8(F)
		C3, C4: 220e-6(F)
series rlc circuit (l)	1	**L1:** 1e-3(H)
series rlc circuit (c)	2	**R1, R2:** 100(Ω)
mosfet	1	-
pulse generators	3	**PG1, PG2: period**=1/85000(sec)
		pulse width= 75%
		PG3:period=1/50(sec)
		pulse width= 50%
voltage measurement	5	-
current measurement	5	-

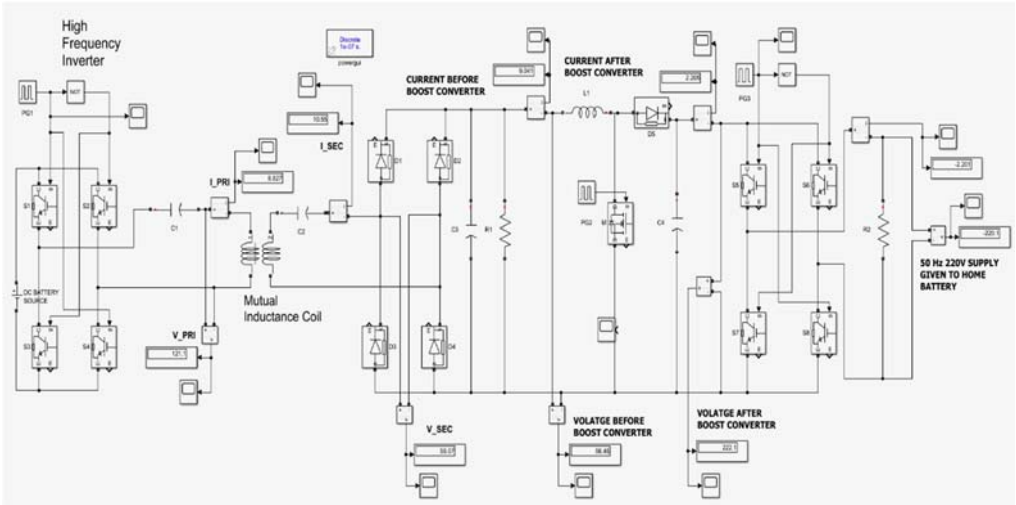

Figure 3.1. Simulation circuit

3.3. SimulationOutput

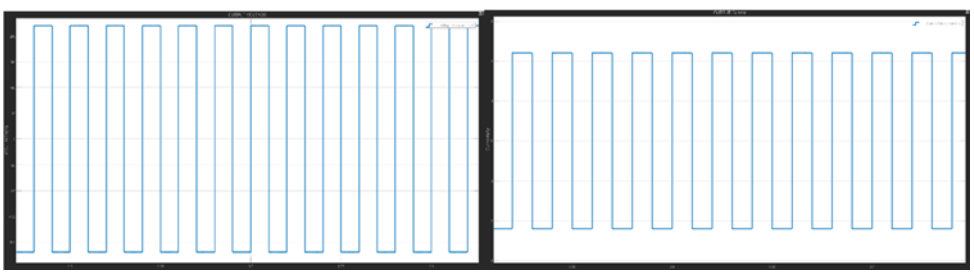

FIGURE 3.2. Voltage Output **FIGURE 3.3.** Current Output

4. ANSYS COIL DESIGN

The coil for the above proposed project is designed in ANSYS Electronics DeskTop (EDT), where a planar helix coil with a defined radius of the wire with a 5mm starting radius is designed. The design is done in the ANSYS EDT software's Maxwell 3D Design included application. The coil is made of standard copper and has 36 segments per turn. The transmitting and receiving coils' excitation are specified correspondingly. For the coil and the air region, the mesh analysis uses default initial mesh values. In the analysis stage, a solution path is added. select the parameter that will be used in the analysis Set up the necessary results section, then validate the model and execute the analysis.

4.1. Maxwell 3D design

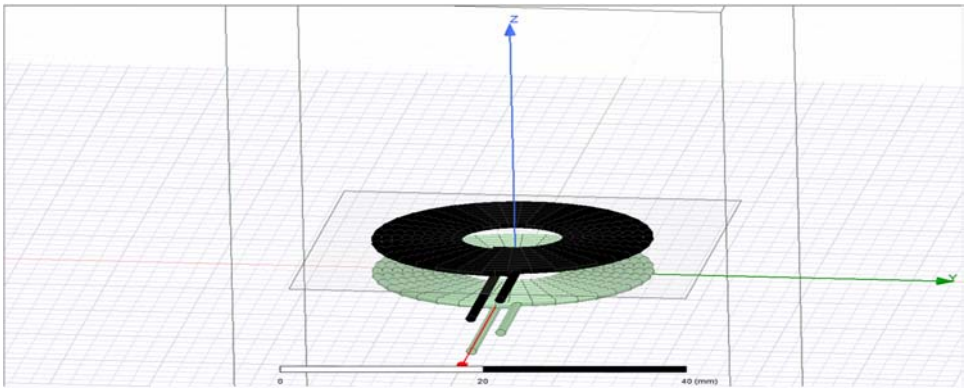

Figure 4.1. The model design of the coil proposed

A helical coil is drawn from the pre-defined structure in the draw menu option. The green coil represents the transmitting side and the black coil represents the receiving coil of the system. The leads are drawn to the coil to give current excitation. An air environment is set to given to satisfy the boundary condition of the coil. 5mm distance is placed between the two coils. Excitation of about 6A of current is given to the coil and the necessary mesh is set-up along with a correct solution setup with the results. The field overlays are defined by a rectangular sheet between the two coils so as to get the vector and magnitude results as the outcome. A tabular output is setup by optimetrics and parametrics option in the project manager to get the tabular output of inductance and coupling coefficient.

Table 4. Design parameters of the Maxwell 3D coil

PARAMETER	PRIMARY COIL	SECONDARY COIL
Polygon Segment	0	0
Polygon Radius	0.5 Mm	0.5 Mm
Starting Helix Radius	5mm	5mm
Radius Change	1.01mm	1.01mm
Pitch	0	0
Turns	9	9
Material	Copper	Copper

4.2. ANSYS Results

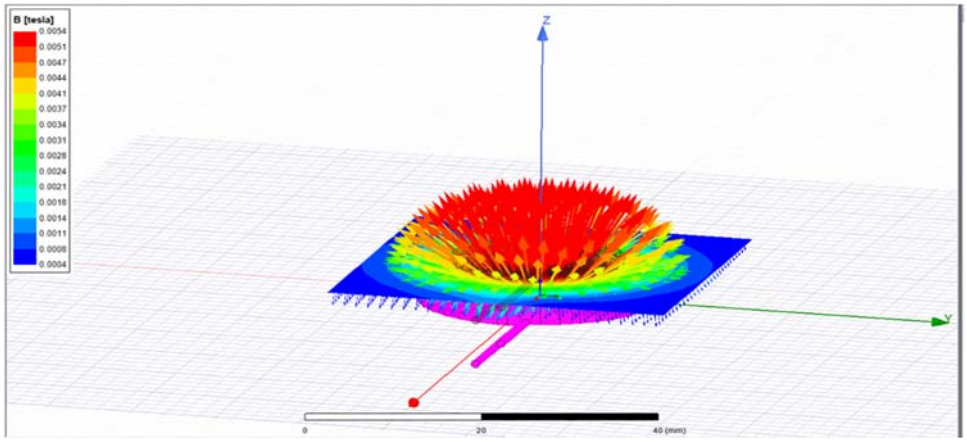

Figure 4.2. Vector and Magnitude Field Results

L Table 1

	Coil_Distance [mm]	Matrix1.L(RX_IN,RX_IN) [nH] Setup1 : LastAdaptive	Matrix1.L(TX_IN,RX_IN) [nH] Setup1 : LastAdaptive	Matrix1.L(RX_IN,TX_IN) [nH] Setup1 : LastAdaptive	Matrix1.L(TX_IN,TX_IN) [uH] Setup1 : LastAdaptive
1	5.000000	230.481972	-147.077256	-147.077256	1.057736
2	10.000000	229.673702	-60.012783	-60.012783	1.057797
3	15.000000	228.351333	-26.409440	-26.409440	1.057535
4	20.000000	227.259928	-12.257496	-12.257496	1.057785

Figure 4.3. Tabular Result of Coupling Coefficient at Variable Distance of Two Coils

Coupling Coeff Table 1

	Coil_Distance [mm]	Matrix1.CplCoef(RX_IN,RX_IN) Setup1 : LastAdaptive	Matrix1.CplCoef(TX_IN,RX_IN) Setup1 : LastAdaptive	Matrix1.CplCoef(RX_IN,TX_IN) Setup1 : LastAdaptive	Matrix1.CplCoef(TX_IN,TX_IN) Setup1 : LastAdaptive
1	5.000000	1.000000	-0.297878	-0.297878	1.000000
2	10.000000	1.000000	-0.121755	-0.121755	1.000000
3	15.000000	1.000000	-0.053742	-0.053742	1.000000
4	20.000000	1.000000	-0.025000	-0.025000	1.000000

Figure 4.4. Tabular Result for Self and Mutual Inductance of Primary and Secondary Coil at Variable Distance of Two Coils

5. CONCLUSION

The simulation for wireless vehicle to home technology is performed in MatLab / simulink simulation software, and the results are provided in this paper. In addition to the simulation, the coil design was developed using the ANSYS Electronic DeskTop software's Maxwell 3d application. A planar spiral coil is design with the necessary condition and the flux linkage result is viewed by analysing the coil and the vector results as well as the tabular results are presented in this paper. Amid concerns about global environmental problems, the spread of smart houses that can carry out energy management by combining solar photovoltaic system and battery storage contributes to the realization of low carbon society.

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Assessment of Corrosion in Concrete Incorporating Treated Used Foundrysand

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ABSTRACT

Concrete is an essential and widely used construction material. 20–35 percent of the total volume of a concrete mixture is made up of fine particles. Although natural river sand has traditionally been the most widely utilised fine aggregate in concrete manufacturing, its usage has been curtailed in recent years due to its high price and scarcity. The usage of natural sand causes a depletion of natural resources. Crushed granite powder, siliceous stone powder, and other related products are now the focus of several investigations aimed at reducing the stress sand demand for river sand. One such product is used foundry sand (UFS), a high-quality silica sand by-product of the casting of ferrous and nonferrous metals. However, the corrosion performance of concrete made using Used Foundry Sand has only recently been the subject of systematic and detailed study. Specimens of reinforced concrete, each measuring 150 millimetres in height and 50 millimetres in diameter, were constructed with and without the addition of Treated Used Foundry Sand to examine the effects of corrosion on the reinforcement (TUFS). The corrosion rate was increased by placing the cylindrical specimens in a 5 percent NACL solution and applying a direct current density. Corrosion of the rebar was evaluated with the use of the impress current method and half-cell potential testing. At the end of the corrosion phase, all corroded reinforcing bars were removed, cleaned in accordance with the ASTM G1-90 standard, and weighed to ascertain the true extent of mass loss. The microstructure of a control mix and mixes with varying quantities of foundry sand was also studied using XRD techniques. Up to a 30% replacement level, TUFS improved the corrosion resistance properties of steel in concrete. At various points in the tests, either no FoundrySand or 10, 20, 30, or 40% FoundrySand is used as a replacement for the fine aggregate.

1. INTRODUCTION

Quality silica sand, such as foundry sand, has uniform physical qualities. Sand has been used as a moulding material for casting ferrous and nonferrous metals for millennia owing to its thermal conductivity, and this waste is produced as a consequence of this process. Depending on the casting method used and the sector of industry in which the foundry is located, the physical and chemical characteristics of the resulting products will be very different.

Figure.1.Foundry Sand Sample

The industrial sector annually consumes approximately 100 million tonnes of sand, with an estimated 6-10 million tonnes being discarded despite being recyclable. Sand from the vehicle. High-quality, size-specific silica sands are purchased by foundries for use in casting.

2. RELATED WORK

Mortars are primarily constructed of sand, cement, and different additives, and they are used in masonry construction. Joining and sealing concrete masonry units, bonding with steel reinforcement to strengthen masonry structures, and adding aesthetic value are some of its primary uses. About one cubic foot of sand is needed to make one cubic foot of mortar. As the cement paste spreads, it fills the spaces between the sand grains and makes the material more manageable.

Foundry sand as a soil/crop amendment

It is possible to include foundry sand into both finished compost and topsoil. It's ideal for use as topsoil because of its uniformity, consistency, and dark colour. Sinceahighsandcontentisrequiredintopsoil,itisanessentialingredient. When added to compost, foundry sand reduces the formation of clumps and maintains the aeration of the mixture. By increasing the availability of oxygen, this speeds up the breakdown process.

Casting in foundry sands that have been smelted

Sand from a foundry might be utilised in the production of zinc and copper. Foundry sand may be used in lieu of pure sand. When used for smelting zinc and copper, the sand should be sufficiently pure (at least 99.0 percent silica), have a maximum particle size of 2 mm, and have a bulk phenol content of less than 2 mg/kg (ppm). 63 To ensure high-quality zinc and copper, the foundry must demonstrate that the foundry sand meets certain specifications in the smelting plan.

3. MATERIALS

All batches of concrete were formulated using IS mark 43 grade cement (Brand-ACC cement). All of the cement utilised was fresh and smooth. The experiment employed locally-sourced sand that conformed to the standards of grading zone III as specified by the International Standard ISO 383 (1970). All particles bigger than a 2.36 mm sieve were removed by sieving the sand and washing it to get rid of the dust.

Sums up to (Coarse)

Coarse aggregates with maximum diameters of 12.5 mm and 20 mm were used in the present investigation because they were easily available in the study area. Crude aggregates were evaluated using the standards established by IS: 383-1970. Tap water was used for mixing the concrete and drying the samples.

4. CONCRETE MIX DESIGN

Based on IS mix design

For M20 grade of concrete mix design was done by Indian standard method forcontrol specimen
Characteristic compressive strength = 20 N/mm2 Type of cement = OPC 53 grade
Maximum size of aggregate = 20 mm
Degree of workability = 0.9 (compaction factor)
Type of exposure = mild
Specific gravity of cement = 3.125
Specific gravity of fine aggregate = 2.69
Specific gravity of coarse aggregate = 2.72
Sieve analysis:
Fine aggregate –zone 111 (Refer table 4 of IS 383)

Mix proportion for M20 grade concrete

Cement Kg/m^3	Water contentKg/m^3	Fine aggregateKg/m^3	Coarse aggregate Kg/m^3	Water cementratio
394	197	637.5	1150	0.50

Mix proportion ratio

Cement	Fine aggregate	Coarse aggregate	Water cementratio
1	1.6	2.92	0.50

5. ASSESSMENT OF CORROSION

Damage to a material and its qualities may be caused by corrosion, which is a chemical or electrochemical interaction between the substance and its surroundings. Corrosion causes the production of rust, which is two to four times as massive as the original steel but retains none of its excellent mechanical qualities when implanted in concrete. Reducing the cross-sectional area of reinforcing steel due to corrosion causes a decrease in its strength capability.

Leaching lime
Rust discoloration
Extra cover thickness (collection of rust products)
Fractional fractures
Splits on a global scale
Cracking in the concrete overlay

Since reproducing reinforcing corrosion in laboratories takes a long time, several speeded-up test processes have been devised. In order to learn more about the effects of reinforcement corrosion, it is typically required to conduct accelerated corrosion modelling in the lab. amazing modern technology

Measurement of half-cell potential

Using a direct current (DC) source, the impressed current technique (also known as the galvanostatic method) rapidly corrodes steel embedded in concrete.

Setups for inducing reinforcement corrosion by impressed current use a DC power supply, a counter electrode, and an electrolyte. The anode, which consists of the steel bars, is connected to the positive terminal of the DC power source, while the counter electrode is connected to the negative terminal (cathode). Current is impressed from the counter electrode through the concrete and onto the rebar using the electrolyte (normally sodium chloride solution). An example of a lollypop reinforced concrete test specimen and set-up utilised for accelerated corrosion research employing impressed current methods.

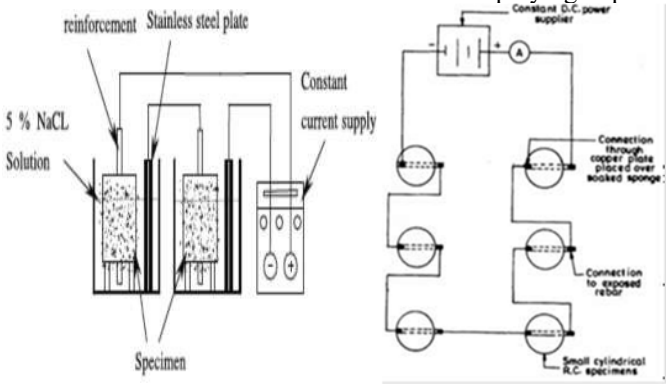


Figure.1. Set-up for impressed current test

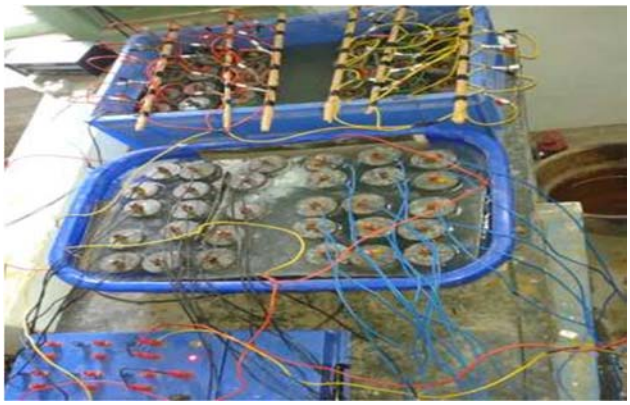


Figure.2. Measurement of Mass Loss

$$\text{Mass loss} = \frac{\text{initial weight} - \text{final weight}}{\text{Initial weight}} \times 100$$

Corroded Specimen

Figure.3.Corroded Bars, Cleaning of Bars with Chemical Solution

Figure.4.Corrosion

6. RESULTS AND DISCUSSIONS

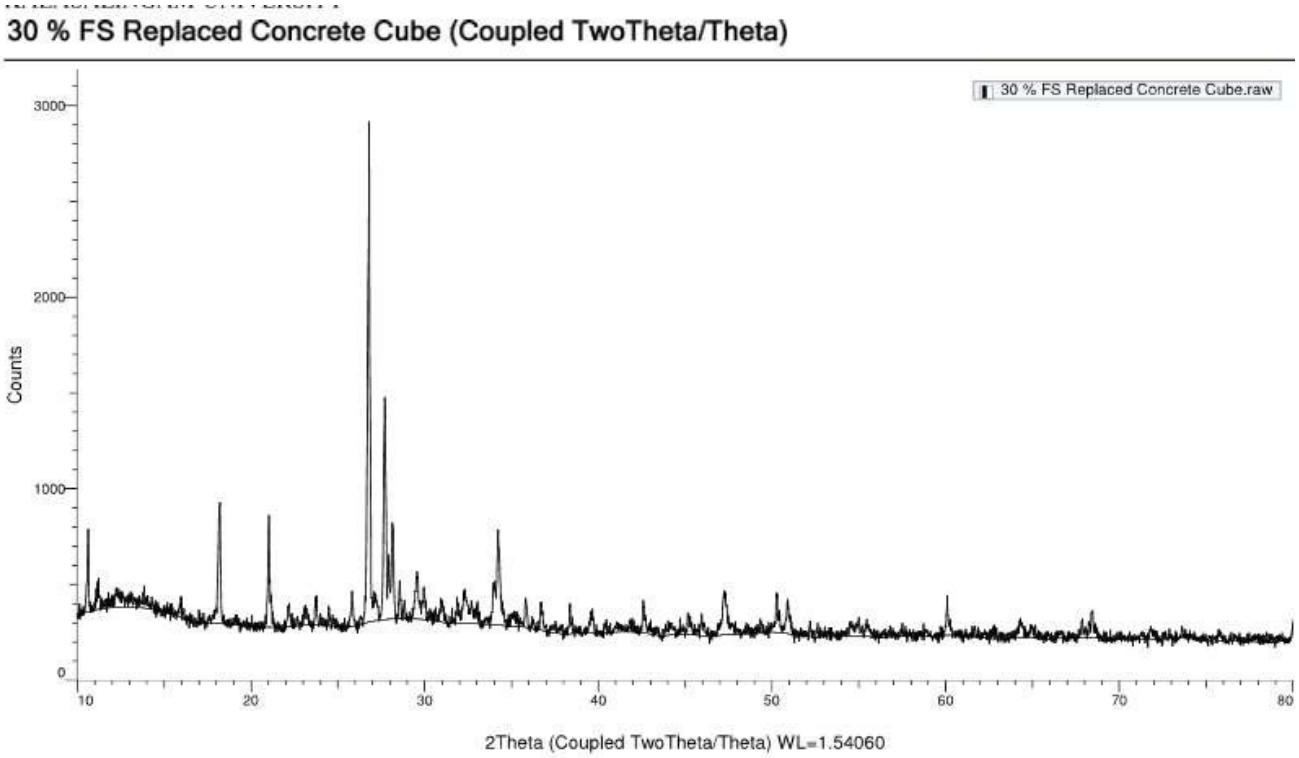
Because of the considerable amount of time needed to simulate reinforcement corrosion in laboratory settings, several accelerated test techniques have been devised. To learn more about reinforcing corrosion and its effects, it is frequently required to conduct laboratory experiments simulating the corrosion process at accelerated speeds. state-of-the-art innovation that is really astounding

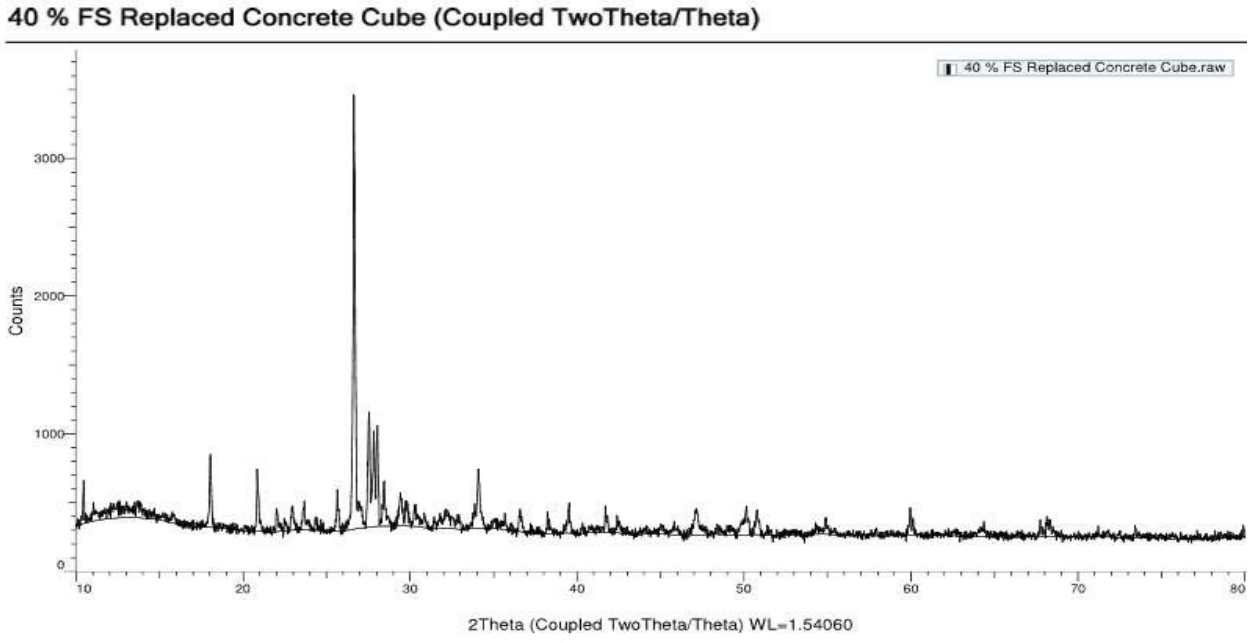
Quantifying the potential of half a cell

To rapidly corrode steel embedded in concrete, the impressed current technique (also called the galvanostatic method) requires applying a constant current from a DC source.

For the purpose of inducing reinforcement corrosion by impressed current, a DC power source, a counter electrode, and an electrolyte are often used in experimental settings. In a DC power supply setup, the positive terminal is connected to the steel bars (anode), while the negative terminal is attached to the counter electrode (cathode). The electrolyte facilitates the transfer of

current from the counter electrode to the rebar embedded in the concrete (normally sodium chloride solution). Here we see an example of a lollypop-shaped test specimen and setup for accelerated corrosion study using impressed current techniques.





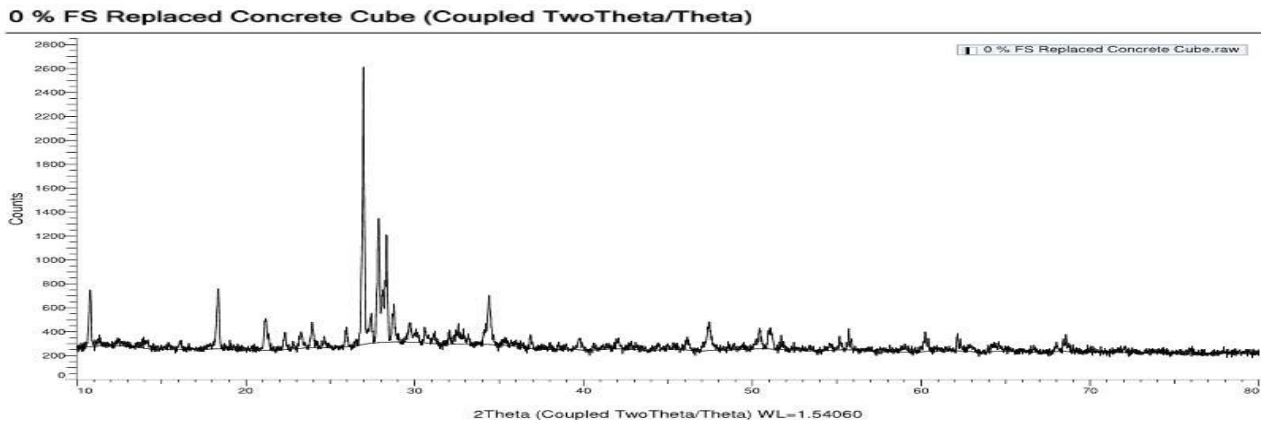


Figure.5. XRD Pattern of 40% Sand Replacement with TUFS

Table.1. Flexural Behaviour Of Beam

LOAD (KN)	DEFLECTION (mm)
0	0.00
4	0.08
8	0.18
12	0.37
16	0.50
20	0.67
24	0.91
28	1.20
32	1.47
36	1.78
40	2.16
44	2.72

Collapse Load = 48.4 KN First Crack @ 14 KN

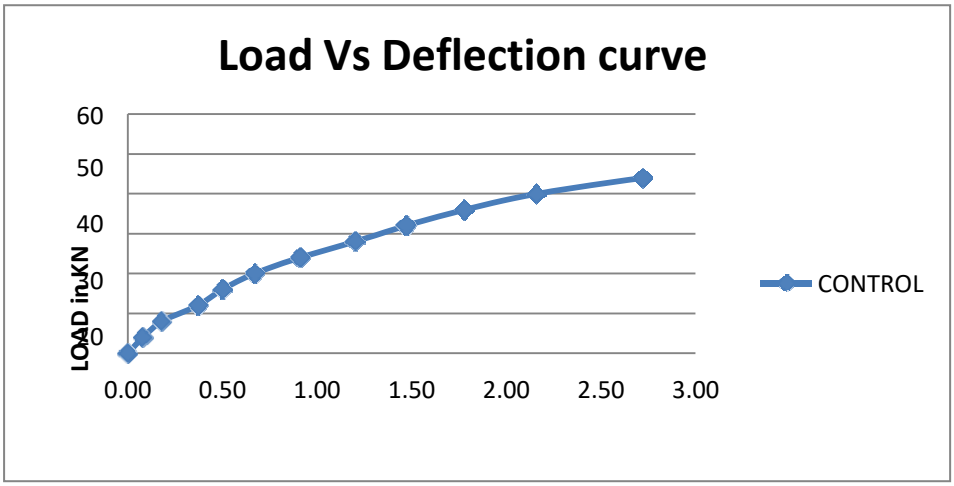


Figure.6. Load Vs Deflection Curve

Table.2.Beam Containing TUFS 30% Replacement

LOAD (KN)	DEFLECTION(mm)
0	0.00
4	0.13
8	0.31
12	0.50
16	0.82
20	1.08
24	1.36
28	1.71
32	2.03
36	2.54

40	4.04
44	4.67
48	5.50

Collapse Load = 52.6 KN First Crack @ 12 KN

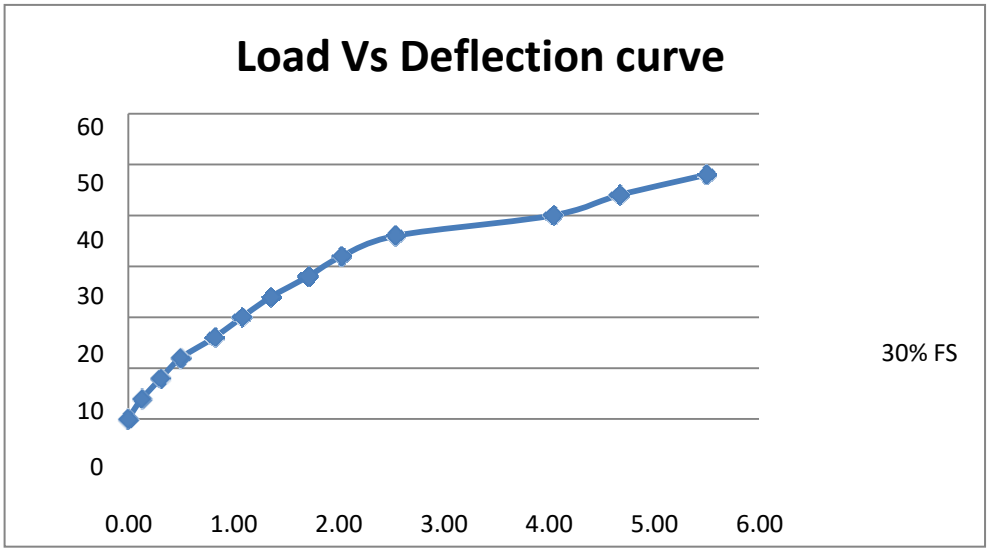


Figure.7. Graphical Representation of Load VS Deflection Curve for 30%FS Beam

7. CONCLUSION

Although natural river sand has traditionally been the most widely utilised fine aggregate in concrete manufacturing, its usage has been curtailed in recent years due to its high price and scarcity. The protection of this natural resource is aided by the substitution of foundry sand for beach sand. To put it another way, the Workability of Concrete made using Replaced Treated Used Foundry Sand is much higher than that of Concrete made with untreated Used Foundry Sand.

Treated Used Foundry Sand has a silica content of 80 percent or more, making it an excellent concrete binding material. In order to test corrosion quickly and accurately, the impressed current method and half-cell potential measurement have been shown to be effective. Up to a 30 percent replacement level, TUFS improved the corrosion resistance of steel in concrete. Corrosion was less severe in TUFS integrated specimens compared to control specimens. The onset of corrosion for the TUFS-enhanced mixture occurs a little sooner than that of the control mixture. Additionally, flexural behaviour is significantly enhanced in TUFS-containing concrete compared to the control mix.

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Comparison of Various Ensemble Machine Learning Techniques to Recognize the Instantaneous Internet of Things Assault

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Abstract.

The adoption of Internet of Things (IoT) devices in residences, workplaces, transit, hospitals, and other places has led to an increase in harmful assaults, which are becoming more common. As the space among IOT systems and fog machines is lower than the gap between IoT devices and the cloud, threats may be discovered more quickly. As a result of the massive amounts of data generated by IoT devices, machine learning is commonly employed to identify threats. It's a concern, though, because fog nodes may not have the computing or storage capacity to identify threats in a timely basis. Machine learning model creation and real-time forecasting may be offloaded from the cloud, and both tasks can be performed by fog nodes, according to this article. In the server, an ensemble machine learning method is created based on past data to identify assaults on fog nodes in real time. This method is used on the NSL-KDD database. In terms of numerous performance metrics, such as processing time, specificity, recall, efficiency, and the ROC (receiver operating characteristic) curve, the findings suggest that the proposed technique is successful.

Keywords. IoT; Data Transfer; Machine learning; Ensemble Learning

1. INTRODUCTION

In the past, only computer systems, cell phones, and tablets were associated with the Internet. A wide range of equipment and utilities (e.g., TVs, air-conditioning units, and washing machines) may now be linked over the Internet via the IoT. Healthcare, farming, traffic control, energy conservation, supply of water, unmanned aerial vehicles, and autos are just a few of the many industries using the Internet of Things (IoT). Figure 1 depicts a three-Level IoT Framework: (1) the thing layer (TL), (2) the fog layer (FL), and (3) the cloud layer. A wide range of IoT machines are included in the thing layer, covering home automation, healthcare, smart automobiles, smart drones, and smart buildings, among other applications. With data limits, computation, power, and storage, this layer allows for data collecting. Following the TL is the fog layer, which may include operational resources for managing real-time activities and making swift decisions. Data may be collected and processed in several data centres thanks to the cloud layer's support. It may take quite some time to implement choices in the TL since it is so far removed from the object layer.

The quantity of information created by IoT devices is growing from 18 zeta bytes in 2019 to 73 zeta bytes in 2025, as per a forecast from the International Data Corporation (IDC). Many new dangers arise from the huge inflow of data [1]. Due to the lack of energy, storage, or connectivity, IoT machines and connections tend to be unsafe since they cannot execute fundamental security operations such as encryption. According to IBM X-Force, the number of IoT assaults doubled in 2020. Malware and botnet assaults are putting IoT-enabled networks at danger of losing their anonymity and safety.

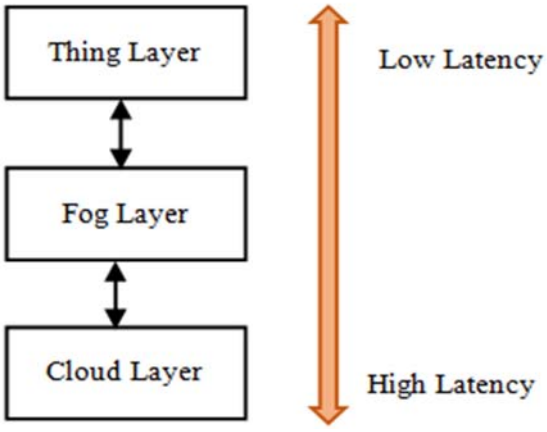

Figure 1: A Three-Level IoT Framework.

Authentication [2], identification, and protection are some of the security measures suggested for the IoT. Incorporating ML algorithms into the IoT might reduce safety and privacy problems [3]. Decisions on where to execute techniques for quick decision making are critical nowadays, whether they are on the cloud, fog or things layer. Any IoT choices may be postponed if

all machine learning judgments are done remotely. Because of the restricted bandwidth, processing power, and energy available at the object and fog layers, it may be challenging to implement ML solutions at these levels.
Deep learning methods are more successful in detecting IoT assaults than typical machine learning algorithms, according to recent study [4]. However, these techniques may only be able to be executed on the cloud layer. The system is designed to make real-time judgments quickly, however in certain cases, such as online surgeries, these methods don't work as well as they should. ML algorithms like support vector machine may only produce relevant results when they are used in conjunction with a feature matching strategy or optimization technique [5][6] in the context of IoT threats. The limited resource requirement cannot be met by this set of techniques. Applications like offline or non-interactive projections among tiny dataset use ML methods such as decision trees, nave Bayes, and K-nearest neighbours. Real-time forecasting is a problem for these algorithms, which are deemed poor.
An ensemble model for detecting IoT assaults is proposed in this research for an IoT system with restricted connectivity and computing power, power and memory. Attacks such as DoS, spoofing, and probes are all taken into consideration. To boost detection rates, no further feature extraction or dimensions reduction algorithms are used. This methodology is best suited for detecting IoT threats in real time and quickly. Step one is picking the best ensemble model that is fast and accurate, and step two is executing the best model so that the decision may be applied in a short period of time. Since picking the optimal ensemble model necessitates a lot of computing power, the first step is done in the cloud, while the second is done in the fog layer, where latency is minimal for real world applications.
The NSL-KDD database is used extensively in this study for data analysis studies. As a real-time representation of IoT assaults on a network, the dataset has been improved from KDD-99. The findings reveal a good precision in a short period of time and with the minimal number of resources required. Here are the sections of the paper's structure: This paper is organized as follows: Section 2 gives an overview of the relevant work, Section 3 outlines our technique, Section 4 outlines simulation scenarios, and Section 5 concludes with the findings.

2. RELATED STUDY

IoT devices and apps are hampered by security flaws that prevent widespread use. It is impossible to utilize standard benchmarks like NSL-KDD to evaluate and validate the efficiency of new Network Intrusion Detection due to the heterogeneous nature of IoT systems (NIDS). In a research [7], the author looked at particular threats in the NSL-KDD database that might affect sensor nodes and networking in IoT contexts to fill the gap. In addition, we examined and reported on the findings of eleven machine learning methods in order to identify the newly emerging assaults. Through quantitative simulation, we demonstrate that approaches based on trees and ensembles outperform all other methods of machine learning. XGBoost is the best supervised algorithm with 95 percent accuracy. Also of note in this study is that the unsupervised Modeling approach surpasses the Nave Bayes classifier by 22.0 percent when it comes to detecting assaults in the NSL-KDD dataset which is a noteworthy research discovery. As a network security measure, intrusion detection has proven useful. Many of the current approaches for detecting network anomalies are based on well-established ml algorithms like KNN, SVM, and so on. It's possible to generate impressive characteristics, but these approaches have a poor rate of precision and depend primarily on human traffic features that have become outdated in the age of big data.
It is recommended that a traffic anomaly identification technique BAT be used to address the issues of poor precision and feature engineering in intrusion identification [8]. BLSTM and attention mechanisms are included in the BAT model. As a result of the attention mechanism, the BLSTM model generates a connectivity flow vector that may be used to classify network traffic. The local aspects of traffic information are also captured using numerous convolutional layers. The BAT model is referred to as BAT-MC because it uses multiple convolutional layers to analyze data samples. Using the softmax classifier, traffic on the network may be classified. No feature engineering skills are required for the suggested end-to-end model, which is capable of independently learning the hierarchy's most important characteristics. It is able to accurately represent network traffic patterns and enhance anomaly detection. The experimental findings conclude that the model performs better than existing comparison approaches on a publicly available benchmark dataset. NIDSs, or Network Intrusion Detection Systems, are critical pieces of cyber-defense equipment.
In order to develop a profile of normal and malicious activity, NIDSs use a variety of techniques. Machine-learning-based NIDS were devised and implemented in article [9] by the author, and their performance was evaluated. In particular, we look at six approaches of supervised learning that fall into three categories: (1) ensemble approaches, (2) NN techniques, and (3) kernel approach. NSL KDD and NSL-Kitsune-2018 datasets are used to test the created NIDSs, which are based on a current real-world IoT traffic that has been exposed to various network assaults. The recognition efficiency, error rates, and inference speed are evaluated using standard performance measures from the ml algorithms literature. In comparison to neural network and kernel approaches, our empirical study shows that ensemble learning have greater precision and fewer margins of error. Neural networks, on the other hand, have the fastest inference speed, which demonstrates their applicability for high-bandwidth networks. Our greatest findings outperform any previous art by 120 percent, as shown in a relation to existing state-of-the-art solutions.
Data sharing and administration of networked "things" are all possible with the Internet of things (IoT). IoT devices are growing and serve a critical role in increasing people's quality of life and their level of living. The actual IoT, on the other hand, is more susceptible to the myriad Internet-based assaults that might lead to the leaking of personal information, data manipulation, and other damage to society and people. The Internet of Things (IoT) relies heavily on network security, and online injection, particularly web shell, is among the most serious threats. Using fundamental machine learning algorithms to identify web shell, author [10] built reliable services for IoT networks. These machine learning models will be enhanced by ensemble approaches and voting [11]. The reliability of web shell incursion has been shown by extensive testing on these models. Simulated findings suggest that RF and ET are appropriate for mild IoT settings, whereas the Voting approach is beneficial in heavy IoT scenarios.

IoT-enabled technology, communications, and apps are used in a smart city in order to increase operational efficiency and improve both the level of services delivered by service providers and the quality of life enjoyed by citizens. There is, however, a greater danger of cyberattacks and threats with the expansion of smart city networks. Detectors coupled to huge public cloud uncover IoT systems in a smart city system to fraudulent malicious activities. Such assaults must be prevented and IoT devices must be protected against failure. The author of article [12] investigated a machine learning algorithm-based attack and anomaly detection method to protect and mitigate IoT cybersecurity risks in a smart city. For example, instead of relying just on a single classifier, we also look at ensemble approaches like bagging, boosting, and stacking. For the described area, we also investigate a combination of selecting features, cross-validation, and multi-class classification that has not been widely studied in the current literature [13] [14]. "Stacking ensemble models beat similar models in terms of performance metrics, suggesting stocking's potential in this area validated with experimental findings using the most current attack database [15] [16] [17].

3. METHODOLOGY

Our goal is to identify assaults in an IoT system using ensemble machine learning methods. The reason for this is because deep learning models demand large amounts of memory. For real-time assault identification, the aim is to find the optimal ensemble approach. Thing, fog, and cloud layers are shown in Figure 2. To do this, youmust go through the three stages listed below (as seen in Figure 2): Putting the right model on the clouds, collecting data at the cloud layer first, and then picking the best prediction from an ensemble of models run on the server. Below is a breakdown of the aforementioned responsibilities.

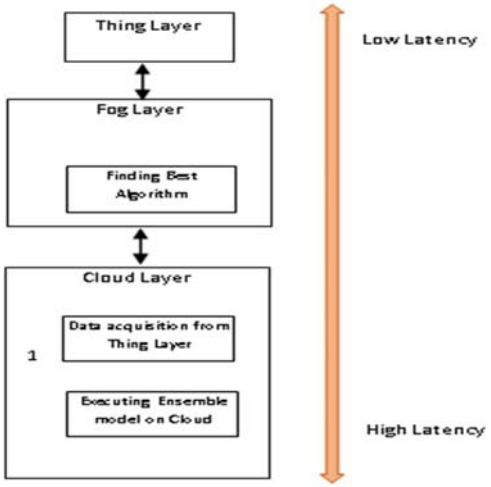

Figure 2. Proposed Approach

3.1. Data Gathering

Gathering information from the things layer and transmitting it to the top layer is part of this process. Input from the thing tier may then be sent to the fog layer in order to do this. The cloud layer may then use the fog layer to convey it. The fog layer may screen information while it is being transferred to the cloud layer, allowing it to select which data should be sent there. The following characteristics may be used to anticipate Internet of Things (IoT) attacks: A user's login information is followed by a list of net datagram fields such as segment characteristics and source and destination addresses (such as IP addresses). Data utilized in our simulation will be given in the next section.

3.2 Choosing Top Model

There are many fundamental machine learning algorithms that may be combined in this stage in order to get the best outcomes. This is a lengthy process; consequently we suggest doing it on the cloud. As a result, we only use the most basic machine learning algorithms since they take less time to run.

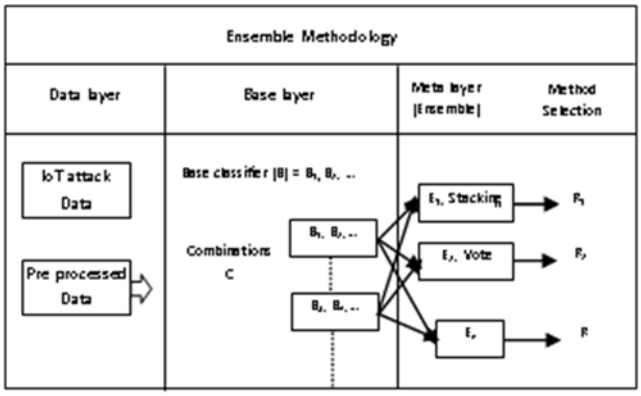

Figure 3. Ensemble Model Selection.

Four layer is composed are shown in Figure 3 to demonstrate this process Pre-processed input from the preceding phase is supplied into the bottom layer in the data layer. Decision trees and KNN are all used in the base layer, as are nave Bayes and decision trees. They are input into the meta layer where ensemble techniques such as stacking and voting are used to combine the outcomes of different pairings. ROC and processing time are taken into consideration while evaluating each ensemble approach. In addition, the model with the best mix of basic classifiers and an ensemble approach is chosen. First, the outcome and results are both set to NULL in Algorithm 1's variables OUTPUT and RESULTS, respectively. The completion time is set to be maximum.

3.3 Executing Top Model on the Fog Layer

Things layer actual statistics is used to run models over the fog layer in this stage based on earlier selections. Base classifiers and an ensemble approach make up the model.A cross-Atlantic experimental analysis of smart Infrastructure IoT networks has been suggested. An IoT gateway transmits data to a cloud-based IoT deployment via the Internet, increasing safety and delay by conducting secure network services. Because fog/edge nodes don't have the capacity to perform heavyweight techniques that take a lot of resources in commercial IoT networks, our technique provides a feasible solution in real time. It is thus reasonable to use only one layer of the fog, the trained model, to reduce the fog node's resource needs. It also makes perfect sense to train the information in the cloud, as outlined in stages 1 and 2 of the process.

4. SIMULATION ENVIRONMENT

4.1 Server Configuration

For the purposes of testing, a 32-bit OS with a Processor speed of 2.80 GHz was used in conjunction with a CoreI511400 processor and 4GB RAM. The cloud node implements the suggested ensemble technique, while the fog node runs the best model. To conduct cloud-based experiments and identify IoT assaults in real time in the fog, researchers turn to the Weka framework.

4.2 Dataset Description

Simulated data is taken from the NSL-KDD database(https://www.unb.ca/cic/datasets/nsl.html). To represent a particular IoT network object, it has a total of 41 characteristics. According to these 41 characteristics, one may categories network invasions into computational data (such as flag or land), content-based data (such as login or root shell data), length or hosts (such as a host's IP address).

The NSL-KDD dataset is shown in Figure 4 by means of two layers: Examples of assaults within each category are shown in the outer layer, which depicts the several forms of IoT attacks in the database. Probe IoT attacks include attacks like Saint, Satan, Nmap, and portsweep, shown in Figure 4. Examine a connected device for holes in its design, which are then manipulated by the hacker for access to secret data.

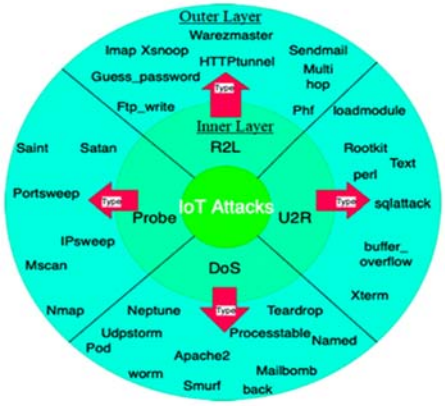

Figure 4. Dataset description.

In the same way, DoS assaults like Neptune, Teardrop, Worm, and Smurf are included in this category. Denial-of-service attacks occur when an attacker uses too many resources, preventing authorized users from accessing a resource, thereby rendering the service unavailable. There are also R2L attacks (remote user to user) and user-to-root attacks (user root to user) that are distinct from one other. Components are highlighted in Figure 4 based on their section. Nominal values predominate in this dataset. TCP, UDP, and FTP are the three main protocols in the collection.

4.3 Data Segregation

While the cloud layer stores previous data on network connections related with IoT threats, the fog layer analyses actual information in order to prevent future assaults. In addition, the cloud layer contains the predicted value and its associated tags, but the fog layer needs this parameter to be forecasted for new additions or tags. There are two sets of data in the NSL-KDD dataset: one for training and the other for testing. Training information is intended as cloud information, while testing information is used as fog data for experimental purposes. To make things more interesting, the cloud layer uses a major portion of the NSL-KDD dataset for train and test, while the fog layer uses the remaining dataset for real-time assessment. At the cloud layer, 80/20 K-cross validation is employed.

4.4 Blending Classifiers

Multiple ML techniques along with couple of ensemble approaches were used to simulate the suggested strategy. Decision trees (DT), random forests (RF), KNNs (KNNs), logistic regression (LRs), and nave Bayes (NBs) are among the classifiers used, along with voting and stacking approaches for ensemble analysis. Table 2 illustrates the specifics of each base classifier pairing used in the base layer. It is tested with ten distinct models. Table 2 lists the variants. It's because we chose five basic predictors, and then constructed two-classifier combinations. As a result, we have ten options.

Model number	Blending Base Classifier		
1	decision tree	random forest	K-nearest neighbor
2	random forest	K-nearest neighbor	logistic regression
3	K-nearest neighbor	logistic regression	naïve Bayes

4	logistic regression	naïve Bayes	decision tree
5	naïve Bayes	decision tree	random forest
6	decision tree	K-nearest neighbor	logistic regression
7	random forest	logistic regression	naïve Bayes
8	K-nearest neighbor	naïve Bayes	decision tree
9	logistic regression	decision tree	random forest
10	naïve Bayes	random forest	K-nearest neighbor

Table 2: Blending Base Classifier

5. RESULTS AND DISCUSSIONS

In this section, we assess the outcomes of the suggested technique using 3 aspects: (1) processing time, (2) quality estimate, and (3) variance. More train data is utilized to develop models and run tests in the cloud layer than on a local computer. The fog layer is used to evaluate fresh data. Selecting the most accurate version is done in real-time with data collected in the cloud layer. This is followed by an analysis of data collected from a layer of fog.

5.1 Cloud Layer Analysis

5.1.1 Runtime Analysis

Using the models listed in Table 2, the voting and stacking ensemble procedures are shown in Figure 5 along with their associated execution times, which shows the number of seconds needed to run each individual model, as well as their length in seconds. Stacking takes substantially longer to execute than the voting ensemble approach. Model number 8 with voting approach has the shortest execution time (9.18 s) and uses KNN, NB, and DT as its basis classifications, as per our findings.

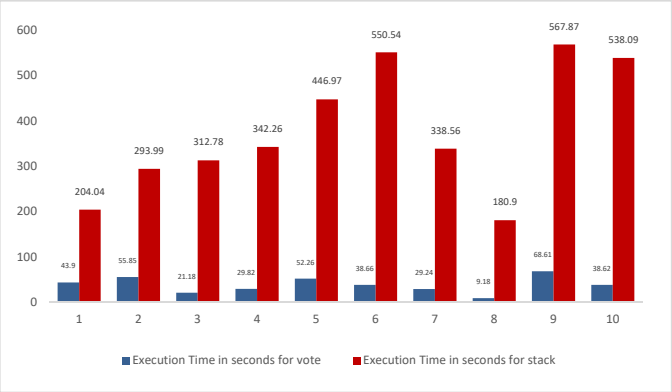

Figure 5: Runtime of various models.

5.1.2 Evaluation Metrics

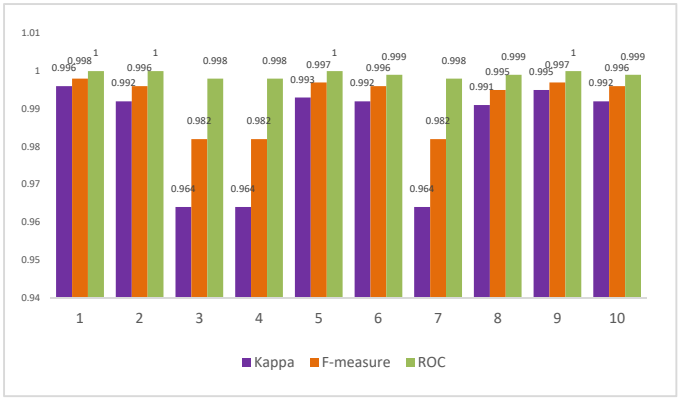

Figure 6: Performance metrics of different models.

Figure 6 depicts performance metrics of different models. As can be seen, all the models had kappa values more than or equal to 0.99, with model 8 having the highest value at 0.991 with an F-measure of 0.995 and an area under the receiver operating characteristic curve (0.99). As can be seen in Figure 7, the voting ensemble approach has errors in terms of MAE, RMSE, RAE, and RRSE. In comparison to any other model, Model 1 with voting has a much lower error rate.Model 8 is chosen for the fog layer despite the fact that it worked well in respect of running time and other performance indicators, as shown in Figure 6.

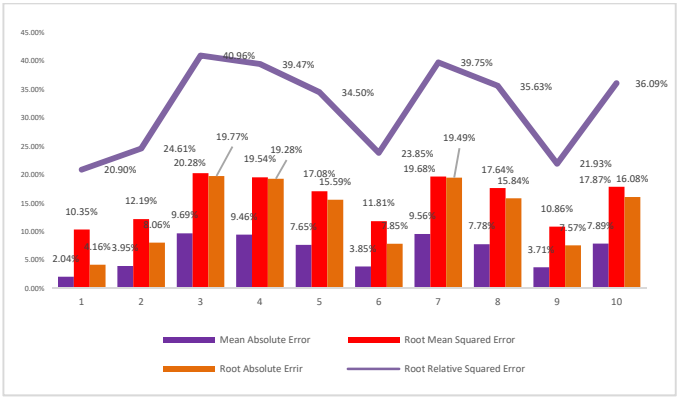

Figure 7. Errors associated with all the models.

Additional measurements of model 8's effectiveness were performed (see Figure 8) to make sure it meets our standards for accuracy and robustness. The Y-axis results are reliable to three decimal places. As a rule, the Model 8's performance in this trial was closer to 99.99%.

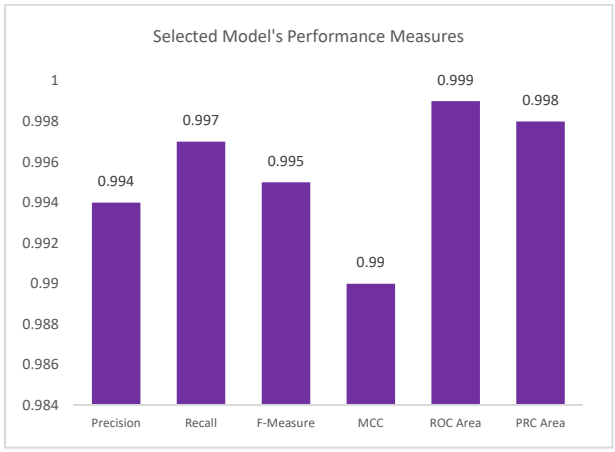

Figure 8: Performance Metrics of selected Models.

We discovered that model 8 based on KNN, DT, and NB outperformed all other models in terms of processing time and Evaluation metrics. Using the voting ensemble approach, it is determined that model 8 takes the least amount of time: 1.18 seconds. In addition, the highest values of kappa, F-measure, ROC, and MCC are 6.39, 98.20, 99.60, and 96.40. It has a mean absolute error of 7.87 percent, RMSE of 17.72 percent, a RAE of 15.91 percent, and a RRSE of 35.68 percent. Model 8 has a RRSE inaccuracy of 27.94 percent, and its minimal effect is 0.6 percent. However, the most time and resource costly approach, model 8, has the largest influence.

5.2 Fog Layer Result Analysis

As a result of the newly added data, we can now analyze the effectiveness of model 8, which combines KNN, Naïve Bayes, and Decision Tree as the model's primary models with voting to create an ensemble model.

5.2.1 Evaluation Metrics

Fog layer evaluation metrics reveals how nicely our model is performing in the fog layer. Figure 9 shows that under the chosen model, every evaluation method is almost equal and at or near the top. When looking at the ROC and MCC curves in conjunction with the F-measure, we see that the averages are 99.9 and 96.40 respectively.

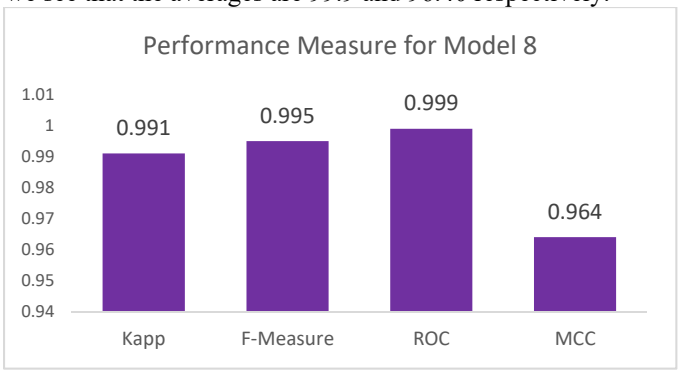

Figure 9: Various Evaluation Metrics

5.2.2 Correlated Errors

Figure 10 shows the various errors on the fog node.

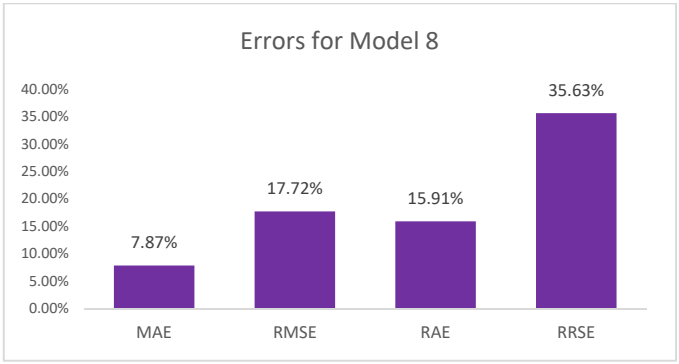

Figure 10: Correlated errors on the fog node.

5.2.3 Runtime and CPU Consumption

Voting as an ensemble approach, we also computed the runtime of our best technique as well as all other technique on the fog node. Figure 11 depicts the total time it took to complete this task. This is a test to see whether the model we choose is efficient in terms of time. Model 8 with voting has the quickest processing time for fog nodes.

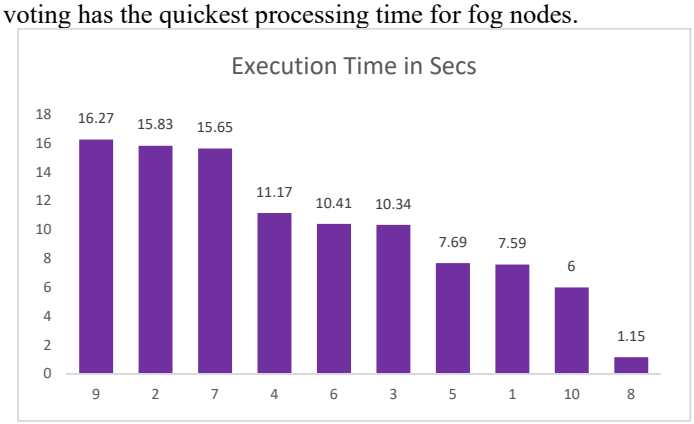

Figure 11: Processing time on the fog node for various models.

Additional calculations were made to determine how much CPU was used in the fog layer. Only a little percentage of the CPU is used by the fog layer. As a result, no extra fog node resources are required for our approach. In addition, our method is fast to implement. This demonstrates the great efficiency of our strategy.

6. Conclusion and Future Scope

The purpose of this work is to offer a method that can offload the duty of ensemble ML model choosing to the server, while simultaneously offloading the task of real-world forecasting to fog nodes. By using this method, the server is able to manage high in-depth resource operations, while the fog nodes are able to manage real-time calculations, which simplifies and reduces the amount of effort required for real-time attack detection. On the NSL-KDD dataset, the methodology that has been suggested has been evaluated. The findings that we obtained by using performance metrics, including as kappa, F-measure, ROC, and MCC, revealed that the method that was chosen to represent the cloud layer worked quite well when applied to the fog layer. In addition, the trials showed that the chosen model required a minimum of 1.15 seconds to complete the fog node. According to the findings of the study, stacking takes much more time to implement than the ensemble technique, which includes voting. The NSL-KDD dataset was used in our research. The gathering of data from a genuine testbed simulation is one of our goals for the future. At the moment, both the EU and the US each have access to a number of different testbeds.

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An Efficient Image Watermarking Approach based on Modified DWT Method to Improve the Performance

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Abstract.
In today's multimedia world, picture watermarking has become an essential component. Watermarking is a technique for securing information from tampering and ensuring integrity of data by injecting additional context to an original picture. Complicated and expensive, frequency transform domain methods diminish picture quality by reducing bit embedding. Uses the basic DCT technique with certain changes and applies it to the frequency ranges of DWT, as suggested. For embedding and extraction, the output is also employed in conjunction with a pixel alteration approach. An increase in efficiency in terms of time, imperceptibility, and stability is expected to be obtained.

Keywords. Watermarking; DCT; DWT; Embedding; Extraction; data integrity;

1. INTRODUCTION

As a signal-processing discipline, image processing is concerned with analyzing and processing images in order to produce the desired final picture, or to produce images that meet certain specifications. One must not overlook the importance of real material, as well. A digital picture's information should not be altered or duplicated throughout the digital processing of the image. Encryption, cryptography, digital signatures, and Steganography are some of the methods used to ensure the validity of material [1]. Both have their drawbacks. It is possible for a digital signature to identify changes to a picture, but it is not possible to determine the exact location of such changes. Information does not become yours when it is encrypted.

The employment of an image watermarking method [2] is one approach to provide validation, copyright, or ownership identity. Various algorithms are used to incorporate the appropriate watermark or brand into the original picture. In contrast to embedding, extraction typically goes the other way.

Digital information may be readily duplicated and manipulated because to the fast development of the Internet and digital multimedia capabilities. It is possible to leverage a watermark's security to stop material from being used illegally and to safeguard rights to intellectual property [3].

Figure 1 depicts the watermarking process. Four processes are involved: watermark creation, embedding, attacks, and recovery. Despite the attacker's best efforts, the watermark should remain hidden even if the host picture is rotated by a little amount.

Figure 2 depicts the fundamental steps involved in watermarking. Privacy via watermarking is a major problem because of a variety of attacks, including as rotation, translation, filtration, injecting noise, compression, etc. Copyrights mostly make use of frequency transform techniques [4]. Nevertheless, the integrity has worsened, thus additional bits cannot be inserted. Figure 3 depicts a picture with a watermark that may be seen. In tandem with pixel modification approaches, frequency domain approaches are incorporated, but they are time-consuming, complicated, not robust to diverse forms of assaults, and mostly capacity is lowered.

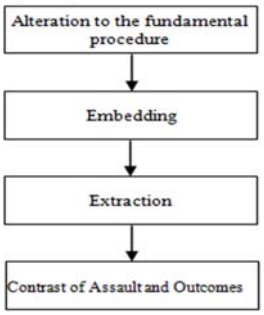


Figure 1. This is a simple watermarking framework.

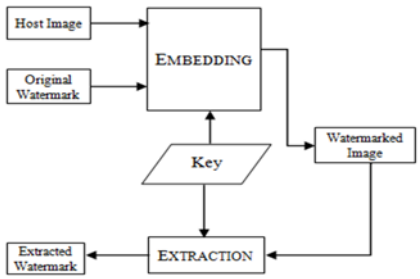


Figure 2: Process flow diagram for watermarking.

Figure 3. Watermarked image sample.

[5] In watermarking, the most essential aspect is to offer great resilience, safety, and scalability. Different forms of assaults must be thwarted by watermarking methods in the spatial and frequency transform domain. In a legal or medical matter, for example, a single photograph might be crucial evidence. Using technology such as Adobe, somebody may have made subtle modifications to the picture that would not be obvious to the naked eye. This would cause large alterations in such circumstances. Using fuzzy preprocessing is necessary if the photos are impacted by uncertainties and errors that influence the entire situation. Characterization of Watermarking Methods by kind of attack is shown in Figure 4.

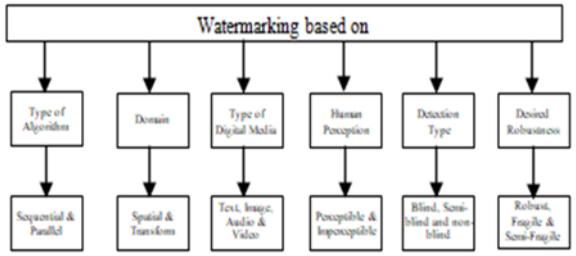


Figure 4: Techniques for watermarking categorization.

In this technique, improvements are made to the unifying framework and existing approaches are combined to create amethod for embedding and extraction. Then, a variety of assaults are used to evaluate the efficiency [6]. As a starting point, the fundamental goal of this study has been to provide a novel way for embedding and extracting data utilizing a hybrid method that includes modifications. It is therefore possible to compare the suggested technique's effectiveness with the efficiency of current solutions.

In this work, adjustments to DCT methodologies and mixtures of DWT, as well as modified approaches with pixel modification that remove the need of DCT for detecting DC parts in spatial domains, are implemented and analysed.

2. RELATED STUDY

Watermarking approaches for copyright and ownership recognition are covered in this area of the research. Watermarking is a popular approach for squaring the patient's relevant data for assessment in medical photographs. It has been determined that the effectiveness of an invisible watermark in a medical imaging application may be examined under a variety of assault scenarios. Nonetheless, most techniques fail to perform well when subjected to rotation assaults in copyrighting attacks. There is a test case of the medical photo watermarking approach for varying degrees of rotation assaults in this dissertation. Edge detection and dilatation methods are used in the construction of an undetectable watermarking approach for medical images. The dilated picture of the high frequency wavelet band is employed as a key for embedding by author [7]. Scaled As a watermark, dilated values are combined with a Gaussian noise template. The high frequency subband of the watermarked picture during the second level DWT decomposition is employed for watermark extraction during the redevelopment process.

Rebuilding quality is examined for various edge detector configurations and by adjusting scaling settings in conducted to test the technique's effectiveness against differing degrees of rotation assaults. Using the Canny edge operator and larger scaling variables under rotation attacks, it was shown to be the most effective method of obtaining the watermark during reconstruction. For various medical pictures, a parametric research is carried out using Mean Square Error and Signal to Noise Ratio. Copyright protection for digital goods is under significant threat as a result of the fast advancements in digital signal processing and computer network technologies. It is via the use of digital watermarking technology that copyright protection and content authentication are both made possible. A deep learning-based watermarking technique for color images is presented in publication [8]. The image's distinctive characteristics may be gleaned using the YUV color space, DCT, and binarization of the chrominance component. Testing results shows that the method is resistant to noise, compression, filtering and cropping, and successful copying assaults.

These days, many kinds of multimedia data, including text, images, music, and video, are created on a regular basis. Multimedia data security is the most important concern. Intruders have easy access to multimedia data and may quickly alter it. It is possible to safeguard multimedia data from illegal access by using watermarking and steganography methods. The data is hidden in the carrier signal via watermarking. Using Steganography, digital data (e.g. data files like audio, video, and text) may be hidden in another digital file. Maintaining watermark integrity is one of the primary goals of the watermarking process. As soon as an intruder attempts to corrupt or erase the watermark from the digital transmission, it's no longer usable. Different uses of watermarking, properties of watermarking, and the fundamentals of image processing are discussed in article [9]. In addition, the literature on digital picture watermarking is thoroughly reviewed in this research. We've also covered a few of the more advanced methods of optimization.

A new non-blind watermarking method for protecting personal information has been developed [10]. Using the signature of the document's owner as a watermark, the document's ownership and authenticity may be confirmed and preserved. Unlike other current approaches, the one we've described is dependable while also being almost undetectable. Relative and absolute findings reveal that the suggested strategy produces outstanding outcomes in experimental simulations and assessments. Multimedia data, such as digital photographs, are increasingly being used and produced as a result of the widespread usage of smart products and open networks. Although it has certain benefits, intellectual property violations have arisen as a result of this [11].

Watermarking digital images is a promising solution to these problems. When it comes to protecting intellectual property and improving the security of digital photographs, a new watermarking method is proposed in article [12] [13] that uses reversible data concealing with contrast enhancement. Reversible data hiding is used to hide a watermark logo in the spatial domain of the original picture such that the logo is exposed and the watermarked image is returned to its original form utilizing reversible functionality, which increases contrast and hides large amounts of data bits. Using the suggested method in a real-world setting has shown to be successful [14] [15]. The system's performance is compared to what is already available [16] [17].

3. METHODOLOGY

In both sectors, picture watermarking employs a variety of techniques. A wide range of picture watermarking techniques are utilised for both domains, including methods that alter the values of pixels, LSB-based watermarking, and DWT-based watermarking, among others. In all of these strategies, geometric and image processing assaults are not completely thwarted. DC components must be found using DCT in order to use these strategies.

Thus, the answer to this problem is a mechanism that modifies a fundamental procedure and removes the usage of DCT to discover DC components. Modifying DC and changing pixel values in the watermark is done as per the new approach, and then those watermark bits are replaced in the hosting file's DC components using the new approach. Figure 5 depicts the suggested methodology's process.

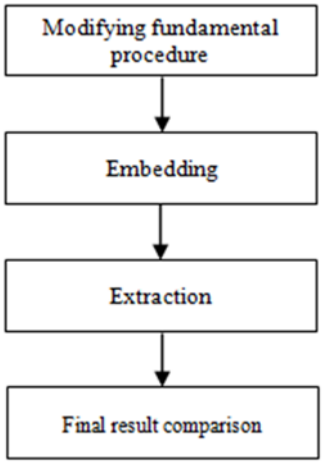


Figure 5. Proposed workflow.

Step I: Modifying fundamental procedure.

The LH band of the DWT technique is modified in the basic DCT technique to implement the alteration. DC values are updated and the frequency band is recalculated before further analysis is carried out. Figure 6 depicts the alteration of DC components. Tables 1 and 2 illustrate the embedding and extraction of DC coefficients that have been adjusted.

Block Image				
Pixel	1	2	3	4
1	52	52	50	54
2	50	53	55	55
3	53	52	54	56
4	53	57	54	50

Table 1. Calculation of DC Coefficient.

Resulted Image				
Pixel	1	2	3	4
1	56	56	54	58
2	54	53	55	55
3	57	52	54	56
4	56	57	54	50

Table 2. Updated DC Coefficient.

Attacks and Result Comparison.

To determine the actual and changed values, the operations were carried out on the host image. Next, a side-by-side comparison is carried out. Figure 6 depicts the whole process of embedding, extracting, attacking, and comparing results.

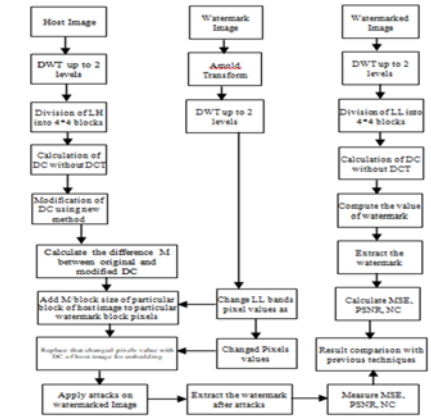
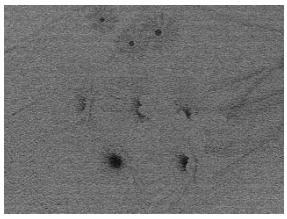


Figure 6. Proposed embedding, extraction algorithms, attacks, and result comparisons.

4. RESULTS AND DISCUSSIONS

The following is how the initial change to the fundamental method is carried out here. When it comes to DC, there is no need for DCT or IDCT since it is immediately implemented in the spatial domain. Figure 7 shows a MATLAB simulation of a redesigned DC source.

Original Host Image



DCT Image

Inverse DCT

Result after modifying each pixel

Figure 7: Alteration based on DCT.

For the Block Image, the DC component is calculated using Tables 1 and 2.

4.1 Embedding and Extraction Process

Figure 8 depicts the end outcome of the watermark encoding and decoding process. Several assaults, including scaling, resizing, adaptive filtration and salt and pepper noise and Gaussian noise are presented in the following examples of watermark extraction. After scaling a picture to check for scaling assaults, the watermark is recovered in Figure 9. Using the suggested watermark extraction technique, Figure 10 shows how the first watermarked picture is clipped from all four edges and the watermark is then retrieved. An image-filtering assault is made to the watermarked picture in Figure 11 before the watermark is retrieved using a high-NC algorithm.

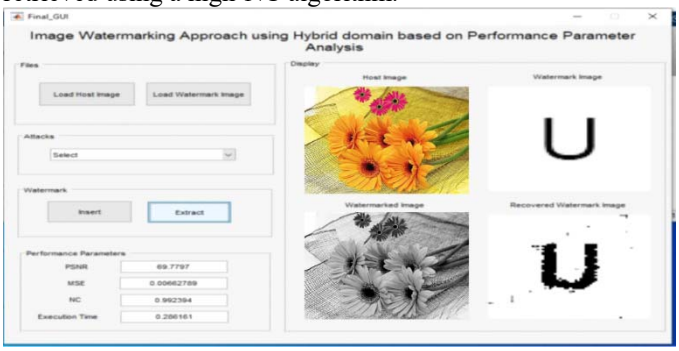


Figure 8: Embedding and extraction using the Suggested method.

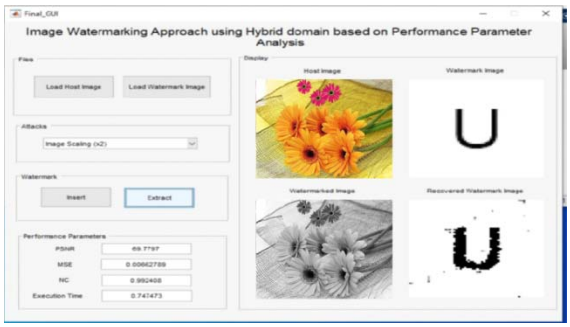


Figure 9: Image scaling attack and extraction of watermark after scaling of watermarked image.

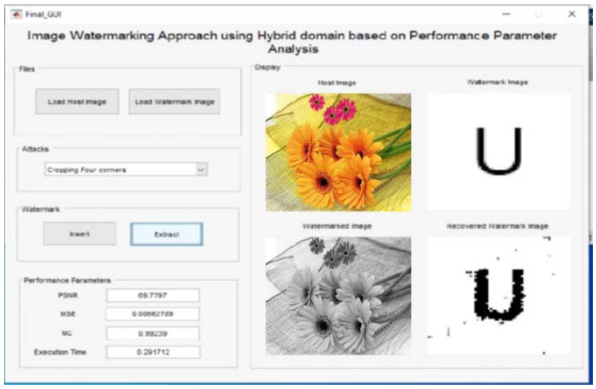


Figure 10: Cropping attack and extraction of watermark

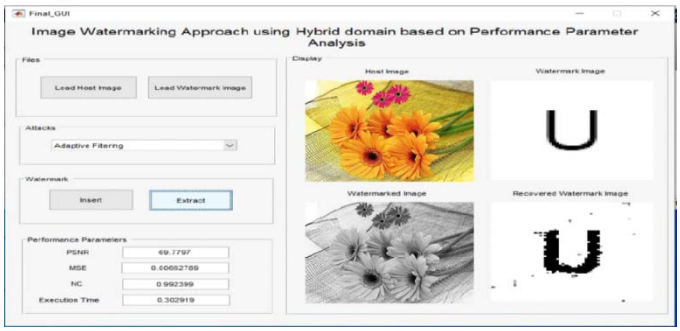


Figure 11: Adaptive filtering attack and extraction of watermark after filtering the watermarked image.

Salt and pepper noise is used to mask the watermark in Figure 12, and then the suggested approach is used to remove it. The normalized relationship is measured by comparing the original and retrieved watermarks. Table 3 compares the retrieved watermarks from various assaults with the original 64 x 64 watermark.

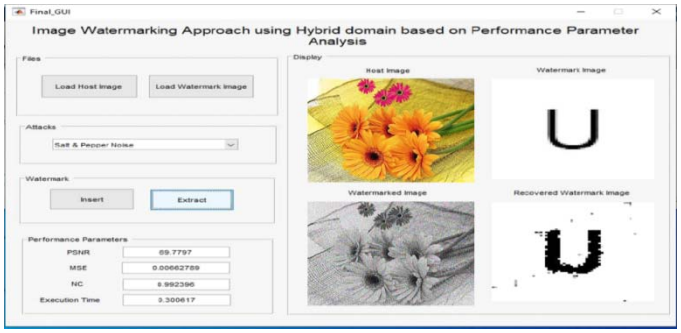


Figure 12: Injecting SP noise on the watermarked image

Original Watermark	Extracted Watermark			
	Scaling	Cropping	Adaptive filtering	Salt & Pepper noise
				

Table 3: Comparison of extracted watermark image of size 64 × 64.

4.2 A Real-Time Image Embedding and Extraction

Different resolution photos are utilized to measure the capacity. Images with watermarks are subjected to various assaults, which are subsequently used to remove the watermark. Histogram equalization, Gaussian noise, sharpening, and other methods are among the attack options. Using the suggested technology, watermarks may be embedded in real-time images as shown in Figure 13. An assault on a watermarked picture is shown in Figure 14, where the suggested approach is used to remove the watermark from it. Gaussian noise is applied to the watermark in Figure 15, and the watermark is retrieved after the noise is injected. Using the extraction process, a watermark may be removed from the picture in Figure 16.

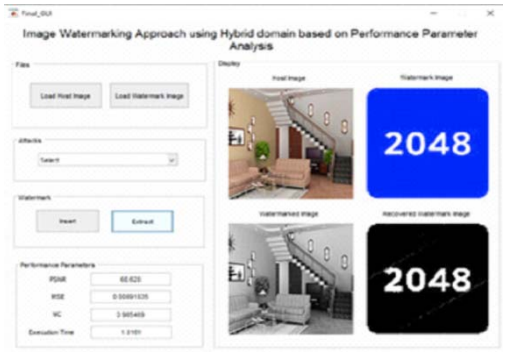


Figure 13: Embedding and Extraction using the proposed method for a real-time.

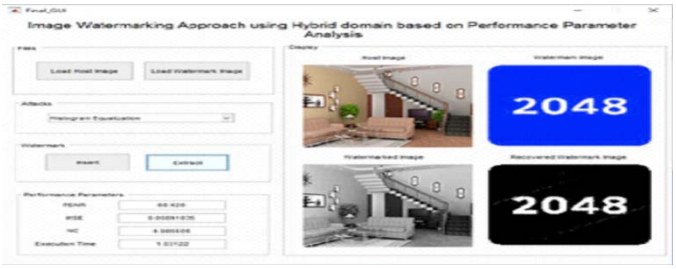


Figure 14: Applying histogram equalization

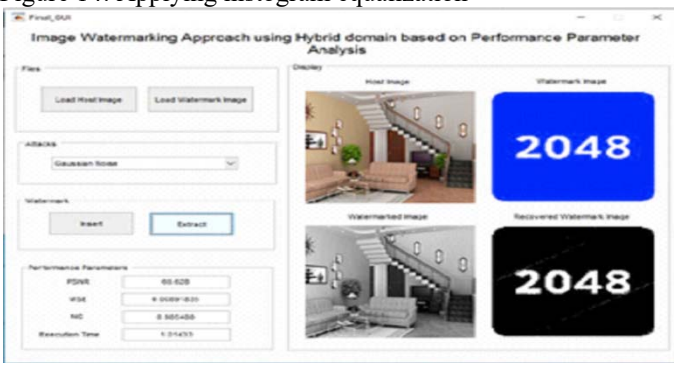


Figure 15: Injecting Gaussian noise

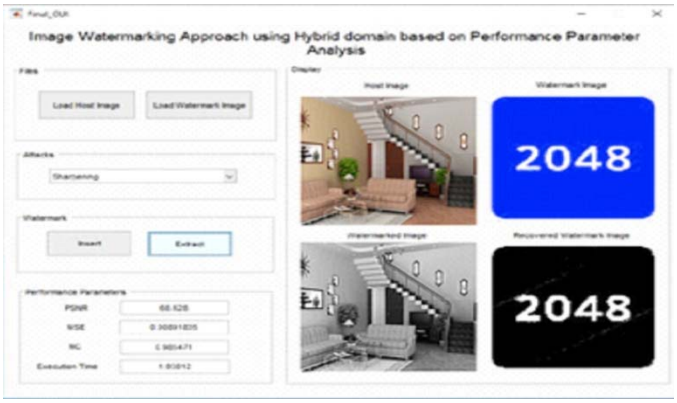


Figure 16: Sharpening watermarked image

Retrieved watermark is compared to original watermark in the following Table 4 to verify for resemblance and to measure normalized relationship, as shown

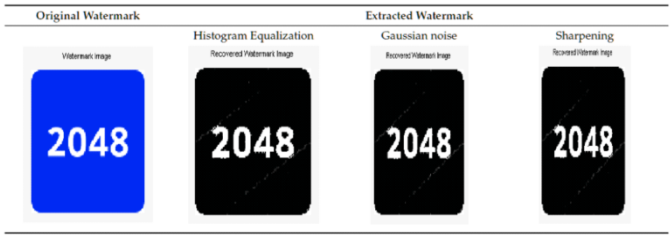


Table 4: Extraction of watermark Comparison

Existing and suggested methods are shown in Figure 17. NC should be as close to one as possible. This implies the technique is particularly resistant to a variety of assaults. Based on the graph, it can be determined that the suggested strategy is the most effective against all known forms of assaults. Increasing the size of the host and watermark images reduces the value of NC while also lengthening the time it takes to execute.

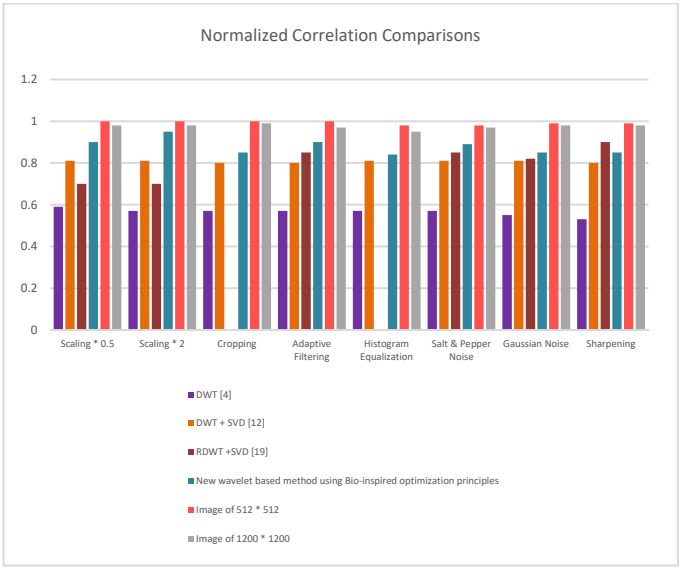


Figure 17: Comparison of Normalized correlation graph.

Figure 18 shows a comparison between the proposed technique and the current one based on PSNR, MSE, execution time, and NC value. Watermarking requires a high level of durability and resistance to deformation. DWT has been widely applied in earlier watermarking systems. Nevertheless, coefficients in the LL band frequency have strong resilience but poor distortion resistance, resulting in incorrect watermarking. DC coefficients are altered in the suggested technique, and then watermarking is carried out in the spatial domain, resulting in both high resilience and greater resistance to distortion. The suggested technique is more flexible and gives a better description of time and frequency. The drawbacks of utilizing DCT may be mitigated by not using DCT to locate DC, which increases execution time and MSE. The suggested technique may be used to a wide range of picture resolutions. The peak signal-to-noise ratio declines as the size of the base picture and watermark rises, but stability and runtime and mean square errors rise.

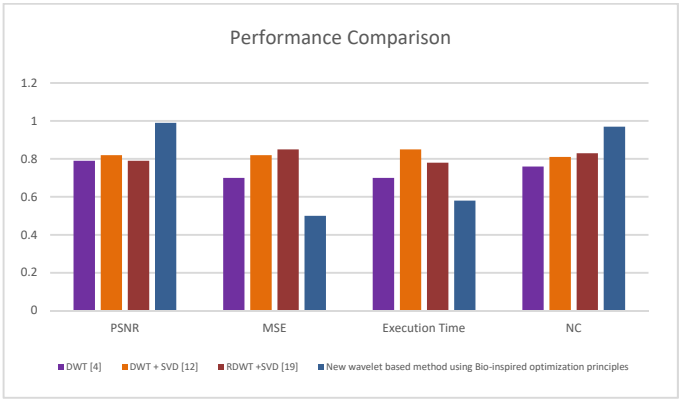


Figure 18: Performance Comparison Graph

5. Conclusion and Future Scope

Different watermarking methods are discussed in this paper. Additionally, other sorts of assaults on photographs have been addressed. The quality of the original picture should not be affected by the inclusion of a watermark. Work has been performed extensively to develop systems that are imperceptible, resilient, secure, and scalable. The primary goal of this project is to ensure long-term viability and high capacity. The basic technique is therefore altered, and embedding is carried out using a mixture of altered methodologies and established DWT methods; this cumulative approach is then used with pixel

modifications, which improves capacity, reliability and imperceptibility while decreasing the overall execution time. MSE, PSNR, NC, and time are among the four metrics used to determine if the new approach improves on the old one. Instead of using SVD, RDWT, etc., DWT is used in this system. The same methodology may be utilized for video watermarking, and the same procedure can be employed.

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Augmented Domain for Hepatic Bruise During Image Based Robotic Liver Surgery

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Abstract.

Hepatobiliary surgery may now be performed with less trauma to the patient because to the advent of robotic liver resection (RLR). Patients with hepatocellular carcinoma (HCC) may advantage from minimally invasive surgery, which is often accompanied with preexisting liver damage. Hepatectomy's therapeutic benefits are not clearly established despite these important benefits of robots in surgical methods. Thus, we analyzed the surgical outcomes of 57 HCC instances in 46 subjects who had RLR, as well as the long-term outcomes. Robotic anatomic liver resection for HCC feasibility and safety were assessed by the comparison of the outcomes of the AR group with the non-anatomic resection (NAR) group. An aggregate console time of 489 minutes, a blood loss of 190 g, and one open conversion were recorded in this study of 57 people with liver disease (3%). With an 11 percent significant rate of complications and no 90-day fatality, postoperative data revealed that the liver function recovered well. AR was associated with lengthier operating and nursing times, higher loss of blood, and worse postoperative liver function than NAR because of the bigger size and complexity of hepatectomy for more malignant tumors.

Keywords. Hepatic Surgery; Robotic surgery; AR; image-guided surgery; AI

1. INTRODUCTION

A growing number of abdominal surgeries are now being performed with robots, which include urological, gynaecological, and upper/lower gastrointestinal procedures. In Hepatobiliary and pancreatic surgery, however, robotic systems are still restricted due to technical complexity and a lack of adequate tools. RLR (robotic liver resection) is one procedure that is still under development. Short-term outcomes of RLR have been published by many researchers, and the performance was compared to those of traditional laparoscopic or open liver resections in most investigations. As a Hepatobiliary surgical procedure, RLR has yet to be thoroughly tested for its practicality, safety, and effectiveness. Due to its ability to integrate the many benefits of laparoscopic surgery with the maneuverability of an open technique, robotics platforms have gotten a lot of interest in liver resections since their introduction. Laparoscopy has been shown to have comparable oncological outcomes to open surgery in terms of healing time, discomfort, morbidity, and severe bleeding after operation [1] [2]. While technically demanding hepatectomy have their benefits, they also have significant drawbacks, most notably limited mobility, inflexible tools, and a reduced field of view or quality of vision [3].

More studies and meta-analyses have been published in the article demonstrating the well-known benefits of robotic surgery with similar post-operative and oncological outcomes [4]. Beyond the technological advances, the DaVinci system allows surgeons to be directed by before operation and/or after encountered imaging during parenchymal excision using a specific software interface rather than a basic operational field [5]. One way to look at the robot is as a way to place a computer between the surgeon and the patient. Augmented Reality (AR) and other imagery solutions have been created to aid the operator and minimize the inherent limitations of a minimally invasive method, such as the absence of tactile input, which might impair tumor diagnosis or pedicle dissection.

A hepatectomy known as an anatomic resection (AR) removes the anatomic liver area provided by the matching portal vein branches with utmost precision and completeness. Even tiny tumors with portal vein tumor invasion may be successfully treated with AR, which has a good cure rate for HCC. Ontologically, AR is superior to NAR in individuals with HCC, according to many studies. Consequently, in certain patients with HCC, AR is a suggested method of resection, based on their hepatic functional reserve. Professionals have done most of the laparoscopic liver resections (LLRs) in recent years, despite significant advancements in the procedure. Another question is whether robotic AR is safe or even possible.

2. RELATED STUDY

Using Indocyanine Green (ICG), liver surgeons may boost their ability to see anatomical features by giving a real-time liver mapping. This approach is effective because of its fluorescence qualities. There were 40 successive clients who had robotic-assisted hepatic resection for cancers from June 2014 to November 2017 who received ICG-fluorescence staining. Colorectal liver metastases were the primary surgical reason for 55% of clients, preceded by hepatocarcinoma in 35% of cases. Resection margins of 12 mm were the most common, with a 100% success rate. Twenty percent of people reported tumor recurrence. There were 91 percent and 84 percent overall success rates at one year and two years, respectively. In the first year, 77.2 percent of patients were clear of illness, but in the second year it was 65 percent. In 12 of the 40 patients who underwent the staining procedure, the earlier indicated transaction line had to be redrawn. The ICG-F discovered 52 liver surface lesions, comprising two superficial colorectal tumors ignored by intra-operative ultrasound, whereas 43 tumors were found using white-light liver surface investigation and intra-operative ultrasonography.

Robot-assisted Hepatobiliary treatments are on the rise as a result of recent advancements in robotic surgery. Nevertheless, the lack of tactile input is a drawback to robotic surgery. As hepatocellular tumors and their metastases increase indocyanine green (ICG), a luminous dye, may be useful. A near-infrared camera that is built into certain robotic systems may let surgeons see the

buildup of ICG, allowing them to conduct surgery more precisely. Subjects with hepatocellular carcinoma and colorectal cancer metastases, but also those from other sources, were studied by author [7] to see whether preoperative ICG application and intraoperative ICG usage were feasible. ICG preoperative preparation and intraoperative usage in patients having robot-assisted liver resections were investigated in this single-arm, single-center trial. The final study comprised twenty individuals.
Patients with severe liver cirrhosis and those who use it too late before surgery have difficulties. It is possible that intraoperative ICG staining will be helpful for patients having robotic hepatic surgery. There is further work to be done in terms of determining the proper dosage, timing, and level of fluorescence intensity.
Whenever augmented reality (AR) is employed in laparoscopic liver resection operation, the researcher of [8] wants to know how accurate point-based registration (PBR) really is.
An evaluation phantom with divot holes was used in the research; a person-specific liver phantom with CT scan markers was used in the study; and in vivo, the anatomical expertise of the surgeon was relied upon to annotate the PBR sample targets. Picture identification was performed utilizing five randomly chosen locations for target and fiducially registration errors (TRE/FRE). Both TRE and FRE increased throughout the practical experiments, demonstrating that AR is not a robust method for calculating image-to-patient registration. Furthermore, it was found that the amount of data to be recorded had an impact. To avoid large-scale mistakes in AR systems, it's best to minimize both labeling mistakes and the quantity of registration quantities.
The author of article [9] described an AR-assisted liver surgery guidance mechanism that depends on a rigid stereoscopic laparoscope. To create an intraoperative 3D liver surface, unsupervised convolutional network (CNN) architecture uses the stereo picture sets from the laparoscope. V-Net framework for volumetric visual data is used to create 3D models of the person's surgery field using preoperative CT scans. Surgeons may see malignancy, their surgery margins, and the arteries that supply them in real time by overlaying preoperative 3D models on live laparoscopic view using a Go-ICP technique, which is used to enroll the pre-and intraoperative models into a single coordinate system. In persons who had serious hepatectomy for hepatocellular carcinoma, the author [10] investigated if pre-operative 3D assessment offered good long-term life expectancy results than the usual 2D evaluation (HCC). Propensity score matching was used in this retrospective analysis to compare persons who had pre-operative 2D assessment with those who had pre-operative 3D assessment. Long-term survival results following major hepatectomy for HCC were the main objectives in both categories. Overall survival rates were much improved with 3D preoperative examination compared with typical 2D evaluation [11].

3. METHODOLOGY

3.1 Patient selection

For tumors that were less than 10 cm in diameter and did not require significant arterial or biliary structures to be repaired, minimally invasive liver resection was the preferred option of technique. When tumors were 10 cm or greater in the centre and there was a suspicion of invasion into the main hepatic veins, we opted for open surgery. We don't have any specific condition among LLR and RLR. In situations where the tumor thrombi had to be removed, open or automated surgery was the only option. Open surgery was not insured by national insurance throughout this research process and was conducted on individuals at their own cost [12] [13]. As a result of this consideration, the resection method was chosen in this research because of its cost-effectiveness and the presence of the device in the clinic. Open, laparoscopic, and robotic hepatectomy techniques all used the same criteria for determining which hepatectomy methods to use based on the patient's hepatic functional reserve and remaining liver volume. There were several factors to consider while dealing with a patient who had had multiple liver resections: the volume of prior resections, the location of the tumor and its size, and preoperative imaging [14] [15].

	Total Cases	**AR**	**NAR**	**P-value**
Age,	71 (20-82)	72 (20-82)	71 (54-82)	0.56
Gender, Male/Female	43/14	18/5	22/12	0.23
Hepatic Function				
Tuberculosis	0.8 (0.4-1.6)	0.9 (0.7-1.2)	0.8 (0.2-1.6)	0.53
Liver Cirrhosis	57% (33)	37% (9)	66% (22)	0.02
malignancy Characteristics				
malignancy size, cm	2.3 (0.7-12.8)	2.4 (0.8-12.6)	1.9 (0.7-10.4)	0.003
malignancy no	1 (1-5)	1 (1-5)	1 (1-6)	0.55
Difficult segments (n)	52% (30)	64% (14)	43% (15)	0.16

Table 1: Background Patient and Tumor Characteristics

3.2 Patient Characteristics

Table 1 lists the features of the 57 HCC patients who had RLR treatment. In a nutshell, the average client age was 71 years old at the time of resection, with men being the majority (n = 42; 74%). All patients had a Child-Pugh class A hepatic functional reserve. The average acceptance rate of indocyanine green at 17 minutes was 15.2%. Thirty-one individuals had postoperative histological evidence of cirrhosis of the liver (54%).

Types of liver surgery	**No**
AR	23
liver parenchyma on the right side	3
liver parenchyma on the left side	2
Right anterior sectionectomy	1

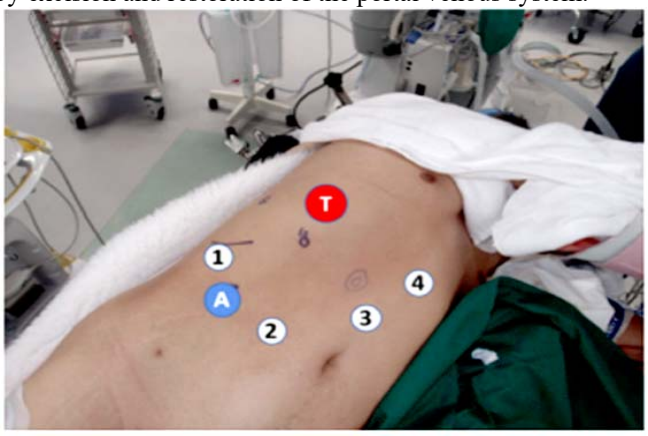
right posterior sectionectomy	2
Left lateral	3
segmentectomy	8
NAR	34
I	3
II	2
III	7
IV	4
V	3
VI	3
VII	2
VIII	10

Table 2: Various Types of robotic liver resection

3.3 Various kinds of liver resection

The 57 RLR patients' liver resection types are shown in Table 2. AR was used in 23 instances (40%) while NAR was used in 34 cases (80%). In 22 patients, there were 23 AR resections, and in 26 patients, there were 34 NAR resections.

Two AR procedures were performed on one of the victims. Twenty-one of the 26 patients receiving NAR have only had one NAR, four have had numerous NARs, and one has had both a NAR and an AR. AR and NAR were performed on two individuals who had numerous tumors in the same procedure. The AR group included these two patients. Major anatomic sectionectomy were performed in 16 of the 23 (70 percent) patients with AR-treated liver tumors. Both tumor thrombi in the right portal vein were eliminated by excision and restoration of the portal venous system.



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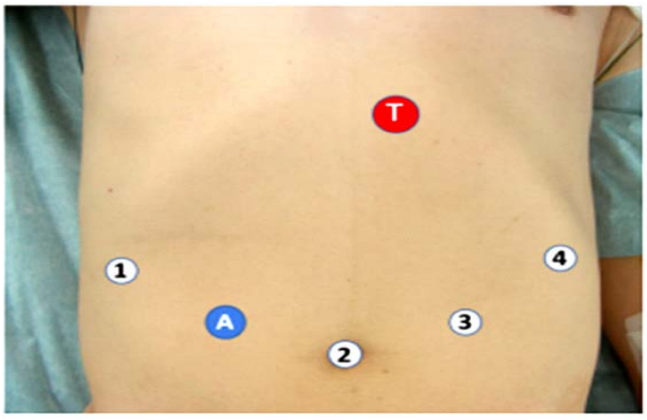


(B)

Figure 1: Positioning of the Patient's Body and the Point.

Operative treatments other than hepatic resection were done in 14 percent of the instances when hepatectomy was undertaken. The AR was used in two of the eight non-hepatectomy surgeries. Recurrent resections with RLR were done in 21 of the 57 instances handled with RLR (37%), in 12 of the 46 individuals (26%). Eight patients had open surgery, two underwent laparoscopic surgery, and eleven underwent robotic surgery.

3.4 Representative Procedures During Robotic AR

Figures 2-4 depict robotic AR methods utilized in robotic anatomic segmentectomy VIII. Anterior portion Glissonian pedicle root may be easily accessed by the cystic plate cholecystectomy, which is the initial surgery (G-ant). The hilar plate is attached

to the liver parenchyma by many pieces of fibrous tissue, which we refer to as the pillar. When anchoring are divided, the area between the hepatic cells enclosed by Laennec's capsule and Glissonian pedicle sheaths is readily created and entered. Extrahepatic separation of the G-ant is made possible by Laennec's capsule-based layer dissection at Gates IV and V in accordance with the Gate hypothesis [Figure 2A and B]. With comparison to the open operation, the enlarged caudal view of the hilum in laparoscopic and robotic techniques seems to be more effective for precise layer dissection and pedicle isolation. Additionally, adjustable tools are quite beneficial during robotic dissection of the hilar pedicles. In the next step, the G-ventral ant's surface is dissected, and the G-ant segment V (G-V) pedicle is outlying outside the body. As a consequence, the G-VIII pedicle is isolated from the rest of the G-ant tape by passing the right stump beneath G-V and then switching cranially over G-V [Figure 2C].

The subtraction procedure is used to isolate deeper pedicles. Before beginning parenchymal dissection, the isolated S-VIII becomes ischemic by clamping G-VIII [Figure 2D]. After clamping G-VIII, an intravenous infusion of ICG clearly shows that S-VIII is stained negatively in the Firefly mode [Figure 3B]. A parenchymal dissection begins with a tracking and exposing of the MHV's root in a cranial-caudal direction [Figure 4A] when confirmation of the S-discoloration VIII's is confirmed. To further dissect along the RHV from cranial to caudal, the root of the vein is revealed in a similar fashion. The S-VIII split many MHV tributaries. G-VIII, which had been outlying at the hilum, is now left vulnerable after parenchymal resection. This is done in such a way that G-VIII and G-ant aren't jeopardized [Figure 4B]. It is possible to separate many G-VIII branches on their own. During anatomic segmentectomy VIII, the Pringle technique is seldom used.

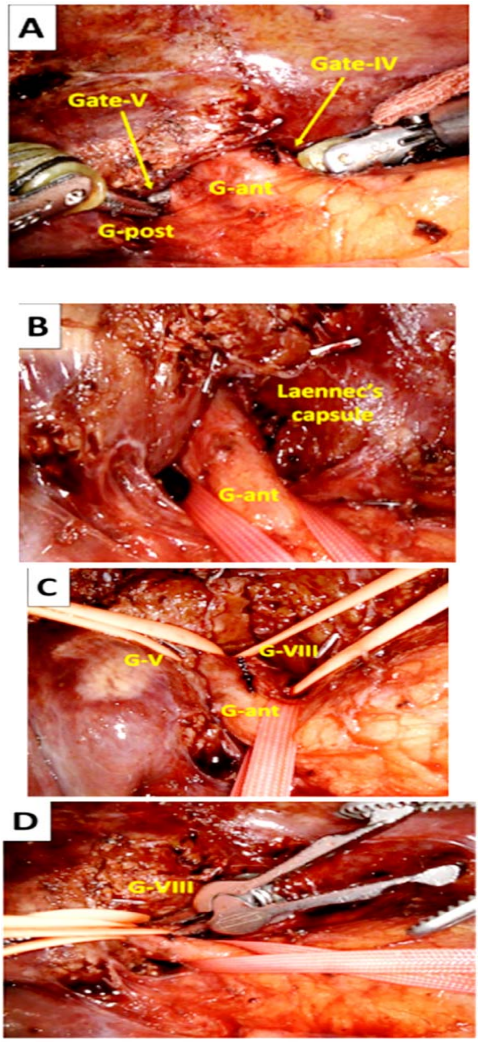
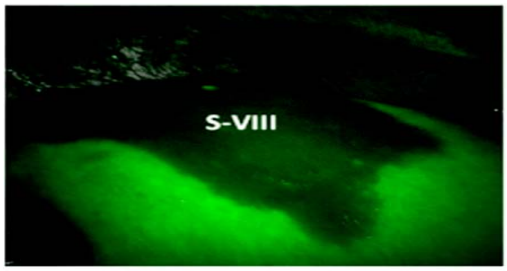


Figure 2: Hilar Dissection in Robotic Anatomic Segmentectomy

(A)



(B)

Figure 3: Discoloration of the segment. (A) Normal endoscopic view. (B) The intravenous infusion of indocyanine green

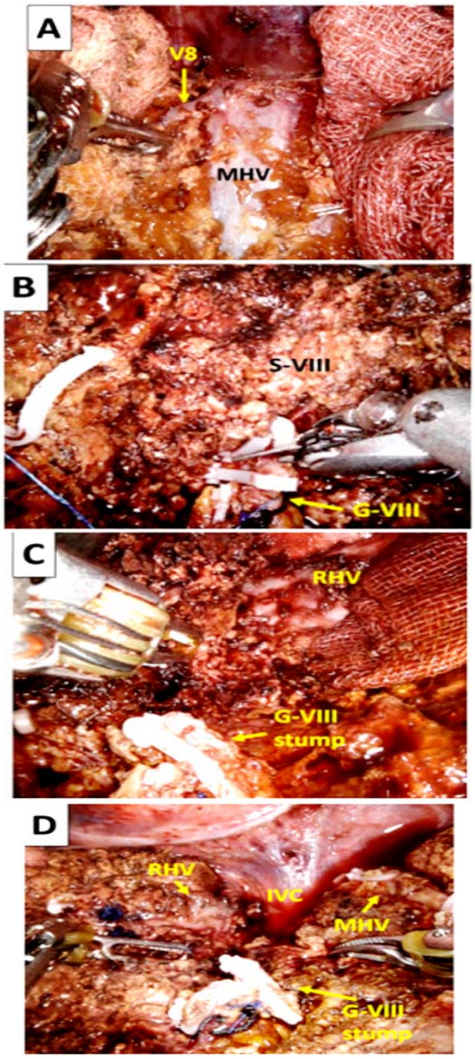


Figure 4: (A) HV base and front wall of the main liver vein (B) HV base in the middle of the cranial-to-caudal (C) HV base of the right liver vein (RHV) is exposed cranially. (D) The final surgical image after a robotic anatomic segmentectomy

4. RESULTS AND DISCUSSIONS

Data from the AR and NAR categories are included in Table 1, which compares all 57 instances. Preoperative serum TB, Alb, AST, ALT, and PT values in both groups of patients were similar in age, sex, and gender distribution. AR patients had a more accurate assessment of liver functional reserve, as measured by blood PC and ICGR15, than those in the NAR group (all of whom had Child-Pugh class A disease). More people in the NAR group had (histological verified) liver damage comparing with AR group, and this difference was statistically significant. The AR group had considerably larger tumors than the NAR group (2.5 cm vs. 1.8 cm; P 0.001), however the tumor count per instance was the same in both categories (n = 1). There was a substantial difference in hepatic functional reserve between individuals who received AR and NAR, and bigger tumors were more likely to be removed during AR. There was a superior contrast among the AR and NAR class in terms of tumor stages (P 0.03), with the AR group having a larger percentage of patients with tumor phases I or II.

4.1 Short-term results of RLR for HCC

There were 57 patients with HCC who received RLR, and Table 2 demonstrates the short-term results of the AR and NAR class. Both groups had equal frequencies of concomitant extrahepatic procedures. There was a significant difference between the AR and NAR groups when it came to estimated blood loss (EBL): 346 g in the AR class and 138 g in the NAR class (P = 0.009).

Pringle's technique was used in 12% of the 57 instances studied; the AR group had a considerably greater rate of use (26%) than the NAR group (3%). One patient who had been treated for bleeding with AR (4 percent) had open conversion.

	Overall	AR	NAR	P
Minimum operating time,	634 (60-2234)	845 (332-2184)	458 (61-1147)	<0.0002
aggregate console time	489 (48-1954)	713 (255-1967)	274 (48-854)	<0.0002
Concurrent proc	13%	10%	19%	0.34
Blood loss	190 (9-6930)	346 (48-6920)	138 (8-4986)	0.008
Pringle maneuver	13%	28%	4%	0.009
Open conversion	3%	5%	0%	0.23
Postoperative laboratory data				
Maximum Tuberculosis	1.6	1.4	1.5	0.17
Maximum AST	436	879	294	0.002
Minimum PT	66	59	68	0.006
Minimum PC	7.6	8.3	7.6	0.48
Pathological data				
R0	97%	95%	99%	0.23
Rest in Hospital	16	17	16	0.24
Postoperative complications				

4.2 Survival Data

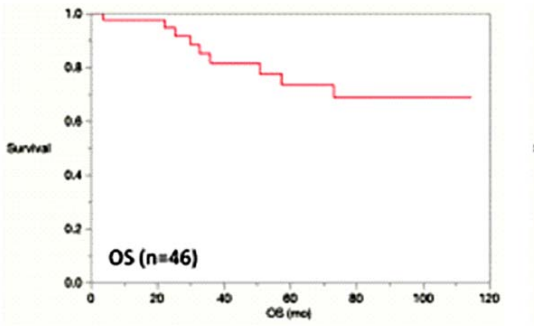
In 46 patients with HCC, the combined OS and DFS rates after the initial RLR were evaluated. A total of 98, 82, and 74% of patients had OS, whereas DFS was at a rate of 80 (42%), 42, and 31% following the first RLR [Figure 5]. In the absence of a median OS rate, the study was deemed a failure. After operation, patients' median DFS was 25.9 months long. At the earlier years following the initial RLR, for 21 malignant hepatoma cases who had robotic AR, the life expectancy rate were 95, 86, and 86 percent and the Disorder-free rates were 75, 37, and 37 percent, respectively. At the earlier years after the first RLR, the life expectancy rates were 100, 81, and 71%, and the Disorder-free rates were 74, 41, and 29%, respectively. For 25 malignant hepatoma cases who received robotic NAR as the first RLR [Figure 6]. There was no big contrast among OS and DFS rates between the AR and NAR populations.

4.3 Discussion

A ten-year retrospective analysis of 57 RLR surgeries involving 46 HCC patients performed at a single hospital examined the surgical outcomes. Moreover, all 23 autonomous liver resections were performed using the identical procedures as were used in the open liver resections and LLRs. This accurate hilar dissection may have been facilitated by robotics, which has intrinsic functional advantages such as tool articulation and an operating area that is stable. Nevertheless, a lack of parenchymal dissection equipment persists. Hemihepatectomy hemiparesis necessitates harmonic shears for parenchymal excision on a single direction, but they may be challenging to use or need skill in circumstances when the resection plane is curved or complicated. Clamp-crush methods, such as those used with articulated forceps or vessel sealers, are widely used in AR operations that require the Pringle manoeuvre. Instruments for parenchymal resection need to be improved.

Most operations were performed because of HCC in our 94 RLRs' experience (n = 57; 61%). Despite the fact that the majority of HCC patients were in the early stages, the cases and tumors features were not pleasing; there were high frequencies of basic cirrhosis (55%), tumors placed in tough regions (50%), repeat liver resections (32%). All the results of the RLR procedure for HCC and other malignancies have been judged satisfactory (in the short and long term). We found that the duration of hospitalization for AR patients was greater than that previously reported for HCC patients in our study. But reliable comparisons are difficult owing to the disparities across the research in people, malignancies and processes. We contrasted the results of the AR and NAR in order to further assess the viability and protection of robotic AR in the treatment of HCC. In comparison to NAR, we found that AR led to longer operational durations, a longer LCST, greater EBL, a higher rate of administration of the Pringle manoeuvre, a higher postoperative AST, and a lower PT. In light of the AR group's more extensive and sophisticated hepatectomy, these results appear credible. AR and NAR patients had considerably greater tumors stages, but the major complication rates and death rates were not mathematical dissimilar between classes, and R0 resects rates were also not statistically different between the two groups of patients. Even though robotic AR requires extensive training and experience, it may be a safe and effective method of removing HCC from the liver in chosen individuals.

It has been shown that even with slight HV injuries, severe CO2 gas embolism and considerable hypotension may develop. In addition, the AirSeal system was not associated with any systemic issues when it was discontinued. Since the main HVs are frequently exposed during parenchymal dissection in AR, our results and the mechanical activities of the Air Seal system suggest that we should keep away from utilizing this system. Significant issues associated with AirSealsystems do not only affect RLR patients. As a result of AR exposing a large HV, we encountered CO2 embolism during LLR. Surgical-site problems, on the other hand, were very rare. Nevertheless, an evaluation of surgical-site risk of complications across open, laparoscopic and robotic AR utilizing comparable procedures is necessary.



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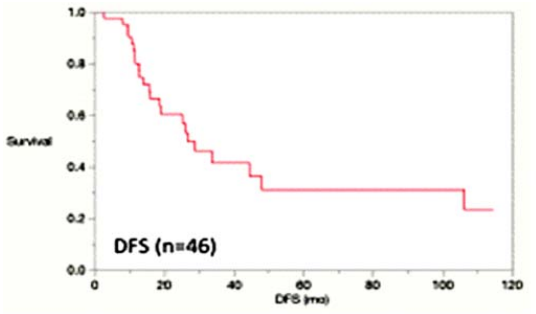
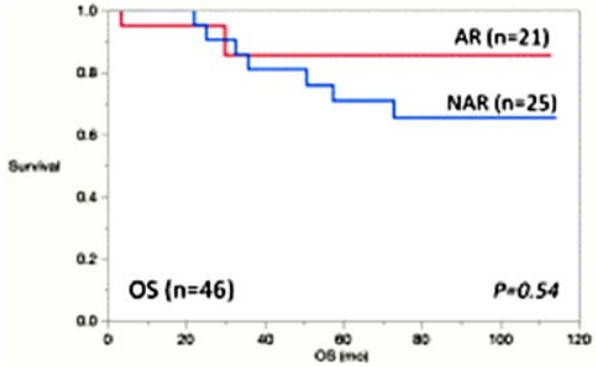


Figure 5: (A) cumulative life expectancy after first RLR; (B) disorder-free survival after first RLR



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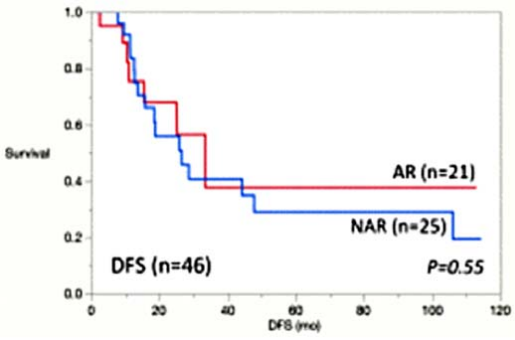

(B)

Figure 6: (A) Analysis of cumulative life expectancy between the AR and NAR; (B) The AR and NAR were compared in terms of disorder-free survival.

RLR and LLR has never been the subject of a randomized control study. Methods and indications for surgery are same at our facility. Because RLR is not covered by any insurer, as well as because there aren't any machines available in the hospital, randomized trials are not feasible. Future randomized research, as well as studies using propensity-score matching, is necessary. Despite its strengths, this research has certain drawbacks. Because of the limited number of participants, this research has some limitations. Second, as previously noted, the lack of health insurance for RLR had a significant impact on the choice of methods.

5. Conclusion and Future Scope

Hepatobiliary surgery may now be performed with less trauma to the patient because to the advent of robotic liver resection (RLR). People with hepatocellular carcinoma (HCC) may profit from minimally invasive surgical, which is often accompanied with pre-existing liver disease. Hepatectomy's therapeutic benefits are not clearly established despite the inherent advantages of robots in surgical methods. Thus, we analyzed the surgical outcomes of 57 HCC instances in 46 patients who had RLR, as well

as the long-term outcomes. A total console time of 487 minutes, a blood loss of 194 g, and one spontaneous conversion were recorded in this study of 57 people with liver disease (2%). With an 11 percent significant rate of complications and no 90-day mortality, post operative data revealed that the liver function recovered well. Because of the larger size and complexity of hepatectomy for more sophisticated malignancies, AR was related than NAR. In spite of this, the rates of significant complications, mortality, duration of hospital stay, and R0 resection were equal across the two sets of studies. Hepatocellular carcinoma (HCC) hepatectomy have had similar long-term outcomes to those previously described. In the end, RLR may be a safe and effective method of hepatectomy for patients with HCC. GPA and HV root-first one-way resection may be used to standardize robotic AR for HCC, which is safe and effective for the patient. In order to determine the value of robotic AR in the therapy of Cancer, further research comparing RLR, LLR, and open resection is required.

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A Novel Deep Learning Methodology for Identification of Stroke from MRI Brain Radiology Specification

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Abstract.
Patients who have suffered an ischemic attack might benefit from an MRI of a brain that helps determine their outlook (AIS). Although DL utilizing brain MRI as well as some visual indicators has demonstrated satisfactory quality in terms predicting terrible consequences, no research has investigated the usefulness of NLP-based data mining algorithms utilizing unrestricted summaries of AIS individuals' complimentary reporting. This really is regardless of the fact of DL combined brain MRI and similar visual biomarkers have consistently showed positive outcomes. As just a consequence, the study's goal was to see whether NLP-based ML systems could indicate negative events in AIS patients using magnetic Resonance textual information. In order to be included for this study, all British findings of brain MRIs performed on AIS patients were taken into account. Just on behavior Rating Scale, poor outcomes were defined by a rating of 3–6; the information was analyzed by competent nurses and physicians. We only looked just at MRI textual record from of the patient's first scan after hospitalization. Random assignment was used on text collection to establish a 8:2 ratio of training and testing. Each phrase, phrase, and paragraph in the literature was vectorized. Bag of word frequency has been used to represent how many instances a textual symbol was utilized inside the sentence - level approach that does never keep in mind the set of characters. Using "sent2vec" again for feeling stage and "clustering techniques" again for classification stage, the sequence of letters was taken into consideration. Search strategy and 5-fold pass approaches have been utilized to predict undesirable outcomes in comparison to current Machine learning algorithms including the convolutional neural network (CNN), extended short attention span, and multiple recurrent neural networks. The region under the receiver operator (AUROC) curves was used to measure the performance of each supervised classification model. A number of 645 people out from under a maximum of 1840 people who have been diagnosed as AIS had a negative outcome 3 months after the onset of the incident. Rf was perhaps the most efficient predictor whenever analysis was conducted at the lexical level (0.852 of AUROC). There was a difference in performance of both the manuscript approach when compared to the phrase and paragraph methods. The inter technique has the best classification efficiency of all the ML algorithms, followed by the Cnn models (0.839). To accurately predict costs of treatment utilizing NLP-based ML of radiologist unrestricted data of brain MRI, DL methods outperformed other ML techniques. In fact, inter and CNN-based strategies boosted the prediction of negative outcomes in file NLP DL more so than back - propagation neural internet approaches. Unorganized EHR data may be used as a key digital marker for DL prediction by applying recurrent neural network DL techniques.
Keywords. Magnetic resonance imaging (MRI) may be used to detect ischemic strokes and their treatment capacity.

1. INTRODUCTION

Disease is a leading cause major impairment across the globe, affecting people in rich and poor countries alike. Thus according data from the Global Burden of Disease, Injuries, and Metabolic Syndrome Project, attacks were accountable with 5.5 high mortality and morbidity and 95 million disorder life decades in 2015 [1]. To minimize accidents, which aren't really infectious but may be prevented, cardiovascular risk variables such hypertensive, insulin, cholesterol, and arrhythmia needs to be addressed? In addition, individuals who are thought to have a bad prognosis due to their stroke might have their prognosis improved by receiving rigorous therapy. Because of this, being able to accurately forecast a patient's prognosis following a stroke is essential for making prompt decisions regarding treatment and efficiently allocating available medical resources.

In recent years, machine learning (ML) and deep learning (DL) algorithms have been utilized to forecast the consequences of strokes with a greater degree of accuracy than traditional logistic modeling techniques. Lin et al. observed an ML technique that used 206 clinical factors and was able to reach an area under the receiver operating characteristics (AUROC) of 0.94 when forecasting the 90-day functional status of ischemic or hemorrhagic stroke victims [2]. This technique was possible to forecast the clients' ability to return to their previous level of function. Heo et al. noted the effectiveness of DL methodologies over the Acute Stroke Registry and Analysis of Lausanne (ASTRAL) score, which is a broadly used logistic regression-based methodology for stroke risk prediction [3]. This score is used to forecast the poor functional efficacy in patients who have recently suffered an acute ischemic stroke (AIS). With regard to predicting outcomes of patients with stroke utilizing statistical data, DL algorithms performed much better than typical providing detailed information. It was also shown that using brain magnetic resonance (MRI) in conjunction with deep neural networks improved the ability to accurately estimate myocardial damage. CTA DL employing ResNet as well as an auto encoder was reported by Hilbert to yield tall picture indicators for forecasting clinical status in AIS patients after endovascular therapy [4]. Information in health records (commonly referred to as EHRs) is typically not organized. More than half of all electronic health records (EHRs) are made up of unstructured information, such as patient notes, nursing notes, and radiography and pathologist data. The medical examination or a nurse's notes are two instances of this sort of information. NLP, or natural language processing, is a well-recognized advancement in machine learning. Textual believe that this method with machine learning algorithms can also be used to acquire critical information that can be analyzed to accurately diagnose, cure, and anticipate the result. In strokes investigation, NLP & ML

algorithms have all shown their value by proving their capacity to distinguish between the particular illness and picture phenotypic of a brain. There is a citation required for this statement. It's fairly uncommon for researchers to utilize radiological textual summaries from cerebral MRIs to forecasting potential functional status or specific traits using NLP and machine learning algorithms. As a consequence, the goal of this research was to see if magnetic Resonance information extraction utilizing NLP and Machine learning algorithms can forecast a three month functioning prognosis in AIS patients.

2. RELATED STUDY

For the purpose of classifying brain MRI data in AIS or quasi traits, researchers [7] tested the efficacy of NLP and deep learning. A single academic institution's worth of brain MRI results collected over the course of two years were randomly split into two groups for the purpose of machine learning: training (70 percent) and testing (30 percent). In order to generate the data frequency matrix, every bit of textual information was first converted into tokens by using an NLP programme. In order to address the inherent bias in the training set, ten rounds of cross-validation were used. Manual work was done to assign labels for AIS, which included locating clinical records. Again for classifiers, researchers employed naïve Bayesian categorization, decision made trees, and SVM classifiers to assess the techniques' effectiveness using the F1-measure. In addition to this, we investigated how the effectiveness of the methods was impacted by n-grams as well as term frequency-inverse document frequency weighting. The exact and computerized collection of therapeutic data trail in unorganized research may satisfy many important uses. ICD codes have the potential to incorrectly identify ischemic stroke occurrences, because they do not differentiate between severity or location. The efficient and reliable extraction of data might give a significant benefit in a number of areas, including the identification of strokes in big databases, the triage of important clinical reports, and the quality improvement initiatives. Using radiography data, the researcher of [8] developed a thorough framework for evaluating the performance of basic and complicated blood clot NLP and Deep Learning (ML) algorithms for determining the frequency, position, and intensity of an anoxic stoke. Radiological information from a cumulative value of 17,864 patients at two large university hospitals amounted to 60,564 CT and MRI scans. In order to featureurize the unstructured text, they made use of traditional approaches and built neurovascular-specific word GloVe embeddings. They used 75 percent of the 1,359 expert-labeled reports to train several binary classification algorithms to detect the existence of a stroke, as well as its location and severity. They provide a complete evaluation of NLP approaches for use with unstructured radiography text. Their results are encouraging that NLP and ML technologies may be utilized to differentiate stroke characteristics from big data cohorts for studies relevant to both clinical practice and research. Written reports, which include specifics on patients and their conditions, are where the great bulk of rich clinical information is kept. The complexity and lack of organization inherent in the natural language data modality presents a problem when it comes to the creation of standard models to be used with the data.

Using an uncontrolled method, a models workflow was developed to teach a BRNN network to provide text codes in [9]. It is possible using these text codes as characteristics fed into a binary classifier that requires amplitudes less dataset than earlier attempts to correctly distinguish among perfectly alright sickness categories, Gathered information from of the Partner's Healthcare database was utilized to build the learning algorithm. Learning on 3 independent allow appropriate resulted in areas under the curve (AUC) for occluded, strokes and hemorrhage statistics of 0.98, 0.95 and 0.99, correspondingly. The resulting work well as part may be used in conjunction with images or audio data to construct algorithms capable of handling a broad range of genres. With the ability to rapidly identify key characteristics from text information, various tests can become a more practical input for efficient and complete deep neural networks. With this, models can be built faster and textual modalities may be included. The majority of patient-generated health data are sent in an unstructured manner, namely as free-text clinical reports. This makes it difficult to make use of the data, despite the fact that the volume of patient-generated health data is growing at an exponential pace. The automation of the processing of free text has been made possible by the development of a number of natural language processing (NLP) methods, which range from statistical to deep learning-based models. Despite this, the most effective method for analyzing medical texts has not yet been identified.

The publisher [10] of such an article gives an edge evaluation of modern NLP methodologies for the reader to consider. We obtained computed tomography ultrasound data from the patient who is now being treated for one of two higher education institutions for distant metastasis. These individuals have cancer that had spread to other parts of their brain. Those entries were divided into two categories after meticulous annotation that used a binary system. Following the construction and evaluation of different backpack and set of images natural language techniques, the annotating documents were first arbitrarily split into training and testing in the ratio of 80:20. Whenever it came to the purpose of removing currently given from unrestricted medical findings, the NLP tactic that showcased the third highest achievement was indeed the backpack methodology coupled with such a LASSO multivariate regression. This would be the case for the NLP strategic plan that showcased the third highest achievement. This NLP strategy was chosen from among a number of other potential NLP strategies. This study not only presents a medical scenario of individuals who are diagnosed with malignant tumors, but it also offers a structure for the building of computer attempting to learn text processing frameworks. In other words, the study provided more than just a therapeutic scenario.

Author [11] wanted to determine whether or if NLP-based machine learning algorithms might predict bad outcomes in AIS patients by exploiting the language of brain MRI findings. Only English-text reports of brain MRIs that were analyzed while AIS patients were being admitted were considered for inclusion in this research. A score of three to six on the modified Rankin Scale was used to determine a poor result, and the data were recorded by competent medical professionals and nurses. They just provided a copy of the letter record of the initial MRI scan that's been carried out upon admittance to the medical facility. Utilizing randomness just on text database, we were able to construct a classification model as well as a testing time series with such a proportion of 7:3 between the two. Vectorization was performed just on material at three different levels: the syllable, the phrase, and the whole book. The "bag-of-words" framework has been used to represent the multiple times a message denoted has been used in the "word level technique," that also did not consider the string of words. This approach just looked at individual words. The "sent2vec" method was applied for the physical feeling approach, whilst the word embedding method was utilized for the document-level methodology. Both methods take into account the sequence in which the words appeared in

the sentence [12]. In addition to traditional ML techniques, Deep learning models were used in order to forecast unfavorable results by utilizing grid search and 5-fold cross-validation methods. This was done in order to improve the accuracy of the predictions [13] [14].

3. METHODOLOGY

3.1 Study Participants

They used a database on strokes that had been systematically gathered over time from such an especially in higher education institution [15]. Every one of the individuals' information, including statistical profile, diagnostic features, laboratory results, and radiographic findings, were stored in this computer. Those records are collected and examined on a regular basis by medical professionals who specialize in stroke treatment. From January 2014 to December 2019, a number of 2538 people who had been identified with AIS and satisfied the prerequisites to take part in this study gave their consent. Because we're doing an analysis of the effect of textual method of gathering from brain MRI scans, we excluded participants who has had a prior experience of attacks (n = 563) from our research. Written data produced from brain MRI scans often include data on physical measurement disorders as well as historical skeletal abnormalities. To put it differently, we made the decision to not provide sick people who'd already previously suffered from motions although we were concerned that now the importance of the textual information especially with regard to currently acute tumors might be undermined even if there was a larger amount of textual information of previous tumors. In furthermore, individuals (n = 135) who did not have adequate magnetic resonance (MR) photographs were excluded from the research investigation. Respondents or the parents or guardians of those respondents submitted their written informed consent for their participation in the register and the collecting of their results once three months had passed.

3.2 Data Collection Using MRI Radiology Reports

It is standard clinical practice to provide several MRI scans to patients hospitalized with acute cerebral infarction. The purpose of these scans is to determine the dynamic state of ischemia and vascular blockage. As a consequence of this, we limited the information that was going to be used for the text processing to simply the MRI language reports of the very first MRI examination that had been done on admissions. Humans was using a MRI Image scanner that had a magnetic permeability of 3.0 T, as well as we adjusted the configurations as continues to follow: the TR was in the spectrum of 9000–11,000; the TE was in the spectrum of 120–130; the crystallite size was 256 x 256; the field of view was 230 x 230 mm; the wall thickness was 5 mm; as well as the cross gap was 1 mm. Throughout the length of the inquiry, a solitary researchers were able was in charge of analyzing the brain MRI and reporting both the descriptive information and the final conclusions that were discovered in the textual information.

This responsibility was assigned to them by the investigating agency. There are several instances of radiology reports for brain MRIs shown in the supplementary figure S1. We solely included descriptive information of the MRI scans and did not include any clinical information or findings in our study.

3.3 NLP and ML Algorithms

To forecast the bad outcomes at three months, we relied only on the descriptive texts included inside the brain MRI radiology reports, as was previously explained. The entirety of the transcribed content was transformed into matrices with varied degrees of precision. In sequence to process component the textual information from the MRI scan, designers manufactured use of such a NLTK Scripting language tool in conjunction with the Information processing model.

3.3.1 Word-level Approach

First, each and every text was broken down into word vectors, where each every word was converted into its own "token" vector. Every single segment of content was broken up into pieces by replacing all uppercase letters with lowercase ones, eliminating all grammar, characters, and apostrophes, and also using lowercase alphanumeric characters. Bag-of-words (BOW) models were provided to the supervised learning models for each and every phrase token that was input (Figure 1). In conjunction to something like this, we employed DL methods in order to categorize MRI readings as potentially favorable or unfavorable repercussions. Supplemental Figure S2 illustrates in great detail the structure of the DL techniques that are used in the word-level approach.

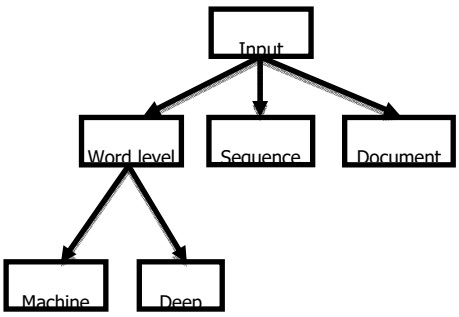


Figure 1. NLP and ML of brain MRI medical textual records.

3.3.2 Sentence-Level Approach

Whenever a method that works at the word and sentence is used, the brain MRI recording of a client is split up into phrase components and entered into a matrix. An anchoring package like sent2vec instead of embeddings enables a vector representation of a phrase instead of a message representation. The dense data is then added to the steerable sentences to perform classification.

3.3.3 Document-Level Approach

In this approach, the whole MRI examining word relating to a single individual was sent into the machine learning algorithms as an input. All of the words in a text were Vectorized with the help of BioWordVec, which is a pre-trained biomedical Fast Text embedding framework that contains the definitions of words in 200 levels.

3.3.4 Primary Outcome Measure

After being discharged from the hospital, follow-up stroke evaluations were performed on each patient in outpatient clinics. The mRS rating was used in order to conduct an evaluation of the patient's physical functioning 3 months after the onset of acute stroke. Ratings between 3 and 6 on the modified Rankin Scale indicated a poor cardiovascular prognosis. The results range from zero for "no shotcomplaints" to 6 for "blood clot death." At three months following the beginning of stroke symptoms, the modified Rankin Scale (mRS) is used in almost all clinical studies involving stroke patients to evaluate the functional rehabilitation of the stroke victim as a result of medications or therapies. As a consequence of this, we came to the conclusion that the 3-month mRS would be the most useful result for making projections utilizing the information first from brain MRI. Using these admission brain MRI scans, our objective was to determine which machine learning system was better in terms of its ability to accurately predict bad outcomes after three months.

3.3.5 ML Task

The entirety of the MRI writings also was randomly assigned between training and testing datasets in the ratio of 7:3, ensuring that the percentage of MRI writings with negative consequences was similar across the two groups. After the supervised learning were split into 5 folded, the classifier was tested utilizing 4 of those folds, confirmed using the one remaining folds of training examples, and then the validity of the system was assessed using another testing dataset. The LASSO regression strategy was the one that we used for the Optimization technique while we were working with the phrase approach. The technique also used the single choice tree, randomized forest (RF), and support vector machine as some of its other possible techniques (SVM). In this study on machine learning, we retrieved the selected features of textual matrices inside the Classification model in order to recognize whether keywords were useful for predicting poor outcomes in MRI texts. Specifically, we did this so that we could find out which terms included MRI texts. We did this so that we would determine whether tickets were important and use them accordingly. It was found that the best means of achieving the highest suitable settings for every application's input variables was to employ the grid search approach. The training of the samples was done on the Tensor flow Backend and Keras frameworks with the support of processing units and a host with 128 GB of RAM. The machine learning techniques that were used in the various levels of text Vectorization are outlined in Table 1, which may be found here.

3.3.6 Statistical Methods

The t-test was run, and the findings were presented in the form of a keyness plot, so that we could determine which phrases were found more often in the MRI report of individuals who had bad outcomes than in the reports of patients who had positive outcome. The effectiveness of every machine learning classifier was judged based on data that it had never seen before. In every machine learning method, we computed the probability score of the data, and the AUROC curve was used to monitor the effectiveness of each machine learning technique.

Model	Approach Level		
	Word	Sentence	Document
LASSO	✓		
Random Forest	✓		
Support Vector Machine	✓		
Convolution Neural Network	✓		
Multilayer perceptron	✓	✓	
LSTM	✓		✓
BLSTM	✓		✓
CNNLSTM	✓		

Table 1. T Various Levels of NLP Employ Various Types of ML Algorithms.

4. RESULTS AND DISCUSSIONS

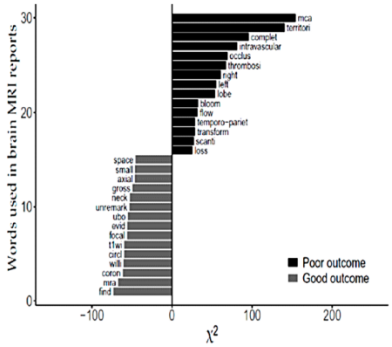
In the end, there were a maximum of 1840 MRI writing that were used into the study. The percentage of unsuccessful results in the testing set was 36.7 percent, whereas the proportion of unsuccessful results in the testing dataset was 33.0 percent. Table 2 presents a comparison of the clinical features of the patients that were associated with either bad or favorable outcomes. When comparing the training dataset to the test dataset, we found that the clinical and demographic factors were identical in both sets.

	Train (n=1287)	**Test (n=523)**	**p Value**
Age, years	68.2 ± 12.8	698.6 ± 12.9	0.769
Male, %	738 (57.3)	319 (58.3)	0.733
Height, cm	165.1 ± 13.2	164.5 ± 67.6	0.612
Weight, kg	68.6 ± 12.8	67.4 ± 13.6	0.695
NIHSS scale, mg/dL	4.9 ± 5.7	4.5 ± 5.4	0.229
Risk factors Hypertension	836 (64.9)	354 (63.8)	0.761
Diabetes	423 (32.8)	354 (63.8)	0.189
Dyslipidemia	225 (17.6)	95 (18.1)	0.782

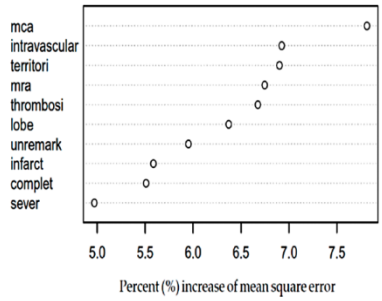
Current smoking	300 (23.3)	132 (22.8)	0.984

Table 2: The demographics of the whole sample population.

The most commonly seen tokens in the train and test sets are shown in Supplemental Table S1; word tokens derived from the MRI texts are spread in a same manner across both databases. The keyness plot, shown in Figure 2A, reveals that a number of tokens that characterized big territorial lesions were commonly seen in the brain MRI texts that had a bad result. We determined, with the help of the RF method, which tokens were critical for the prediction of unfavorable outcomes in MRI wordings (Figure 2B). According to this material significance plot, the most essential tokens for forecasting bad result brain MRI texts were a few tokens that represented considerable territorial participation in brain MRI texts.



(A)

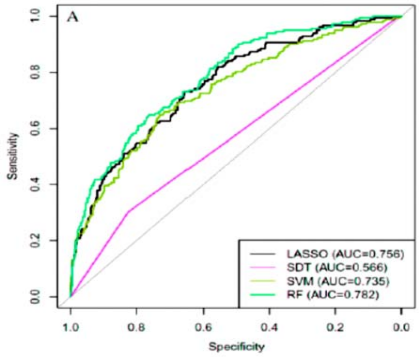


(B)

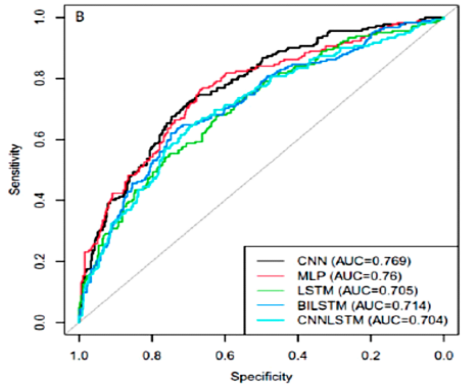
Figure 2: (A): Frequency of Word Tokens. (B). Variable Importance Plot

4.1 Efficiency of ML Algorithm in Brain MRI Texts

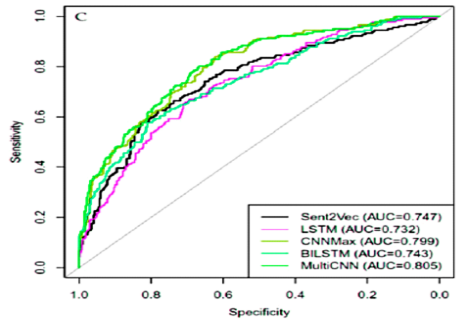
Utilizing the BOW model, Supplemental Table S2 presents a contrast of the source tokens included in the training dataset vs. those found in the test dataset. There were no major differences between them in terms of the input characteristics. Figure 3A compares the accuracy of four different machine learning algorithms. The AUROC score of the RF algorithm was 0.852, which was the highest among them. Figure 3B presents the outcome of the BOW DL technique, which demonstrates that the CNN's effectiveness (0.843) was superior to that of the other DL methods tested. Using a word-level strategy, the RF algorithm proved to be the most accurate classifier for determining which brain MRI texts will have a negative result.



(A)



(B)



(C)

Figure 3. (A), (B), and (C) are ML Approaches that use Word-Level data, whereas

The findings of both the sentence-level and document-level DL models are shown in Figure 3C. When it came to forecasting bad outcomes, the strategy at the sentence level was not more accurate than the one at the document level. ROC With respect to the level of words, there are three approaches: In general, the manuscript strategy outperformed the word embeddings and phrase methods in terms of efficacy. The inter method (0.865) showed the best performance as comparing to the other ML classifiers, followed by the CNN model (0.843). (0.839). manuscript

5 DISCUSSION

Utilizing NLP-based DL of radiography text data, we demonstrated that now the multi-CNN DL method can accurately predict future health outcomes with AIS. Radiological text records were used to conduct the inquiry. For the entire radiology language records, manuscript encoding was more efficient than word- or sentence-level NLP approaches. There are also machine learning techniques that are capable of extracting key text features from of the brain MRI readings in order to predict future findings. In spite of the lack of information from the DL methods, the RF was able to identify what word embeddings were important for this categorization. MRI is essential to the process of creating a sophisticated plan of care for stroke, as well as through specific image processing study results in MR pictures, such as proximal hyper density ship sign, dispersion stringent infarct volume, or bleeding transformation lesion, we are capable of predicting the potential outcome of Patients with diseases to a somewhat extent.

Our results show that employing manuscript DL rather than combination of elements or phrase approaches for estimating the outcome of AIS patients employing brain MRI unstructured textual information are preferable. After conducting extensive investigation, we got to this result. NLP-based ML research have demonstrated strong performance of the classifier in isolating certain sickness characteristics from either the related unlimited text MRI data using merely a phrase method.

A phrase technique was used to do this. But at the other extreme, the study did not employ DL techniques to predict its own objectives. NLP technology also performed evaluations only based on the BOW framework. As per our results, the manuscript method fared much better than that of the BOW method, where analyzes every phrase as a computer matrix for every phrase. Document-level approaches take into account all sentences; hence this led to what happened. Convnets (RNNs), which fully reflect the sequence of words or impulses, utilizing LSTM and bi-LSTM approaches, were more successful than the CNN and multi-CNN approaches that used a manuscript strategy. In spite of the RNN technique using LSTM and bi-LSTM algorithms, this was the case. Related to structural feature extraction of the successive sentences is already encoded in the approach employed at the classification stage; overall effectiveness of a CNN may be higher than even an RNN. CNNs contain lower complexity than RNNs like LSTM and deep neural modules, which allows for faster calculation. CNNs are a good alternative to these types of RNNs. Convolutional neural networks in CNNs are also better configured for learning location information than in RNNs. As a result, CNNs have an edge over RNNs in this area. In particular, the CNN proposes to construct a method into a highly hierarchical architecture so that the machine maylearn the full sequence of phrases effectively. Gradient disappearance or explosion may occur as the number of hidden layers inside the structure increases. A CNN model may have outperformed an RNN in this investigation, based on the test results obtained. It was because of here that we got to this judgment that the CNN model utilized in the document-level method did not need learning for the local minima. As a consequence of this, the CNN model's results obtained may have been improved. While RNNs take a large amount of processing resources to train, we have shown that CNNs are adequate when trying to predict a certain phenotypes by applying data mining techniques to text and brain MRI scans.

AIS individuals' bad results may be predicted by a slew of lifestyle factors. When it comes to predicting bad outcomes, established possible risks and their accompanying laboratory investigations such as increased blood pressure, cholesterol and mellitus are important indicators. AIS individuals with auxiliary artery indications, dispersion lesion sizes, cortical micro bleeds, and heterogeneous hemorrhage metamorphosis disorders are known to have a poor prognosis because of these imaging features. This is because AIS is often diagnosed with multifunctional MRI. There is growing evidence to support the efficacy of MRI DL techniques as a treatment tool for patients with AIS. The EHRs of patients with stroke have not been reported to have had any text indicators. We showed that this image reporting text matrix may be useful for preferred outcome in a significant way.

For the vast majority of applications, Deep Learning outperforms standard prediction models. This analysis also found that DL models were trained with CNN and RNN outperformed Ml techniques taught with RF and SVM. Word matrices that might be used in NLP-based textual DL challenges to predict exactly the poor outcome of Patients admitted were not discovered, unfortunately. However, computer unsupervised learning such as RF can recognize, as shown in Supplemental Figure S2, which components of a predictive data mining prediction task are most important to identify. In spite of advances in machine learning (ML) techniques such as the DL technique, RF and SVM techniques to text-based forecasting are still critical in identifying significant "digital phenotypes" in huge volumes of unconstructed EHR text data and translating them into structured data. Even while the DL approach has improved further than older Ml methods, this is still the case.

Several flaws exist in the methodology we used in this study. It is necessary to conduct an independent evaluation of the DL computation ability to forecast the consequences of attacks since research aims place at a single institution check the MRI textual reports. Our Recurrent neural network DL efforts were therefore concerned with the analysis for English texts. The sequence in which words are joined has a significant impact on the writer's capacity to process a sentence read in a language which makes use of emphasis, such as English. Using brain MRI textual information published in languages other than English hasn't allowed us to make any judgments of whether or not these DL algorithms would better predict negative outcomes. Despite these limitations, there are a few positive aspects to our study. To begin, we analyzed data collected retrospectively from stroke physicians and trained nurses on stroke outcomes. Using this method, we were able to guarantee that the ML model works correctly. We did not try to categorize the findings of a brain MRI, but instead predicted the patient's future clinical prognosis based on the text documents. More research utilizing EHR data may be able to utilize these results to forecast future medical events, and we believe our work has provided some answers.

6 CONCLUSION AND FUTURE SCOPE

During the course of this particular research project, we came to the realization because when contrasted to other ML approaches, DL algorithms displayed superior efficiency whenever it related to predicting future patient outcome utilizing NLP based ML of brain MRI radiologist free text data. To be more explicit, the application of inter and CNN was planned to improve the predicting of unfavorable results in manuscript NLP DL more so than the application of Home health nurse methods did. Data may be recovered from later, disorganized EHR material by using a DL technique that is based on NLP, and then the data can be utilized in a broad way for the aim of anticipating critical medical findings.

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A comparative Study of Several Machine Learning Algorithms to Identify Fall Detection in Senior Citizens

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Abstract.
Falling is a regular incident that occurs in the senior population and may result in severe injuries if not addressed promptly. As a result, early diagnosis of falls in the elderly is critical in order to minimize the critical consequences of a fall in this population. Several fall tracking methods rely on the accelerometer have been presented for the purpose of fall identification in recent years. Most of them, on the other hand, wrongly perceive everyday actions or fall as everyday life engagement as they do. This work proposes a machine learning-based fall detection system that is both efficient and effective in achieving this goal. When based on current state-of-the-art approaches, the suggested methods identify the collapse with high sensitivity, specificity, and precision. To properly identify the fall incidence, a publicly accessible database with a relatively basic and computationally structured collection of attributes is employed in conjunction with machine learning methods. With the Support Vector Machine algorithm, the suggested technique achieves an accuracy of 99.78 percent, according to the results.

Keywords. Fall Detection; SisFall Dataset; ML Algorithms; KNN; SVM; WSN; fall detection in seniorcitizens

1 INTRODUCTION

The number of persons over the age of 65 who are residing solitary throughout the globe has been steadily growing, particularly in western nations. The elderly are susceptible to a variety of issues, the most common of which is falling. Falling is the most prevalent problem among the senior population under the age of 60. Generally speaking, a fall is described as "unknowingly coming to rest on the ground, the basement, or another lower level, omitting purposeful adjustment of posture to come to rest in furniture, the wall, or other items." One-fourth of adults over the age of 60 experience an average of two falls per year, and two-thirds of them have the chance of collapsing again [1], with the risk of falling increasing as the person becomes older.

According to a research published by the World Health Organization [2], collapses are the second biggest threat of unintended or accidental mortality. When you have a serious fall, it may result in a lengthy hospital stay as well as chronic impairment, difficult rehabilitation, the loss of independence, and even death.

For more than two decades, professionals from both the technology and medical disciplines have been trying to reduce the effects of falls by shortening the reaction time and offering better treatment when a collapse occurs. Collapse are regarded as one of the most dangerous accidents that may occur to an aged people, and they can be fatal.

There has been earlier study on this issue in the emergence and development of various systems connected to Ambient Assisted Living Systems, in which the establishment of a platform for the recognition of Activities of Daily Living and their surroundings has been investigated [3], and this subject is included in that studies.

Falls may have a negative impact on the quality of life of senior individuals by causing a variety of potentially life-threatening health conditions such as tear and central nervous system damage, as well as a decrease in mobility and activity. The "longlie," which is described as being on the floor for longer time following a fall, is a dangerous consequence of falling and may result in death if not treated immediately.

The elderly, defined as anybody over the age of 65, are the group that suffers the largest number of fatal falls. According to estimates, over 646000 people die from falls each year across the world, with more than 80 percent of these deaths occurring in low- and middle-income nations. The number of people who die as a result of inadvertent falls is growing all around the world. Approximately 30,000 senior adults over the age of 65 died in the United States as a result of an unintended fall in the year 2016. In Figure 1, you can see the mortality rates per 100,000 populations for those over the age of 65 from the year 2000 to the year 2015. There has been a continual increase in this rate, with an average annual growth rate of 4.9 percent since the beginning of the period. Furthermore, when comparing senior men to elderly women, the death ratio is greater in males [4] [13].

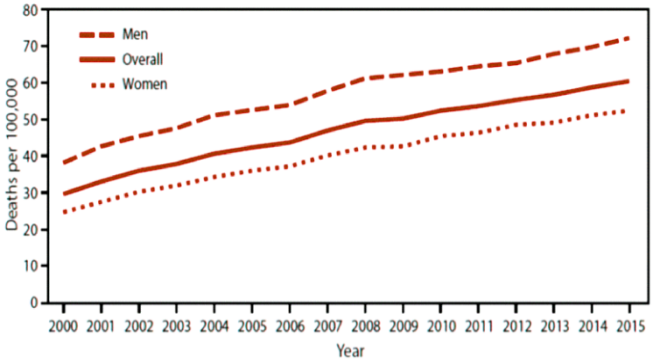

Figure 1: Fall-related death toll in the United States, 2000-2015

The repercussions of a fall are not just limited to serious bodily injuries, but may also include psychological distressing effects. A few of the symptoms people with this illness experience include worry, movement disorder, depression, hyperbolic activity restriction, and a lack of self-confidence over. Fear of collapse is one of the most common psychological difficulties that affect senior individuals, and it significantly limits their ability to carry out their everyday duties. Because of their fear of falling, about 60% of the older population restricts their daily life activities [5]. It is possible that this activity limitation will result in poor gait balance and muscular weakening, which will eventually impair the mobility and independence of the elderly, and as a consequence, the incidence of falling will recur. Figure 3 depicts the fall cycle that may occur repeatedly as a result of a fear of collapse.

Because the human body grows weaker with age and as a result of the ageing process, the likelihood of a fall rises. Every year, around 35 to 60 percent of persons residing in long-term care facilities are injured in a fall, with 40 percent of those injured falling again. Falls become exponentially more common as a result of age-related physiologic changes. During the previous three decades, the frequency of various fall-related injuries, such as breakage and spinal cord damage, has grown significantly, by a factor of 131 percent. On average, one or more persons in each team of five people will be 65 years or older by the year 2050, according to projections. As a result, if preventative assess are not implemented in the coming days, the amount of casualties caused by collapse is expected to rise dramatically.

A fall occurrence happens anytime an individual lacks his or her equilibrium and is unable to maintain their balance and remain upright. When a youngster loses his or her equilibrium, he or she has the ability to regain it; but, when an old person loses his or her stability, it is exceptionally hard for him or her to recoup since he or she is relatively feeble at that stage of their lives. There are a variety of variables that might contribute to a fall. All of the elements that have the potential to cause falls are together referred to as risk factors for falls. In reality, the incidence of a fall is the consequence of a complicated interplay between a variety of circumstances. Specifically, there is a relationship between the risk of dropping and the number of variables, with the chance of falling increasing as the number of factors grows. As seen in Figure 2, the risk factors may be divided into three categories: behavioural, environmental, and biological risk variables. Behavioral risk factors are the most common form of risk factor.

Risk factors associated with human behaviors, emotions, and routines of everyday living are referred to as behavioral risk factors. By implementing a strategic intervention, these elements may be brought under control. For example, if a person suffers a fall as a result of excessive drug or alcohol use, this habit or behavior may be changed via strategic therapy. People are exposed to environmental risk factors because they live in an area that is hazardous to them. Floors that are too slippery, inadequate illumination, and damaged paths are just a few of the serious ecological risks to be aware of.

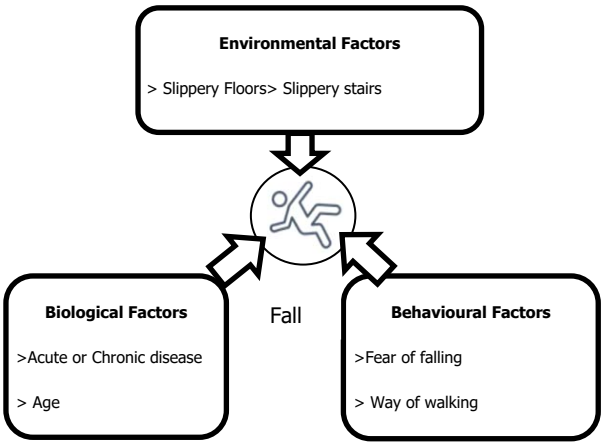

Figure 2: Risk Factors During Collapse

Genetic risk factors are associated with a person's age, gender, and physical well-being. Biological risk factors include chronic diseases, insulin, heart disease, eyesight abnormalities, blood pressure, movement and equilibrium issues, and other conditions. Although biological characteristics such as age and gender are unchangeable, illnesses may be relieved or managed by effective therapy, and physical health can be enhanced as a result of proper treatment.

Figure 3: Falling Life Span

The acute and lengthy consequences of falling may be mitigated by recognizing the fall as soon as possible and seeking medical attention as soon as possible. Fall surveillance systems may thus assist in reducing these issues by sending out an emergency notice in the event that a fall incidence occurs. Many systems for collapse identification have been presented in order to achieve this goal. It has also been recommended for fall detection that several fall tracking model based on accelerometer and gyroscope be implemented. This work proposes a machine learning-based fall detection system that is both efficient and effective in achieving this goal. In the human fall-related arena, there are two study tracks: falling identification and prevention of Collapsing. The primary goal in the falling detection area is to minimize the amount of time it takes to rescue someone once a fall has happened. The primary emphasis of the falling prevention domain is the prediction of falls using gait and balance analyses.

In the event of a falling occurrence, fall detection systems may be quite useful in shortening the reaction time. Fall prevention devices may be very effective in both preventing and delaying future falls. It is possible to categories people fall-related devices into three groups: camera systems, environmental systems, and wearable systems. Camera- and ambient-based gadgets are seldom utilized because of the elevated amount of the technologies. Wearable gadgets that employ inertial measuring units such as accelerometers and gyroscopes are becoming more popular. As a result of the development of micro-electro-mechanical systems, wearable gadgets that are both compact and lightweight may be deployed. In fall detection systems, a variety of data processing methods are utilized to detect falls. These strategies are reliant on the parameters that have been obtained from the sensors. In FDS, there are primarily two kinds of data processing techniques that are used: analytical approaches and machine learning methods.

1.1. Analytical Approach

Fall prediction and prevention are accomplished via the use of analytical approaches that use statistical methodologies. These strategies for data categorization are based on techniques that have been around for a long time. Thresh-Holding, HMM [12], and BF are some of the most well-known data-processing analytical approaches available. All of these strategies are used to differentiate between collapse and non-collapse. The Thresh-Holding method is the most often utilized of these approaches. When maxima or certain form characteristics are recognized in the transmitted data, the fall is recorded or anticipated using this approach. This strategy is primarily employed in wearable technology-based systems. Environment-based systems used to track vibration signals,while camera-built device employ image analysis methods to predict and track falling objects.

1.2. ML Techniques

Machine learning approaches use complicated system to determine or identify the occurrence of falls. These complicated methods are utilized to get a detailed understanding of data in order to anticipate the occurrence of falls. In machine learning approaches, the technique is first trained on a set of features collected from the database, and then it is applied to real-time data to see how well it works [14] [15]. Well-known machine learning techniques are utilized for the identification or forecasting of falls. In order to identify and even anticipate future falls, these strategies are employed to acquire insight into the data collected.

The remainder of this work is arranged in the following manner. Section II discusses the work that is associated with it. The methods used are described in Section III. Section IV discusses the outcomes of the experiment. Final section of this article, which includes an acknowledgment, brings the article to a close.

2. RELATED STUDY

The frequency of fall sensing devices has expanded dramatically as the world's older population has grown at an alarming rate. With sophisticated detection and monitoring, it is possible to guarantee that medical assistance is provided as soon as possible. The past decade has seen the development of a number of technologies that can properly detect falls and alert caretakers when they occur. However, the majority of systems were designed on the basis of sensor data from specialized quality detectors. As a consequence, the model performed worst on machines that had various qualities of the same sensors in different locations. On the [6, the author offers Fall Guardian, a system for fall identification and tracking that can be deployed in Mobile devices with a variety of detector characteristics. In this system, acquired sensor data was transferred to a cloud server, which was equipped with a Random Forest model. Then, using a post-fall motion identification algorithm, the system determined the severity of the fall injury and informed the career of the senior user, who was also given the elderly person's GPS position.

[7] The author offers a real-time, high-accuracy, deep learning-based collapse detection approach with automated human recognition and tracking that is both accurate and quick to implement. To be more specific, the proposed technique first enhances the YOLOv3 network in order to more effectively recognize people and extract feature maps from the item under consideration. YOLOv3 feature maps are fed into a multi-target monitoring system, which is constructed as a Deep SORT technique, for cascade matching and IOU matching. Following that, it enhances the YOLOv5 network's ability to identify postural irregularities. Finally, it refines the posture abnormalities that have been discovered in order to achieve the final fall detection result. The experimental findings demonstrate that the suggested strategy enhances both the accuracy and the efficiency of fall detection at the same time.

Deep learning-based collapse identification is one of the most important jobs for smart video monitoring systems, which attempts to identify accidental collapse of people and alert users to potentially hazardous circumstances when they occur. The author of [8] presents a simple and efficient method for detecting falls using a convolutional neural network to detect falls. In order to do this, we first offer a novel image synthesis approach that can accurately capture human motion in a single frame of video. As an image classification problem, the fall detection task is made simpler as a result of this. Furthermore, the suggested synthetic data creation approach allows for the development of a substantial quantity of training database, which results in good efficiency even with a tiny model. As part of the inference process, they also portray genuine human movement in a single picture by calculating a mean of the initial frames from the images.

In healthcare monitoring, movement detection is critical since it helps to identify when someone is doing anything. Most of our vital measures, such as heart rate and BP, are influenced by the activity we are engaged in at the moment, and without understanding this, it is difficult to identify irregularities in these values. Apart from that, activity detection may assist us in identifying emergency scenarios such as falls or even heart attacks. Taking into consideration the significance of distinguishing between abnormal activities and normal activities, this research has identifying the possibility of detecting falls using three important frequencies of wrist accelerations in each axis and their amplitudes in order to detect falls and ADLs. The use of an IMU in a wearable device has been shown in this context [9], which can detect moving, running, being still, and falling. With the help of ANN, we may compute the decision function (statistical model). In order to train the algorithm, 674 samples from almost 30 persons were collected. The results demonstrate that 94.8 percent of the time, continuing activity may be detected.

Author [10] has proposed a rapid and robust technique that can instantly identify falls and notify careers by SMS so that they may offer prompt aid, hence decreasing the amount of damage and treatment expenses. As a result, author [10] has highlighted the critical need of establishing an intelligent surveillance system to detect fall occurrences and notify the family or the caregivers. Two networks are used in their technique, a posture estimation network and an MLP classifier. First, they obtained a database that comprises features of the body in 500 postures, including lying and non-lying postures with varying lighting conditions, and then they utilized an MLP net to identify the poses using the information from the database. With regard to the validation dataset, the accuracy and loss were 92.5 percent and 0.3 percent, respectively.

According to [11], the author recommends an Internet of Things-based collapse detection and mitigation system for such persons in order to encourage living alone without relying on others or the need to be continuously watched, therefore boosting their quality of life. Our prototype of the system identifies the fall using a threshold-based accelerometer technique and prevents a fall by deploying Bluetooth Low Energy modules at key areas around the building. When a fall occurs, the system informs parents, caregivers, and medical personnel in charge by email and SMS so that they may take the necessary steps to prevent additional harm from occurring.

3. METHODOLOGY

For the purpose of detecting falls, the suggested technique makes use of a machine learning approach. Using the SisFall database, which are freely accessible, researchers were able to train and test the suggested method on a variety of activities that included falling or not falling.

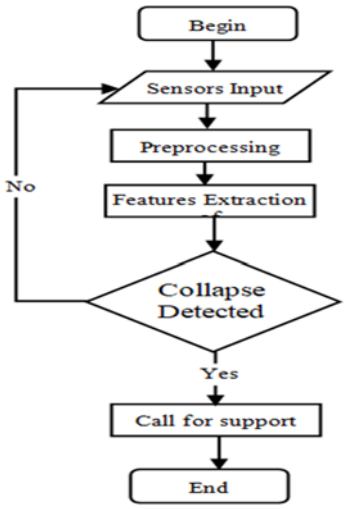

Figure 4: Proposed Methodology Flowchart

Figure 4 depicts the four important processes of the proposed technique, which are collection of data, preprocessing, extraction of features, and fall detection. Figure 4 depicts the four phases of the suggested method.

3.1 Data acquisition

Using the suggested technique, the first step is to gather data that will be utilized in the subsequent phases once it has been preprocessed and organized. Collection of data in real time by individuals, particularly those conducting activities, is a highly difficult process, especially for senior individuals. A large number of scholars have gathered information on autumn activities as well as activities of everyday living. There are a variety of available data, although the majority of them include actions done by only very young children. For a senior fall detection system to be effective, the dataset should include not only the falls but also the everyday living activities conducted by the old persons themselves. As a result, we discovered the SisFall dataset, which has people who are both young and old.

A tumble and motion database, SisFall, was employed in this work to gather data. In the SisFall dataset, there are 4505 files, including 1798 files containing 15 kinds of falls and 2700+ files containing nineteen types of Daily life activities done by 20+ young adults between the ages of 19 and 30 years and 15 older persons between the ages of 60 and 75 years. In this study, all actions are collected using a wearable device positioned at the waist of the subject and equipped with three motion sensors, namely two accelerometers and one gyroscope, at a sampling rate of Fs = 200 Hz.

3.2 Data Preprocessing

Once the information has been analyzed, the following step is to retouch it in order to eliminate any unpleasant noise from the signal, which will allow the machine learning algorithms to do a better categorization job. Many various filters are employed, but in this research, we chose a 4th order lowpass filter infinite impulse response (IIR) Butterworth filter with a cut-off frequency of 5 Hertz since it is small and requires little processing power.

3.3 Extraction of Feature

Features	**Equation**
Maximum Amplitude	$\max(a[k])$
Minimum Amplitude	$\min(a[k])$
Mean Amplitude	$\mu = \frac{1}{N}\sum a[k]$
Variance	$\sigma^2 = \frac{1}{N}\sum (a[k] = \mu)^2$
Kurtosis	$K = \frac{m_4}{(m_3)^2}$
Skewness	$S = \frac{m_3}{(m_3)^{\frac{2}{3}}}$

Table I: Collection of Details Used in Identification of A Fall

After the raw signal has been prepared, the next objective is to remove the attributes that will be used in the classification method. From the preprocessed data, we were able to extract six characteristics. The maximum amplitude, minimum amplitude and average amplitude are some of the characteristics of the signal. Table I contains a list of these characteristics, as well as some mathematical expressions. In this study, each feature is extracted from three sensors' data, which includes two accelerometers and one gyroscope, along three axes: we get a final feature vector of size [1 x 54] for all three sensors along all three axes for a single sample for all three sensors.

3.4 Collapse Identification

Following the extraction of features, the next phase is to determine if the task is a collapse or not by classifying it as such. When it comes to fall detection, it's a binary classification issue, which means we have to decide whether an action is fall-related or non-fall-related. As a result, we separated the entire database into two categories, namely, Class-1 for collapse activity and Class-2 for non-Collapse activities. Every one of the extracted features that were obtained from the samples acquired in the database by doing falls was labeled as Class-1, while every one of the extracted features that were derived from the specimens collected by conducting ADL was marked as Class-2, and so on. As a result, the total amount of data in Class-1 for falls is 1748, whereas the total amount of data in Class-2 for ADL is 2737.

Following the labelling of the feature vector of data, we employed the 10-fold cross-validation procedure in order to improve the prediction model and reduce the bias of the machine learning classifier. Finally, in order to test the performance of the proposed approach, we employed four machine learning classifiers. In this group include decision tree algorithms, logistic regression methods, the K-Nearest Neighbour (KNN), and the Support Vector Machine classifier. Section IV contains a summary of the findings.

4. RESULTS AND DISCUSSIONS

The suggested algorithm's effectiveness is evaluated using three generally used performance measures, namely, sensitivity, specificity, and precision, which are all presented in this paper. These are the ones that are defined as follows:

4.1 Sensitivity (SE)

A fall detection system's ability to detect falls will be measured by this test. In other words, it is the relationship between true positives and the overall amount of collapse.

$$SE = \frac{TP}{TP + FN} \times 100 \qquad (1)$$

4.2 Specificity (SP)

It refers to the system's ability to sense collapse only when they really happen.

$$SP = \frac{TN}{TN + FP} \times 100 \qquad (2)$$

4.3 Accuracy

It refers to the system's capacity to distinguish between collapse and non-collapse situations.

$$Accuracy = \frac{TP + TN}{TP + FN + TN + FP} \times 100 \qquad (3)$$

Where TP is an abbreviation for True Positive, which means that a fall happens and the algorithm finds it. TN stands for True Negative, which means that a fall does not occur and the algorithm does not identify a fall. False Positive (FP) refers to a

situation in which a collapse does not happen but the method claims that it did, while False Negative (FN) refers to a situation in which a collapse does happen but the method does not identify it.

The tests are carried out with the help of MATLAB R2018a. In order to assess the retrieved features, we employed four ML models for fall detection, each of which was assessed in terms of the variables stated above. As seen in Figure 5, the classification confusion matrices of various Models are displayed.

Confusion Matrix - DT

DT	Predicted	
Actual	*Fall*	*ADL*
Fall	1776	22
ADL	22	2685

Confusion Matrix - LR

LR	Predicted	
Actual	*Fall*	*ADL*
Fall	1778	20
ADL	8	2699

Confusion Matrix - KNN

KNN	Predicted	
Actual	*Fall*	*ADL*
Fall	1794	4
ADL	0	2707

Confusion Matrix - SVM

SVM	Predicted	
Actual	*Fall*	*ADL*
Fall	1797	1
ADL	0	2707

Figure 5: Confusion Matrix of DT, LR, KNN, and SVM Models

Training and testing are carried out with the use of the 10-fold cross-validation technique, which means that the database is arbitrarily split into 10-folds, with 9-folds utilized for training and 1 fold used for testing on each occasion. The findings of the four ML techniques are shown in Table II. These characteristics are computed by the use of confusion matrices, as seen in Figure 5.

Model	Sensitivity	Specificity	Precision
Decision Tree	97.68%	98.91%	98.69%
Linear Regression	97.92%	98.99%	98.78%
K-Nearest Neighbor	98.98%	98.78%	98.89%
Support Vector Machine	99.56%	99.95%	99.78%

Table II: Detection Results from the Suggested Method.

It can be shown in Table II that based on collected number of characteristics; SVM outperforms the other three machine learning algorithms in terms of sensitivity, specificity, and accuracy when compared to the other three classifiers.

5. CONCLUSION AND FUTURE SCOPE

In this work, a basic and computationally efficient collection of characteristics taken from a publically accessible dataset was used to develop an efficient fall detection system, which was shown to be effective. The collected features are used to train and evaluate four machine learning classifiers, with the results being presented in this paper. Out of all of these classifiers, SVM has the greatest accuracy, with a 99.99 percent rate of success, which is better than the current best practices, as seen in Table III. The suggested method is effective for application in a real-time fall detection system because of its efficiency. The suggested fall detection algorithm will be implemented in hardware in the future, which would allow older persons to maintain their independence for longer periods of time.

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Performance Analysis of Skin Cancer Detection Using GLCM and SVM

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Abstract.

Cancer of the skin is the most prevalent and destructive form of the disease in humans. The most dangerous kind of skin cancer is called melanomas. If it is caught in its early stages, it is very easy to treat. The biopsy technique is the formal approach that is used for diagnosing the presence of melanoma. This technique may be rather uncomfortable and requires a lot of time to complete the procedure. As a result of this research, a computer-aided detection method for the early diagnosis of melanoma has been developed. Within the scope of this research, an effective method of diagnosis is developed via the use of image processing methods and the Support vector machine (SVM) algorithms. The picture of the damaged skin is captured, and then it is subjected to a number of different pre-processing methods in order to provide an improved image and a smoothed image. After that, the image goes through a process of segmentation that uses morphological and thresholding approaches to separate the various components of the picture. The photos of the skin have had some crucial aspects of its texture, color, and form removed. For the purpose of extracting texture characteristics, the Gray Level Co-occurrence Matrix (GLCM) approach is used. The GLCM, color, and form characteristics that were retrieved are the ones that are used as input by the SVM Model. It determines if the photograph in question depicts a benign melanoma or a malignant melanoma. When we integrate and use the shape, color, and GLCM characteristics to the classifier, we are able to reach a high level of precision that is equal to 96 percent.

Keywords. Melanocytes, Support Vector Machine, Segmentation, Gray Level Co-occurrence Matrix.

1. INTRODUCTION

When it comes to humans, the skin is considered to be the most vital organ in the body. The muscles, bones, and internal organs that lie under the skin are shielded by the skin. The skin plays a very significant part in the overall defense mechanism of the organism against UV radiation. UV radiations released by the sun cause DNA in the cells of the skin to become damaged. These factors have the potential to be the origin of skin related disorders as well as malignancies of the skin. Melanin is found in skin cells and acts as a shield against the damaging effects of ultraviolet (UV) radiation. Since persons with light skin do not produce as much melanin in their skin, they are more susceptible to the damaging effects of ultraviolet (UV) radiation than those with dark complexion. Because of this, those with light skin are more likely to have been diagnosed with melanoma. Melanoma cancer is considered to be the most lethal kind of all skin diseases that may affect people. Malignant melanoma and benign melanoma are the two subtypes that may be assigned to the cancerous skin growth known as melanoma. Even though it has been revealed that only 4 percent of the people are affected with this malignant melanoma, it accounting for more than 70 percent of the fatality caused due to melanoma cancer [1].Malignant melanoma kind is among the worst and most deadly forms of skin cancers.

The human skin, which serves as both the body's covering and its main organ, is the body's largest organ. Up to 7 levels of ectodermal tissues may be found in skin, which serves as a protective barrier for the muscles, bones, ligaments, and internal organs that lie underneath it. The human skin has many important functions: it prevents harmful substances and bacteria from entering the bloodstream, it assists in maintaining the respiratory rate, and it enables humans to experience sensations of cold, heat, and touch. A skin lesion is the term used to describe an abnormality in one area of the skin in comparison to other areas of the skin. The infection that occurs either in or on the skin is the fundamental and primary cause of skin lesions. Primary skin lesions are those that are present at birth or develop over the course of a person's lifetime, whereas secondary skin lesions are those that are caused by improper treatment of primary skin lesions. Both types of skin lesions have the opportunity to enhance into skin cancer, and each year in the United States, upwards of three million people are diagnosed with some form of skin cancer. Every year in India, more than 5000 individuals are diagnosed with skin cancer, and over 4000 people lose their lives to the disease. Basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma are the three types of skin malignancies that may develop. Melanoma is the most dangerous kind. If a tumor is determined to be malignant, which is a very hazardous kind of skin cancer due to the fact that this tumor develops quickly and spreads to other places of the skin [3] [11] then the tumor is deemed to be cancerous. A benign tumor, on the other hand, is not a particularly hazardous sort of tumor since it grows but does not spear. Since the skin lesion is evaluated with the naked eye, where features cannot be detected accurately, manual identification of skin cancer is not particularly suited. This leads to maltreatment, which ultimately ends in death. Early stage discovery of accurate skin cancer may boost the likelihood of a patient surviving the disease. As a result, automated detection is more trustworthy, resulting in improved accuracy and efficiency.

Melanoma skin cancer might be healed if it has been recognized or successfully treated in really initial phases, so for the diagnosis to melanoma can indeed be supplied early date and will save this same person’s life, however if melanoma is detected during last phases, there are many more possibilities for such an illness to just go depth again into the epidermis. Melanoma skin cancer might be healed if it is recognized or successfully treated in really beginning phases, so for the diagnosis to melanoma

can indeed be supplied previous period after it has progressed to this point, it will be far more difficult to cure. Melanocytes, which are found throughout the body, are the primary factor in what leads to the development of melanoma [1]. The biopsies taken from the patient are used in the official way of diagnosing skin cancer. This approach includes a procedure for removing a bit of human tissue from the body, after which the tissue will be examined further in a laboratory. To do this is by far the most difficult and agonizing task possible. For testing reasons, there will be a significant increase in the amount of time required. Both patients and their physicians need to devote more time to the testing process. The use of the biopsy approach is fraught with increased danger since there is a possibility that the illness may spread to other areas of the body.

The majority of scholars contributed to this investigation and suggested a number of different detecting methods. Melanoma, a kind of skin cancer, may be found using a method known as common identification, which consists of four key stages: pre-processing, separation, semantic segmentation, and classification [2] [12]. This approach is used to find melanoma. In order to get the area of interest, a method called segmentation first isolates the lesion from the surrounding skin. Because of its efficiency and ease of application, the GLCM approach has been used as the foundation for the feature extraction process of a significant number of computerized melanoma detection equipment.

This computer-based analysis will cut down on the amount of time spent detecting a problem while also improving its level of precision. Dermatological illnesses are high in complexity; as a result, diversity and a scarcity of knowledge is one of the most challenging problems for rapid, simple, and correct diagnosis. This is particularly true in developing nations and developed economies with inadequate healthcare budgets. Additionally, it is well knowledge that the early diagnosis of an illness in its early stages lowers the risk of the disease developing into a more severe condition. There are just a few environmental variables that have been shown to have had a significant role in the development of malignant melanoma skin disorders [1].

The biopsy is the standard diagnostic procedure for cancer. During a biopsy, afflicted somatic cells are extracted, and the resulting sample is submitted to the laboratory for examination. The procedure is laborious and takes a considerable amount of time. Therefore, an automatic software-assisted system is necessary in order to achieve accurate and rapid processing. Through the application of quantitative characteristics, it will provide enhanced comprehension of the aim. During this phase of the process, the characteristics of the cancerous area are collected, and a support vector machine (SVM) classifier is used to diagnose carcinoma. This method of diagnosis makes use of the photographs obtained during dermoscopy. After that, some image preprocessing is carried out to strengthen the standard and remove noise from the images, which is then followed by segmentation through the use of the thresholding approach. The GLCM approach is used [4] in order to extract the picture characteristics; the classifier is then provided with these extracted features as an input. Classifier will classify the picture that is provided as either malignant or non-cancerous, depending on the circumstances.

In this study, we tried out a whole new method for melanoma diagnosis when we got to the phase when we extracted features. By integrating a variety of different methods for the extraction of features, it is our hope to attain a relatively high level of accuracy in the categorization of melanomas. In this study, we evaluate feature extraction using texture, shape, and color, and then we classify the results to see which method yields the most accurate results. First, an SVM classifier is used to establish each method for feature harvesting, and then accuracy levels are determined for each method. Then, we used a support vector machine (SVM) to construct a classification algorithm, combining texture and shape information, and evaluated how accurate it was. In the end, we combined the different aspects of form, color, and texture in order to develop a classification algorithm and determine its correctness. In addition to this, using an analysis that is supported by an SVM classifier, we determine which method of extraction of features is the most practical and trustworthy for the identification of melanomas.

2. RELATED STUDY

In the subject of melanoma skin cancer detection, there have been many investigators working. They used a broad variety of computer vision methods, such as image analysis, separation, semantic segmentation, and picture categorization, among other machine vision. These methodologies have been used in a variety of other research articles as well.

The risk of death from skin cancer is among the highest of any malignancy. It is expected to spread to other parts of the body if the first symptoms are ignored and the condition is not properly evaluated and treated. Additionally, it takes place when the tissue is exposed to sun's rays, mostly because of the fast proliferation of skin cells during this time. In order to reduce the amount of time and effort required, as well as the risk to human life, early identification definitely requires the use of a reliable computerized method for the recognition of skin lesions. Graphics rendering and learning techniques are both components of the method that has been shown to be effective in the treatment of skin cancer. An automated method for the categorization of skin cancers was proposed by the author in [5]. In this particular investigation, nine distinct forms of skin cancer were identified and categorized. Observations are also made about the performance and efficiency of deep convolutional neural networks (CNN). Through the use of the Convolution Neural Network, the goal is to construct a model that not only detects skin cancer but also categorizes it into a number of different subtypes. Graphics rendering and deep learning are both concepts that are used in this form of diagnosis. The quantity of pictures has also been increased thanks to the use of a variety of strategies for image enhancement. In conclusion, the strategy known as transfer learning is used in order to further increase the accuracy of the classification jobs. The suggested CNN approach demonstrates an accuracy of around 79.45 percent, with a weighted mean accuracy of around 0.76, a weighted mean recall of around 0.78, a weighted mean f1-score of around 0.76, and so on.

Melanoma is the most lethal kind of skin cancer; nevertheless, if it is detected at an early stage, there is an extraordinarily elevated potential of the treatment that may reach up to 99.2 percent. Despite a decade of work put into employing technology, manual inspection by a dermatologist is still the primary and most trusted procedure that is employed up to this day. As a result, because limited number of dermatologists available, it is hard to undertake preventative monitoring on those who are at the greatest risk for early detection. Deep Convolutional Neural Networks (DCNNs), which have exhibited a significant advance in automated skin lesion categorization, are crucial for improving diagnostic performance across a mass population that has limited access to experts [6]. Website builder dermoscopy photography with incorporated artificial intelligence (AI) is a technology that has the potential to become accessible in the future for the study of skin lesions. As a consequence of this, the artificially

intelligent plug-in has the potential to act as facilitators for the dermatological community. In this research, we discuss the outcomes of our inquiry into the use of deep convolutional neural networks (DCNNs) for automated melanoma zone segmentation in dermoscopy pictures.

The likelihood of effective treatment of cancer may be increased by early and correct diagnosis of the disease. The most serious kind of cancer is malignant skin cancer, which is prevalent all over the globe and is becoming more common as time passes. Within the cancer varieties, malignant skin cancer is the most common form. Applications of computer assisted diagnosis are used in the process of categorizing various skin malignancies. Dermoscopy pictures obtained from the ISIC repository are utilized in this work to construct a dataset with two classifications; this dataset is then used to categories benign and malignant forms of cancer. In addition, the categorization score is anticipated to improve as a direct consequence of the early detection of the condition [7]. In order to accomplish this goal, several image preprocessing procedures, including color clarity, edge recognition, and noise removal, are used to dermoscopy pictures collected from the dataset. Following this operation of processing, the InceptionV2 computational intelligence network is used so that the processed photos may be classified.

Because of its prevalence and high mortality rate, melanoma of the skin necessitates the development of a detection technology that is both precise and effective in order to facilitate early clinical condition. Artificial Intelligence (AI) enhanced detection approaches strive to accomplish this objective while cutting down on the time and money required by conventional methods. In [8,] the author demonstrates how to enhance performance above single classification techniques by using a half as good learning strategy that is trained using weighted losses. The ensemble approach reduces over-fitting that occurs as a result of imbalanced data in the dataset. As a result, it was able to get a score of 0.591 on the Balancing Multi-class Accuracy test without identifying any unknown classes. During the testing phase, the algorithm was enhanced by adding the suggested CS-KSU module collection. This allowed for the identification of the existence of pictures that belonged to new classes. A score of 0.544 was achieved for the Area under the ROC Curve (AUC) when the extended procedure was applied to the unknown class. The efficiency of our algorithm is comparable to that of the most advanced methods now available for completing this assignment.

Melanoma is the most aggressive and potentially lethal type of skin cancer. Nevertheless, differentiating melanoma tumors from other types of skin lesions, such as non-melanoma lesions, has proven to be a difficult process. In the past, several computer-aided diagnostic and monitoring techniques have been built specifically for the purpose of carrying out this activity. Their performance has been hindered as a result of the complicated distinctive attributes of the skin lesion pictures, which include in homogeneous elements and hazy borders. These qualities have prevented them from reaching their full potential. In the article [9], the author presents a technique based on deep neural networks that overcomes these restrictions for the automated identification and classification of melanoma lesions. For the purpose of making learning and feature extraction more effective, an improved encoder-decoder system has been proposed [13] [14]. These mechanisms bring the conceptual level of the transceiver convolution layers closer to something like the digital converter convolution layers. In order to classify melanoma lesions in a pixel-by-pixel manner, the system incorporates a multi-stage and multi-scale technique, as well as a softmax classifier. Based on the findings obtained from pixel-wise classification, we develop a brand new technique that we name the Lesion-classifier. This technique is used to conduct the categorization of skin conditions into melanoma and non-melanoma.

Because it enables physicians to get rapid recognition for worrisome lesions via their cellular telephones, the field of mobile tele-dermoscopy contributes to the development of patients' medical management. Even for highly trained medical professionals, identifying skin cancer using dermoscopy photos may be a challenging process because of the intrinsic heterogeneity that exists in the presentation of skin lesions. Recent developments in photo editing using Deep Convolutional Neural Networks (CNN) have prompted a large number of scientists to employ CNN for the categorization of skin lesions. These scientists came to the conclusion that CNN worked just as well as experienced dermatologists. In this study, we made use of a dataset that consisted of 48,373 dermoscopy photos obtained from three separate archives and certified by qualified dermatologists. These images were categorized by the archivists. In [10], the author used transfer learning to manually train a resource-constrained CNN model dubbed MobileNetV2 for binary categorization of skin conditions into benign and malignant classifications. The predictive model achieved a total accuracy of 91.33 percent, with a batch size of 32 being used in the training process [15].

3. METHODOLOGY

Detecting the presence of malignant melanoma cells in an image using SVM-based methods is known as melanoma skin cancer detection. Here, SVM and GLCM techniques are employed to develop the algorithm. Additionally, certain chosen form and color characteristics are retrieved from the skin photos using the GLCM approach. To classify the data, all of the retrieved characteristics are pooled and fed into an SVM. Computer vision approach SVM is used for supervised learning models with associated. Figure 1 depicts the suggested methodology's key phases.

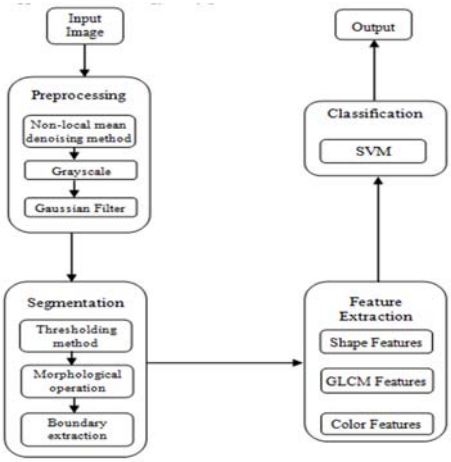

Figure 1: Methodology

3.1. Input Images

For the purposes of this investigation, the skin photos were obtained from the ISIC online collection. The collection of photographs pertaining to skin cancer may be found inside this internet repository. In order to establish an accurate method for the identification of melanoma and to minimize the number of fatalities that are caused by melanoma, the ISIC melanoma detection-based initiative was initiated. This ISIC dataset may include as much as 23,000 photographs. Within the scope of our investigation, we gathered a total of 600 pictures and used them for both training and testing purposes.

3.2. Image pre-processing.

The primary objective of feature pretreatment is to improve picture quality in addition to preparing for further treatment. This is accomplished by eliminating undesired elements from the foreground of digital mammograms. In order to get rid of the sounds and the elevated elements, the filtering were used.

3.2.1. Process of removing hair and noise.

The primary goal of this method is to remove undesirable sound and hair from skin pictures. The most difficult part of this investigation is determining which characteristics are true and which are the result of unwanted noise. A pixel's value may vary in a random way. The Non-local mean denoising approach is being used in our work to eliminate undesirable features from skin images. A denoised picture is shown in Figures 2 and 3 as compared to an original image.

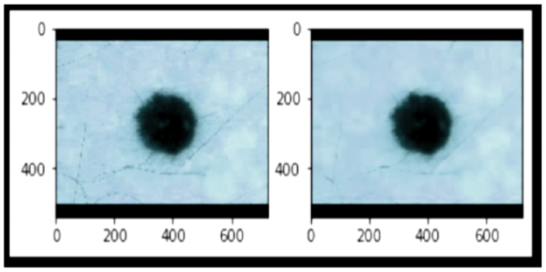

Figure 2: Noise eliminated

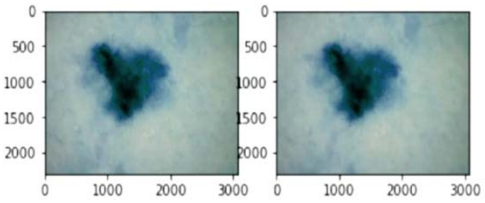

Figure 3: Noise eliminated

3.2.2. Conversion of RGB to Grayscale

The only information that is included in a grayscale picture is the brightness. The beam of energy corresponding to each data point in the grayscale picture may be thought of as a number. A grayscale picture provides a distinction between the various levels of brightness. The only thing that the grayscale picture measures is the amount of light. In the methods that we have provided, the color photographs are converted to grayscale before being saved. This is done because processing grayscale images is simpler and more efficient than processing colored ones. After that, we deploy a grayscale conversion technique to the pictures that are now free of noise. The picture in grayscale is shown in Figure 4.

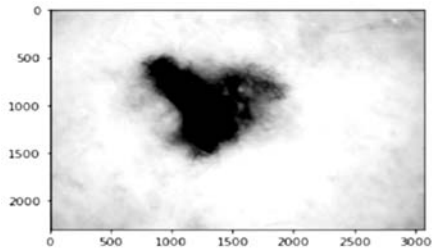

Figure 4: Sample Grayscale Skin Image

3.2.3. Applying Gaussian filter

A picture may be blurred using the Gaussian smoothing technique. The confidence interval of the Gaussian distribution is employed in the calculation of the filtering degree that is desired. The output that is provided by the Gaussian filter is a cumulative total of each pixel's neighboring pixels, with the averaged giving more consideration to the worth of the pixel intensities that are located in the centre of the image. In the approach that we have described, the grayscale pictures are given a Gaussian filter treatment in order to smooth them out. Figure 5 displays the picture after going through the Gaussian filter.

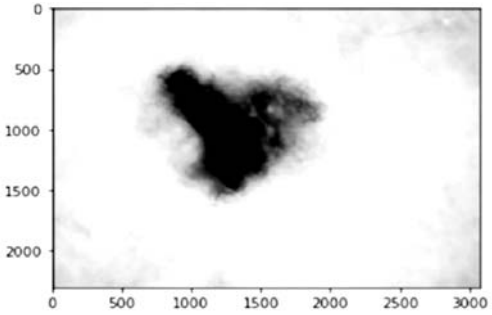

Figure 5: The filtering was done using a Gaussian distribution.

3.3. Segmentation

The procedure of fragmentation is used in order to obtain the area of interest (ROI) from the skin magnetic image. In ROI, all of the pixels have the same characteristics. In the system that we have provided, we are using two different methods for the segmentation: step. (1) An adaptive version of Otsu's thresholding approach applied to a picture (2) Filling up the gap by means of a morphological procedure. Figure 6 displays the picture after it has been divided.

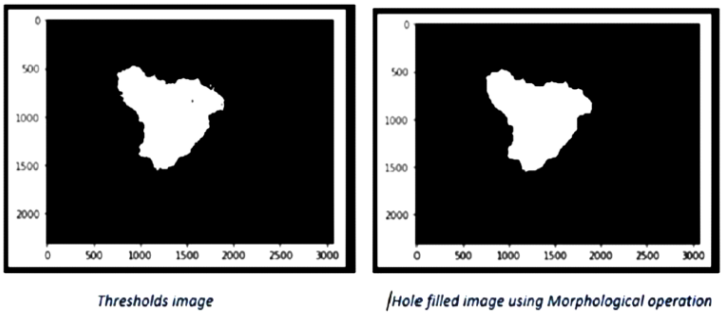

Figure 6: Sample threshold image & hole filled

In the last step of the classification stage, contours are used so that we can determine the border of the lesion portion. In order to assess the features of the form, boundary separation is necessary. The completed result can be seen in Figure 7, which was generated by the classification stage.

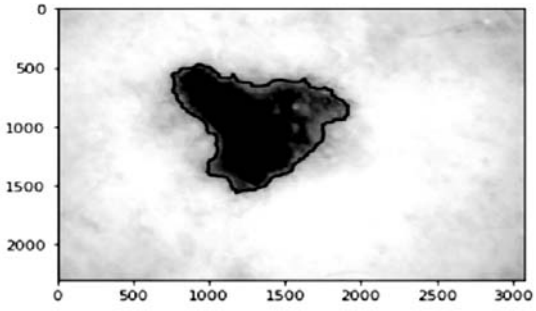

Figure 7: Retrieved picture of the boundary

3.4. Feature Extraction

The process of collecting data from the targeted skin picture involves many steps, one of which is edge detection. In the course of our research, we have identified a number of singular and distinct characteristics that set malignant melanoma apart from benign melanoma. In the approach that we have provided, the analysis of the texture characteristics was carried out using the

GLCM methodology, and in addition to that, we are recovering the color and form data. Following that, we aggregate them, and use them for the goal of categorization.

The GLCM approach is the surface data analysis method that we have chosen to use in the architecture that we have suggested. The grayscale picture is used as the input here. As input is provided, the grayscale picture is shown. The number of grey levels corresponds directly to the quantity of multiple rows that the GLCM matrix has. It is utilized for the goal of feature extraction since it is a method that maps these probabilities. There are Contrasting, Connectivity, Volatility, and Inverted Differentiation moments that may be obtained from the extraction of features from GLCM.

3.4.1. Shape Features

The Boundary roughness index, Anomalous index, Circumference index, and size index are the four shape features that are evaluated from the bruise in a binary picture.

3.4.2. Color Features

Within the scope of our investigation, we computed the mean as well as the sample variance for the RGB streams for color characteristics.

The purpose of image retrieval is to minimize the original picture information source by determining particular values or characteristics that aid to categories distinct photographs from each other and. This is accomplished via the method used to measure certain variables or characteristics.

3.5. Classification

The next phase is the categorization of pictures, which identifies melanoma as either benign or malignant depending on the appearance of the tumor. The classifier is used to distinguish melanoma photos from other types of images that do not include the disease. It's possible that using an SVM classifier would be desirable to simplify the categorization process significantly. After collecting a set of skin data, one then predicts, for every number of inputs, to which of the two groups the collected data should go. The support vector machine (SVM) generates a hyper plane that separates 2 categories with a significant space somewhere between. In the context of our research, sensory evaluation features, in addition to the results obtained of GLCM, are provided to SVM classifier. This includes taking testing and training data, as well as clustering data, in order to produce a classification model the source skin image and determine whether or not it contains melanoma.

4. RESULTS AND DISCUSSIONS

When compared to the conventional biopsy procedure, the diagnostic methodology that we have presented is quite effective. In this particular research Endeavour, both the financial investment and the amount of time necessary for the melanoma diagnosis procedure were significantly reduced. Techniques relating to machine learning and image processing are included into the approach for the purpose of diagnosing skin cancer. The support vector machine (SVM) method was used in order to perform accuracy tests on the skin lesion disease picture.

Image ID	Area	Perimeter	Diameter	Abnormality	Irregularity	Circularity
1	249592.0	2115.02	563.73	1482.95	1.43	17.92
2	93053.0	1308.95	344.21	893.34	1.47	18.41
3	168088.5	1827.99	462.62	1155.51	1.58	19.88
4	175778.0	1791.63	473.083	1232.90	1.45	18.26
5	534159.0	3277.70	824.69	2047.91	1.60	20.11

TABLE 1: The outcomes of the form feature extraction process

The SVM algorithm was used in order to improve the efficiency as well as the precision of the melanoma detection process. In the first step of the aforementioned system, form characteristics are extracted. The following shape characteristics are derived from this: area, perimeter, abnormality, irregularity, circularity, and diameter. Table 1 contains the characteristics of five photos that were selected at random.After the form characteristics have been extracted, they are fed into a SVM in order to identify the pictures using varied size test data. Table 2 details the performance of the different train to test ratios with regard to the various shapes attributes.

Train to Test ratio	Accuracy
5:5	85%
6:4	83%
7:3	84%
8:2	84%
9:1	87%

TABLE 2: The accuracy of various train-to-test ratios using shape features

Then, we use solely the GLCM selected features from epidermis pictures for categorization purposes. These are the GLCM characteristics: Brightness, Linkage, Inverted Differential Times (IDT), and Disorder Features of five photos randomly selected are shown in Table 3.

Image ID	Contrast	Correlation	IDT	Entropy
1	4.3229	0.9946	0.5962	8.8114
2	5.7088	5.7088	0.5050	9.4623
3	6.7545	0.9950	0.5216	9.1870
4	5.4357	0.9945	0.5318	9.0827
5	23.3354	0.9844	0.3676	10.2662

TABLE 3: GLCM feature extraction results

Table 4 presents the results of the difference train test ratio along with GLCM characteristics.

Train to Test ratio	Accuracy
5:5	82%
6:4	84%
7:3	84%
8:2	87%
9:1	89%

TABLE 4: Accuracy for varying training to testing ratios using texturing attributes

Geometry and GLCM characteristics are then combined, and SVM is used to classify. Table 5 summarizes the results of the differential train test ratio using geometry and GLCM characteristics.

Train to Test ratio	Accuracy
5:5	87%
6:4	85%
7:3	87%
8:2	88%
9:1	91%

TABLE 5: An accurate train ratio test using a combination of form and texture characteristics has been developed.

Afterwards when, we integrate the characteristics of form, color, and GLCM, and then we apply those characteristics to an SVM classifier to generate the model. Table 6 contains the results of the differential train test ratio using shape, color characteristics, and GLCM characteristics.

Train to Test ratio	Accuracy
5:5	85%
6:4	88%
7:3	90%
8:2	91%
9:1	96%

TABLE 6: Combination of form, color, and GLCM characteristics for varied train test ratios

According to the chart that was just presented, the high accuracy achieved by utilizing only the GLCM feature is 89% when the ratio of training data set to test data is 90% to 10%. The highest level of accuracy is obtained, when the GLCM features and Shape features are combined. This degree of precision is achieved when the ratio is 90%:10%. We were able to create an SVM model with an accuracy of 96 percent by combining the GLCM, Shape, and Color features. This was achieved with a train-to-test ratio of 9:1 percent. The conclusion of our investigation is shown in Table 7.

Feature Extraction	Accuracy
Shape	87%
Texture (GLCM)	89%
Texture & shape	91%
Texture, shape & color	96%

TABLE 7: The Planned Study's Findings as Summarized

When we merged and applied the shape, color, and GLCM data to the classifier, we were able to determine which model had the highest level of accuracy again for process as a whole. On the basis of the findings presented above, we are able to draw the conclusion that the efficiency of the classification algorithm is dependent on the number of characteristics that are applied towards the SVM. The larger the amount of characteristics will give the higher level of accuracy.

5. CONCLUSION AND FUTURE SCOPE

The purpose of this research is to develop a technique for accurately detecting melanoma, which is a kind of skin cancer, such that it may be readily classified as either benign melanoma or malignant melanoma based on the input picture. When the GLCM approach with color and shape characteristics are coupled for the extracting the features, the suggested system achieves a high accuracy of 96 percent. Because it does not include any discomfort or time constraints, this procedure is superior to the biopsy method in terms of efficacy and comfort for both patients and medical professionals. We searched the web data repositories, but we were unable to find any photographs of people with dark complexion to use in the implementation. However, the darkish skins are essential for the ongoing work and experimentation that will be done with the research.

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Impact of Personal Factors on Turnover Among Seafarers

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Abstract.
Working on ships isn't an easy task. It is common for seafarers aboard ships to have little social life, monotonous routines, and to suffer from harsh working conditions. This stress results in both physical and psychological problems. An important factor that causes stress to a seafarer is the personal stress that may influence their desire to leave the marine industry. Using this study, we sought to determine the factors that affect seafarers and lead to Turnover. Seafarers are affected by several personal factors that lead them to leave the ocean industry, including sleep, food, changing work timing, climate, parting with family members and loved ones, and temperature changes. Our study looked at 200 seafarers with factors affecting their work and affecting retention. The data were then analyzed quantitatively. We hope identifying these data will allow us to develop special programs and orientations to ease the stress of seafarers and maintain their careers in the maritime industry.

Keywords. Seafarer, Personal factor, Stress factor, Turnover, Multiple Regression, Working conditions.

1. INTRODUCTION

In the world of the seafarer industry thousands of fresh sailors, cadet crew members, and marine engineers are recruited around the world. Every young graduate has high expectations of making big in the marine industry field by becoming a top-grade seafarer. With their knowledge and training, these officers venture into reputed shipping companies attempting to mark their footprints to upgrade their ranks. No matter how highly bankable industry, venturesome working environs, or "Hodophile" lifestyle, most seafarers decide to quit the ship jobs by accepting land side jobs. Seafarers need to sign a long-term contract with shipping companies and set how far they are going to stay on the ship which means abiding absence from home, family, friends, and their loved ones. This day by day creates stress among the seafarer which affects their psychological moods and resolute their minds to leave the marine industry. Separation from own circle of relatives is the most outstanding stressor for seafarers, and loneliness within the vessel becomes related to separation from own circle of relatives (Ana Slišković and ZvjezdanPenezić 2016). Seafarers are subjected to different stressors, including sleep deprivation, disconnection from the family, anxiety, monotony, lack of quality rest, physical changes (climatic differences, seasickness), and the lives of the seafarers. Certain studies have identified the level of stress among seafarers and factors connected with their stress level. Mental fitness is an important part of bodily well-being at sea[2]. Depression or extreme temper imbalance can endanger the secure operation of the vessel, and the well-being of seafarers and the maximum extreme instances can cause suicide. While personal stress is a normal part of life, over an elongated period it can lead to serious anxiety illnesses, if left unchecked it can open to full-blown depression. This study particularly aims to provide suggestions to lower the stress among the seafarers and make them retain in the sea.

Aim of the Study

1. To determine which factors, cause the seafarers to leave the industry.
2. To reduce the turnover intention among seafarers.

2. RELATED STUDY

According to Yi-Shih Chung (2017), Seafarer fitness and wellness has long been a difficulty inside the delivery enterprise due to the specific traits of operating at sea. The function of burnout in seafarer fitness and health and its impact on protection have been identified. The differentiationof seafarer burnout into private and paintings-associated burnout displays the ambiguous difference between relaxation and paintings in seafarers' activity environment. The effectiveness of emotion law for seafarers to lessen burnout. A framework changed proposed to become aware of the causal dating among occupational pressure, sleepiness, emotional law, burnout, and incidents at sea. To confirm the proposed framework, scales have been tailored from hooked up scales inside the literature; a cross-sectional survey was changed into additionally carried out to gather empirical records for evaluation with direction and simultaneous equation models. The evaluation outcomes found that private and paintings-associated burnout in seafarers is jointly affected; however, most effective paintings-associated burnout exerts a right away impact on incidents. Reappraisal is a powerful emotion law method in seafarers to lessen private burnout, however now no longer paintings-associated burnout. Occupational pressure and sleepiness exert fine results on each private and paintings-associated burnout; yet, their impact on incidents is mediated via way of means of paintings-associated burnout.

According to Ibrahim (2020), The motive has a look at turned into to show and examine the effect of the painting's environment, organizational citizenship conduct, organizational dedication to environmental activity delight, and overall performance. How does the connection between delight and overall performance with the technological elements affect the aim to forestall? The facts or facts received turned into processed via way of means of statistical strategies the use of the Warp PLS software. Methods of facts evaluation of the use of PLS. The facts series method used a Quizinoer with a Likert scale. The effects confirmed that each relationship had a wonderful impact on delight and overall performance. Satisfied personnel deliver proper overall performance and decrease the aim to quit. However, organizational citizenship conduct has a poor and insignificant impact on

overall performance. The study affords to enter to the seafarers' enterprise scope in Balikpapan, East Kalimantan, that many elements need to be taken into consideration to boom delight and overall performance, to lessen the aim to forestall running adoption of technology[3].

According to Joanne McVeigh (2021), The number one intention of the look turned into evaluating the results of a psychosocial application on the perceived strain, resilience, and activity pleasure amongst a pattern of service provider seafarers. Secondary information evaluation turned into carried out with the use of a running questionnaire administered with the aid of using a big delivery company. The matched topics method and multivariate evaluation of covariance had been carried out by the use of a theoretical version of this system's results on activity pleasure, resilience, and perceived strain. A giant interplay among application participation and weeks on board indicated that the results of weeks on board on perceived strain differed notably for the intervention organization and paired manage the organization. The findings suggest that participation inside the application moderated the results of weeks on board on the perceived strain, suggesting that this system might also additionally have safeguarded individuals towards the results of weeks on board on the perceived strain. Importantly, however, a piece surroundings this is skilled as supportive, inclusive, and simply essential as a cornerstone for individually-centered psychosocial interventions turned into optimally applied.

According to Fiona Kerkamm (2022), Seafarers are exposed to several job-associated strain elements which could purpose fatigue, sleepiness, and disturbed sleep conduct. This assessment aimed to offer an outline of the subjective and goal size strategies of those strains. Using a scientific assessment, 166 research had been diagnosed from January 2010 to December 2020 with the usage of the PubMed database. Six research used the simplest subjective and research simplest goal strategies had been used. Actigraphy and response time tests (RTT) had been the maximum not unusual place goal strategies. Measurement-associated boundaries because of vessel-associated effects had been much less regularly said than expected. The literature assessment exhibits that there are numerous exercises to degree fatigue, sleepiness, and sleep conduct onboard. An aggregate of subjective and goal strategies regularly seems to be beneficial. The common use of actigraphy and RTT onboard counseled appropriate feasibility and dependable measurements with the strategies. The use of ambulatory PSG in maritime-like contexts indicates that the approach could additionally be viable on board.

According to F. Turker (2007), The significance of turnover from the factor of view of mana is that an excessive price of turnover now no longer best necessitates an expensive employee's replacement, recruitment, selection, and schooling of recent employees however additionally disrupts ordinary operations ensuing in a lack of productiveness and protection. Besides a lack of crucial employees who are wearing out middle activities, like a master, lead engineer, or leader officer that cannot be compensated without difficulty with some other ready alternative, it can bring about a lack of manufacturing and lack of a professional employee who's ready and dependable with protection precautions and enterprise politics this means that lack of heaps of bucks in maritime transportation. The take a look concentrates on making research on the "goal to quit" and its antecedents. Consequently, the results of turnover on each organizational and protective factor and their countermeasures are mentioned in advance.
According to Anna Carotenuto (2012), Seafaring is a specific profession, wherein people are commonly uncovered to numerous stressors which might be associated with the special responsibility onboard ships. The paper has reviewed the principle courses on various factors affecting seafarers to perceive particular pressure elements associated with specific responsibility on board. The result evaluation showed that seafaring is related to intellectual, psychosocial, and bodily stressors. The maximum critical elements had been separated from Family, loneliness on board, fatigue, multi-nationality, limited hobby activity, and sleep deprivation. The AMSA document gave an extra special evaluation of the way of life and applicable elements inducing mental distress[4]. Seafaring remains related to applicable intellectual fitness risks. Information on regarded pressure elements on board ought to be furnished to seafarers to assist them in reducing pressure perception.

3. METHODOLOGY

A wide variety of data collection analyses and processing methods have been used to explore the significant factors driving seafarers' exodus, including semi-structural interviews, frequency, and multiple regression. Table 1 shows the steps taken in this study. This section provides a detailed explanation of the creation, distribution, and recycling of questionnaires since they are the primary measure of this study.

To collect data for the questionnaire, 21 young seafarers aged between 18 and 64 with turnover intention were conducted through semi-structured interviews from which ground analysis was conducted to extract keywords. Second, a pilot questionnaire with 33 questions covering four aspects was designed based on the literature review and keywords extracted. Twenty questions were included in the formal questionnaire. Total, 220 questionnaires were answered by electronic means, 20 of which were disregarded due to extreme viewpoints, and 200 were reserved.91.1% of the tests were valid.

TABLE-1 DEMOGRAPHIC PROFILE OF THE RESPONDENTS

DEMOGRAPHIC FACTORS	ITEMS	PERCENTAGE
AGE	18-29	21
	30-39	45
	40-64	31
	ABOVE 65 YEARS	3

GENDER	MALE	56.5
	FEMALE	43.5
MARITAL STATUS	MARRIED	56.5
	NOT MARRIED	43.5
DESIGNATION	CREW STAFF	23
	OFFICER	31
	ENGINEER	46
TYPE OF SHIP	CARGO	44.5
	PASSENGER LINE	50
	CONTAINER	5.5
ACADEMIC	DIPLOMA	56.5
	DEGREE	43.5

Source: Author's own data.

4. MULTIPLE REGRESSION

TABLE-2 MULTIPLE REGRESSION

MODEL SUMMARY

MODEL	R	R SQUARE	ADJUSTED R SQUARE	STD. THE ERROR OF THE ESTIMATE
1	.386 A	0.149	0.14	1.73

A.PREDICTORS:(CONSTANT), GENDER, PERSONAL FACTORS

By measuring the variance of the dependent variable, we can find out how much the variable varies. Considering both gender and personal factors, the model's multiple correlation coefficient (R) is 0.386. There is a coefficient of determination (R2) of 0.149. As a result of this, 15 percent of the dependent variable's change is the result of the independent variable, while 85 percent of the dependent variable's change is unaccounted for. The adjusted R2 of the model was 0.140, which showed that personal factors and gender variables could be used to forecast 14 percent of Turnover changes.

TABLE-3-ANOVA

MODEL	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG.
REGRESSION	103.097	2	51.549	17.227	.000B
RESIDUAL	589.498	197	2.992		
TOTAL	692.595	199			

a. DEPENDENT VARIABLE: TURNOVER RETENTION
b. PREDICTORS: (CONSTANT), GENDER, PERSONAL FACTORS

Table 3 shows how the regression equation explains the response variable variability based on variance analysis (ANOVA). The results indicate a highly significant relationship between the independent and dependent variables. In this way, the regression model predicts outcomes statistically. Table -4 Displays the regression coefficients of the model and its collinearity statistics.

As shown in Table There is a p-value (Sig.) of 0.000 in this model, which is less than the alpha value of 0.05, and therefore it is significant. Hence, the independent variables DV of Turnover and DV of personal factors can significantly explain the variance of Turnover.

TABLE-4- CO-EFFICIENT

MODEL	UNSTANDARDIZED COEFFICIENTS	STANDARDIZED COEFFICIENTS	STANDARDIZED COEFFICIENTS	T	SIG
	B	ST. ERROR	BETA		
(CONSTANT)	2.741	1.644		1.668	0.097
PERSONAL FACTORS	0.376	0.068	0.362	5.491	0
GENDER	-0.624	0.248	-0.166	-2.52	0.013

a. DEPENDENT VARIABLE: TURNOVER

The gradient (β) is then tested for significance and if there is no correlation it will be zero. With a sig value of less than 0.05, the coefficients of all independent variables are statistically significant. Therefore, there is substantial evidence that the gradient is not zero. Based on the independent variables, unstandardized coefficients (B) are used to predict the dependent variable.
Turnover = 2.74 + 0.375 (Personal Factors) + 0.620 (Gender) is the regression equation for this study.

We can determine based on the regression equation that the Turnover will increase by 0.376 units when the Personal factors increase by 1 unit. By increasing one unit in gender, the turnover intention will increase by 0.624.A standardized coefficient (beta) analysis shows that personal factors (b=0.362) are the most important factors associated with turnover intentions. However, gender hurts Turnover (b=-0.166).

5. SEAMEN LEAVING THEIR JOBS DUE TO PERSONAL REASONS

Seafarers are still adversely affected by some of their factors today, which is a primary problem. Traditionally, seafarers are supposed to work in the area of the sea surrounded by water and sea. There is a feeling of isolation in the sea without being able to communicate with friends, family, and loved ones[5]. Even though they have android phones and WiFi to communicate with them, they feel insecure about their personal information not being shared with them. Besides missing their family and friends, the physical strain on their bodies is also a tremendous hindrance. “National Sleep Foundation guidelines advise that healthy adults need between 7 and 9 hours of sleep per night” Eric Suni(2021). They do not have enough time to rest since they work different hours on different days and this results in poor sleeping disorders and loss of concentration at work, which again causes stress for them. Another fact to note is that some ships have vegetarian foods rarely, however, they have Indians and North Indians among the crew. If the chef is Indian, other crew members wouldn't get the foods they require. Assuming there is a mixed crew and the Chef is Ukrainian, the Indians will normally have diminished chances of eating, and even if they eat, the food they consume won't be digested, which causes a " Poor Diet". Diet scheduling changes greatly impact crew morale, and cause stress.
Additionally, there is the major concern of Temperature Differentiation resulting from the skin's difficulty adjusting to constantly changing temperatures, as well as Hairfall resulting from overheating in the engine ship, these negatively affect the seafarers. The seafarer would experience stress if he or she does not have a permanent friend or colleague on the ship, another stress factor is crew changes; for example, if he or she becomes closely attached to a motorman and then the motorman leaves the sea as their six-month agreement terminates and the sea, and if this is a chain process, the seafarer would feel depressed. Moreover, the tightening of sea fastenings and the movement of vessels due to rough weather exacerbate stress. In addition, folks who are confined on a deck may experience adverse health effects due to the ship's pitching, pitching, yawing, swaying, and surging movements[6][7]. These factors are key reasons why sailors quit their jobs in their field.

6. CONCLUSION AND RECOMMENDATION

Regarding the study, a negative impact is found on gender and the above table explains that a negative impact is found on personal factors in a seaman's life. To reduce the stress levels of seafarers who must leave their families and friends for continued work on the seas, we should provide "Unlimited" Internet access instead of supplying limited GB per day. This will not prevent them from missing their families but will encourage them to feel relaxed when they can communicate with them at any time. Food changes can help reduce stress by keeping South Indians on the same ship with South Indian chefs so they can enjoy Indian cuisine, however, this might not be practical on all ships so they may consider identifying how many people belong to each nation so they can determine if different chefs are needed accordingly. To make their working hours shorter, seamen should have at least 7 hours of sleep each night to feel relaxed. Incorporate entertainment and fun-based activities such as play station, tennis, and other indoor games into all ships to ensure that this atmosphere is stress-free for seafarers. There should be a mental health program and a campaign geared towards reducing stress in the maritime industry. The workplace should allocate mentors to every worker to help them discuss and solve problems.

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On $\kappa - \varrho$ −Bipolar Fuzzy BCI-Ideals

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Abstract.

This paper introduced the $\kappa - \varrho$-BFBCI-Ids and $\kappa - \varrho$-BFBCI-Imp-Ids with examples and properties are studied. In furthermore, discussed about $\kappa - \varrho$ −Bipolar Fuzzy Union and Intersection set as its various algebraic aspects.

Keywords. Fuzzy Set (FS), Fuzzy BCI-ideal(FBCI-Id), $\kappa - \varrho$-Fuzzy Subset ($\kappa - \varrho - FSb$), $\kappa - \varrho$-Bipolar fuzzy set ($\kappa - \varrho$-BFS), $\kappa - Q$-bipolar fuzzy Ideal ($\kappa - \varrho$-BFI), $\kappa - \varrho$-bipolar fuzzy BCI-Ideal ($\kappa - \varrho$-BFBCI-Id) and $\kappa - \varrho$-bipolar fuzzy BCI-Implicative Ideal ($\kappa - \varrho$-BFBCI-Imp-Id).
Mathematics Subject Classification: MSC2020-zbMATH-03B52

1. INTRODUCTION

[17]Zadeh L A described the notation of fuzzy sets in 1965. In 2004, Bipolar logic and bipolar fuzzy logic developed by [18]Yang Y. [19]Zimmermann H J initiated by the concept of Fuzzy set theory and its applications in 1985. In 1986, described the concept of Intuitionistic fuzzy sets by [1]Atanassov K T. [2]Hu Q P developed the concept of On BCI-algebras satisfying$(x * y) * z = x * (y * z)$ in 1980. [16]Nagarajan R, initiated by notation of a new structure and construction of Q- fuzzy groups in 2009. In 2019, Cubic intuitionistic structures applied to ideals of BCI-algebras developed by [15]Shum K P. [9]Aldhafeeri S depicted the concept of N-soft p-ideals of BCI-algebras in 2019. In 2009 introduced by the notation of BCI-Implicative ideals of BCI-algebras in [8]Meng J. [10]Jun Y B developed the concept of Hesitant fuzzy translations and extensions of subalgberas and ideals in BCK/BCI-algebras in 2017. Bipolar valued fuzzy sub algebras and bipolar

fuzzy ideals of BCK/BCI-algebras in 2009 developed by [5]Lee K J. [7]Liu Y L described the notation of fuzzy ideals in BCI-algebras in 2001. Bipolar valued fuzzy sets and their operations developed by [6]Lee K M in 2000. [14]Premkumar M develop the concept of On Fundamental Algebraic Attributes of $\omega - Q$ −Fuzzy Subring, Normal Subring and Ideal in 2021. On $\kappa - Q$-Anti Fuzzy Normed Rings in 2021 described by [12]Prasanna A. [3]Iseki K initiated by the notation of BCI-algebras in 1980. $\kappa - Q$ −Fuzzy Orders Relative to $\kappa - Q$ −Fuzzy Subgroups and Cyclic group on various fundamental aspects depicted by [11]Premkumar M in 2020. [13]Premkumar M developed the concept of Fundamental Algebraic Properties on $\kappa - Q -$ Anti Fuzzy Normed Prime Ideal and $\kappa - Q -$ Anti Fuzzy Normed Maximal Ideal in 2021. In 1993, Closed fuzzy ideals in BCI-algebras depicted by [4]Jun Y B.

In this paper introduced by the new contribution of Algebraic Properties on $\mathbb{K} - \mathrm{Q}$-BFBCI-Ids. And also described the new notation of $\mathbb{K} - \mathrm{Q}$-BFBCI-Imp-Ids in BCI-Algebra and their results.

2. PRELIMINARIES

Definition: 2.1

An algebra $(G;*,0)$ of kind (2,0) is a BCI-algebra if it satisfies for all $x, y, z \in G$

(i) $\big((x * y) * (x * z)\big) * (z * y) = 0$

(ii) $\big(x * (x * y)\big) * y = 0$

(iii) $x * x = 0$

(iv) $x * y = 0 \; and \; y * x = 0 \Rightarrow x = y.$

Definition: 2.2

A $FS\ \mu$ in G is a FBCI-Id of G if it satisfies for all $x, y, z \in G$

(i) $\mu(0) \geq \mu(x)$

(ii) $\mu(x) \geq min\{\mu(x * y), \mu(y)\}.$

Definition: 2.3

A $FS\ \mu$ in G is a FBCI-Imp-Id of G if it satisfies for all $x, y, z \in G$

$$\mu\left\{\left(x * \big(y * (y * x)\big) * \Big(0 * \big(0 * (x * y)\big)\Big)\right)\right\} \geq min\left\{\mu\left(\Big(\big((x * y, q) * y, q\big) * (0 * y, q), q\Big) * (z, q)\right), \mu(z)\right\}.$$

Definition: 2.4

Let G and Q be any two nonempty sets and $\kappa \in [0,1]$ and μ be a $\bar{\mathrm{Q}} - FSb$ of a set G. The $FS\ \mu^{\kappa}$ of G is called the $\kappa - Q - FSb$ of G is defined by

$\mu^{\kappa}(x, q) = (\mu\ (x, q), \kappa), \forall\ x \in G \; and \; q \in Q.$

3. ON $\mathbb{K} - \mathrm{Q}$-BFBCI-IDS AND $\mathbb{K} - \mathrm{Q}$-BFBCI-IMP-IDS IN BCI-ALGEBRA

Definition: 3.1

A $\mathbb{K} - \mathrm{Q}$-BFS, $\tilde{\mathrm{A}}$ in G is called a $\mathbb{K} - \mathrm{Q}$-BFBCI-Id of G. If its following conditions

(a) (i) $\mu_{\tilde{\mathrm{A}}^{\mathbb{K}}}(0, \mathrm{q}) \geq \{(\mu_{\tilde{\mathrm{A}}}(\tilde{\mathrm{u}}, \mathrm{q}), \mathbb{K})\}$

(ii) $\mu_{\tilde{A}^{\mathbb{K}+}}(0,\mathfrak{q}) \leq \{(\mu_{\tilde{A}^{+}}(\tilde{u},\mathfrak{q}),\mathbb{K})\}$

(b) (i) $\mu_{\tilde{A}^{\mathbb{K}-}}(\tilde{u},\mathfrak{q}) \geq min\{(\mu_{\tilde{A}^{-}}(\tilde{u}*\tilde{v},\mathfrak{q}),\mathbb{K}),(\mu_{\tilde{A}^{-}}(\tilde{v},\mathfrak{q}),\mathbb{K})\}$

(ii) $\mu_{\tilde{A}^{\mathbb{K}+}}(\tilde{u},\mathfrak{q}) \leq max\{(\mu_{\tilde{A}^{+}}(\tilde{u}*\tilde{v},\mathfrak{q}),\mathbb{K}),(\mu_{\tilde{A}^{+}}(\tilde{v},\mathfrak{q}),\mathbb{K})\}, \forall\ \tilde{u},\tilde{v} \in G.$

Definition: 3.2

A $\mathbb{K}-\mathfrak{Q}$-BFS, $\tilde{A}$ in G is called a $\mathbb{K}-\mathfrak{Q}$-BFBCI-Imp-Id of G if it satisfies in above definition condition (a) and the following conditions

(i) $\mu_{\tilde{A}^{\mathbb{K}-}}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} \geq$
$min\left\{\left(\mu_{\tilde{A}^{-}}\left(\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right)*\right.\right.\right.$
$\left.\left.\left.(z,\mathfrak{q})\right),\mathbb{K}\right),(\mu_{\tilde{A}^{-}}(z,\mathfrak{q}),\mathbb{K})\right\}$ and

(ii) $\mu_{\tilde{A}^{\mathbb{K}+}}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} \leq$
$max\left\{\left(\mu_{\tilde{A}^{+}}\left(\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right)*\right.\right.\right.$
$\left.\left.\left.(z,\mathfrak{q})\right),\mathbb{K}\right),(\mu_{\tilde{A}^{+}}(z,\mathfrak{q}),\mathbb{K})\right\}, \forall\ \tilde{u},\tilde{v},z \in G.$

Example: 3.2.1.

Consider a BCI-Algebra$(G,*,0)$, where $G=\{0,a,b,c\}$ and $*$ is given by the table

$*$	0	a	b	c
0	0	a	b	c
a	a	0	c	b
b	b	c	0	a
c	c	b	a	0

Let $\mathbb{K}-\mathfrak{Q}$-BFS in G represented by

G	0	a	b	c
$\mu_{\tilde{A}^{\mathbb{K}-}}$	-0.8	-0.8	-0.5	-0.5
$\mu_{\tilde{A}^{\mathbb{K}+}}$	0.9	0.9	0.4	0.4

Then by routine calculations $\mathbb{K}-\mathfrak{Q}$-BFBCI-Imp-Id of G. ■

Theorem: 3.3

Any $\mathbb{K}-\mathfrak{Q}$-BFBCI-Imp-Id of G is a $\mathbb{K}-\mathfrak{Q}-$ BFI of G.

Proof:

Let, $\mathbb{K}-\mathfrak{Q}$-BFBCI-Imp-Id of G

Then,

(i) $\mu_{\tilde{A}^{\Bbbk}-}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},q),q)*(0*(0*(\tilde{u}*\tilde{v},q),q),q),q)\} \geq min\left\{\left(\mu_{\tilde{A}-}\left(\left(\left((\tilde{u}*\tilde{v},q)*\tilde{v},q\right)*(0*\tilde{v},q),q\right)*(z,q)\right),\Bbbk\right),\left(\mu_{\tilde{A}-}(z,q),\Bbbk\right)\right\}$ and

(ii) $\mu_{\tilde{A}^{\Bbbk}+}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},q),q)*(0*(0*(\tilde{u}*\tilde{v},q),q),q),q)\} \leq max\left\{\left(\mu_{\tilde{A}+}\left(\left(\left((\tilde{u}*\tilde{v},q)*\tilde{v},q\right)*(0*\tilde{v},q),q\right)*(z,q)\right),\Bbbk\right),\left(\mu_{\tilde{A}+}(z,q),\Bbbk\right)\right\}, \forall\ \tilde{u},\tilde{v},z \in G.$

Substitute z by $\tilde{v}$ and $\tilde{v}$ by 0 to get

(i) $\mu_{\tilde{A}^{\Bbbk}-}\{(\tilde{u}*(0*(0*\tilde{u},q),q)*(0*(0*(\tilde{u}*0,q),q),q),q)\} \geq min\left\{\left(\mu_{\tilde{A}-}\left(\left(\left((\tilde{u}*0,q)*0,q\right)*(0*0,q),q\right)*(\tilde{v},q)\right),\Bbbk\right),\left(\mu_{\tilde{A}-}(\tilde{v},q),\Bbbk\right)\right\}$ and

(ii) $\mu_{\tilde{A}^{\Bbbk}+}\{(\tilde{u}*(0*(0*\tilde{u},q),q)*(0*(0*(\tilde{u}*0,q),q),q),q)\} \leq max\left\{\left(\mu_{\tilde{A}+}\left(\left(\left((\tilde{u}*0,q)*0,q\right)*(0*0,q),q\right)*(\tilde{v},q)\right),\Bbbk\right),\left(\mu_{\tilde{A}+}(\tilde{v},q),\Bbbk\right)\right\}, \forall\ \tilde{u},\tilde{v},z \in G.$

$\Rightarrow \mu_{\tilde{A}^{\Bbbk}-}(\tilde{u},q) \geq min\{\left(\mu_{\tilde{A}-}(\tilde{u}*\tilde{v},q),\Bbbk\right),\left(\mu_{\tilde{A}-}(\tilde{v},q),\Bbbk\right)\}$ and $\mu_{\tilde{A}^{\Bbbk}+}(\tilde{u},q) \leq max\{\left(\mu_{\tilde{A}+}(\tilde{u}*\tilde{v},q),\Bbbk\right),\left(\mu_{\tilde{A}+}(\tilde{v},q),\Bbbk\right)\},\ \forall\ \tilde{u},\tilde{v} \in G.$

Hence, $\Bbbk - Q$-BFBCI-Id of G. The converse of theorem 3.3 is not true as proved by the following example. ■

Example: 3.3.1

Consider a BCI-Algebra$(G,*,0)$, where $G=\{0,a,b,c\}$ and $*$ is given by the table

$*$	**0**	***d***	***e***	***f***
0	0	0	0	f
d	d	0	0	f
e	e	e	0	f
f	f	f	f	0

Let $\Bbbk - \mathrm{Q}$-BFS in G represented by

G	0	d	e	f
$\mu_{\tilde{A}^{\Bbbk-}}$	-0.6	-0.4	-0.4	-0.4
$\mu_{\tilde{A}^{\Bbbk+}}$	0.8	0.7	0.7	0.7

Then not a $\Bbbk - \mathrm{Q}$-BFBCI-Imp-Id of G, as defined by

$\mu_{\tilde{A}^{\Bbbk+}}\{(d*(e*(e*d,\mathrm{q}),\mathrm{q})*(0*(0*(d*e,\mathrm{q}),\mathrm{q}),\mathrm{q})\} = \mu_{\tilde{A}^{\Bbbk+}}(d,\mathrm{q}) = -0.4 \not\leq -0.6 = max\left\{\left(\mu_{\tilde{A}^{+}}\left(\left(\left((d*e,\mathrm{q})*e,\mathrm{q}\right)*(0*e,\mathrm{q}),\mathrm{q}\right)*(0,\mathrm{q})\right),\Bbbk\right),\left(\mu_{\tilde{A}^{+}}(0,\mathrm{q}),\Bbbk\right)\right\} = \mu_{\tilde{A}^{\Bbbk+}}(0,\mathrm{q})$. ■

Proposition: 3.4

Let, $\Bbbk - \mathrm{Q}$-BFS in G is a $\Bbbk - \mathrm{Q}$-BFBCI-Id of G, if and only if for all $\tilde{u},\tilde{v},z \in G$, $(\tilde{u}*\tilde{v},\mathrm{q})*(z,\mathrm{q}) = (0,\mathrm{q}) \Rightarrow$

$(i)\ \mu_{\tilde{A}^{\Bbbk-}}(\tilde{u},\mathrm{q}) \geq min\left\{\left(\mu_{\tilde{A}^{-}}(\tilde{v},\mathrm{q}),\Bbbk\right),\left(\mu_{\tilde{A}^{-}}(z,\mathrm{q}),\Bbbk\right)\right\}$ and

$(ii)\ \mu_{\tilde{A}^{\Bbbk+}}(\tilde{u},\mathrm{q}) \leq max\left\{\left(\mu_{\tilde{A}^{+}}(\tilde{v},\mathrm{q}),\Bbbk\right),\left(\mu_{\tilde{A}^{+}}(z,\mathrm{q}),\Bbbk\right)\right\}$.

Proposition: 3.5

Let, $\Bbbk - \mathrm{Q}$-BFS in G is a $\Bbbk - \mathrm{Q}$-BFBCI-Id of G, if and only if for all $\tilde{u},\tilde{v},z \in G$, $(\tilde{u}*\tilde{v},\mathrm{q}) = 0 \Rightarrow$

(i) $\mu_{\tilde{A}^{\Bbbk-}}(\tilde{u},\mathrm{q}) \geq \mu_{\tilde{A}^{\Bbbk-}}(\tilde{v},\mathrm{q})$ and

(ii) $\mu_{\tilde{A}^{\Bbbk+}}(\tilde{u},\mathrm{q}) \leq \mu_{\tilde{A}^{\Bbbk+}}(\tilde{v},\mathrm{q})$.

Definition: 3.6

Let, two $\Bbbk - \mathrm{Q}$-BFSs in G. Then the union denoted by $\mu_{\tilde{A}_1{}^{\Bbbk-}} \cup \mu_{\tilde{A}_2{}^{\Bbbk-}}$ and $\mu_{\tilde{A}_1{}^{\Bbbk+}} \cup \mu_{\tilde{A}_2{}^{\Bbbk+}}$ is $max\left\{\mu_{\tilde{A}_1{}^{\Bbbk-}},\mu_{\tilde{A}_2{}^{\Bbbk-}}\right\}$ and $min\left\{\mu_{\tilde{A}_1{}^{\Bbbk+}},\mu_{\tilde{A}_2{}^{\Bbbk+}}\right\}$.

Definition: 3.7

Let, two $\Bbbk - \mathrm{Q}$-BFSs in G. Then the intersection denoted by $\mu_{\tilde{A}_1{}^{\Bbbk-}} \cap \mu_{\tilde{A}_2{}^{\Bbbk-}}$ and $\mu_{\tilde{A}_1{}^{\Bbbk+}} \cap \mu_{\tilde{A}_2{}^{\Bbbk+}}$ is $min\left\{\mu_{\tilde{A}_1{}^{\Bbbk-}},\mu_{\tilde{A}_2{}^{\Bbbk-}}\right\}$ and $max\left\{\mu_{\tilde{A}_1{}^{\Bbbk+}},\mu_{\tilde{A}_2{}^{\Bbbk+}}\right\}$.

Theorem: 3.8

Let, two $\Bbbk - \mathrm{Q}$-BFSs in G and two $\Bbbk - \mathrm{Q}$-BFBCI-Imp-Id of G. Then $\mu_{\tilde{A}_1{}^{\Bbbk-}} \cup \mu_{\tilde{A}_2{}^{\Bbbk-}}$ and $\mu_{\tilde{A}_1{}^{\Bbbk+}} \cup \mu_{\tilde{A}_2{}^{\Bbbk+}}$ is a $\Bbbk - \mathrm{Q}$-BFBCI-Imp-Ids of G.

Proof:

Let two $\Bbbk - \mathrm{Q}$-BFBCI-Imp-Ids of G.

Then,

(i) $\mu_{\tilde{A}_1{}^{\Bbbk-}}(0,\mathrm{q}) \geq \mu_{\tilde{A}_1{}^{-}}\left((\tilde{u},\mathrm{q}),\Bbbk\right)$ and $\mu_{\tilde{A}_2{}^{\Bbbk-}}(0,\mathrm{q}) \geq \mu_{\tilde{A}_2{}^{-}}\left((\tilde{u},\mathrm{q}),\Bbbk\right)$

(ii) $\mu_{\tilde{A}_1}{}^{\kappa+}(0,\mathfrak{q}) \le \mu_{\tilde{A}_1}{}^{+}((\tilde{u},\mathfrak{q}),\mathbb{K})$ and $\mu_{\tilde{A}_2}{}^{\kappa+}(0,\mathfrak{q}) \le \mu_{\tilde{A}_2}{}^{+}((\tilde{u},\mathfrak{q}),\mathbb{K})$.

Therefore

$$max\left\{\mu_{\tilde{A}_1}{}^{\kappa-},\mu_{\tilde{A}_2}{}^{\kappa-}\right\}(0,\mathfrak{q}) \ge max\{\mu_{\tilde{A}_1}{}^{-}((\tilde{u},\mathfrak{q}),\mathbb{K}),\mu_{\tilde{A}_2}{}^{-}((\tilde{u},\mathfrak{q}),\mathbb{K})\} \text{ and}$$
$$min\left\{\mu_{\tilde{A}_1}{}^{\kappa+},\mu_{\tilde{A}_2}{}^{\kappa+}\right\}(0,\mathfrak{q}) \le min\left\{\mu_{\tilde{A}_1}{}^{+}((\tilde{u},\mathfrak{q}),\mathbb{K}),\mu_{\tilde{A}_2}{}^{+}((\tilde{u},\mathfrak{q}),\mathbb{K})\right\}$$

For all $\tilde{u},\tilde{v} \in G$ *and* $\mathfrak{q} \in \mathcal{Q}$,

$$\mu_{\tilde{A}_1}{}^{\kappa+}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_1}{}^{+}\left\{\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\},$$
$$\mu_{\tilde{A}_1}{}^{\kappa-}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_1}{}^{-}\left\{\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right\} \text{ and}$$
$$\mu_{\tilde{A}_2}{}^{\kappa+}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_2}{}^{+}\left\{\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\},$$
$$\mu_{\tilde{A}_2}{}^{\kappa-}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_2}{}^{-}\left\{\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right\}$$

Thus, $min\left\{\mu_{\tilde{A}_1}{}^{\kappa+},\mu_{\tilde{A}_2}{}^{\kappa+}\right\}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$
$min\left\{\mu_{\tilde{A}_1}{}^{+}\left(\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right),\mu_{\tilde{A}_2}{}^{+}\left(\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*\right.\right.\right.$
$\left.\left.\left.(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right)\right\} = min\left\{\mu_{\tilde{A}_1}{}^{+},\mu_{\tilde{A}_2}{}^{+}\right\}\left\{\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right\},$

and

$$\begin{aligned} max\left\{\mu_{\tilde{A}_1}{}^{\kappa-},\mu_{\tilde{A}_2}{}^{\kappa-}\right\}\{&(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})\\ &*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\}\\ &= max\left\{\mu_{\tilde{A}_1}{}^{-}\left(\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)\right.\right.\right.\\ &\left.\left.\left.*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right),\mu_{\tilde{A}_2}{}^{-}\left(\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)\right.\right.\right.\\ &\left.\left.\left.*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right)\right\}\\ &= max\{\mu_{\tilde{A}_1}{}^{-},\mu_{\tilde{A}_2}{}^{-}\}\left\{\left(\left((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q}\right)\right.\right.\\ &\left.\left.*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathbb{K}\right\}. \end{aligned}$$

That is $\mu_{\tilde{A}_1}{}^{\kappa-} \cup \mu_{\tilde{A}_2}{}^{\kappa-}$ and $\mu_{\tilde{A}_1}{}^{\kappa+} \cup \mu_{\tilde{A}_2}{}^{\kappa+}$ is $\mathbb{K}-\mathcal{Q}$-BFBCI-Imp-Ids of G. ■

Theorem: 3.9

Let, two $\mathbb{K}-\mathcal{Q}$-BFSs in G, and two $\mathbb{K}-\mathcal{Q}$-BFBCI-Imp-Ids of G. Then $\mu_{\tilde{A}_1}{}^{\kappa-} \cap \mu_{\tilde{A}_2}{}^{\kappa-}$ and $\mu_{\tilde{A}_1}{}^{\kappa+} \cap \mu_{\tilde{A}_2}{}^{\kappa+}$ is a $\mathbb{K}-\mathcal{Q}$-BFBCI-Imp-Ids of G.

Proof:

Let, two $\mathbb{K}-\mathcal{Q}$-BFBCI-Imp-Ids of G

Then,

(i) $\mu_{\tilde{A}_1}{}^{\kappa-}(0,\mathfrak{q}) \geq \mu_{\tilde{A}_1}{}^{-}((\tilde{u},\mathfrak{q}),\mathfrak{K})$ and $\mu_{\tilde{A}_2}{}^{\kappa-}(0,\mathfrak{q}) \geq \mu_{\tilde{A}_2}{}^{-}((\tilde{u},\mathfrak{q}),\mathfrak{K})$

(ii) $\mu_{\tilde{A}_1}{}^{\kappa+}(0,\mathfrak{q}) \leq \mu_{\tilde{A}_1}{}^{+}((\tilde{u},\mathfrak{q}),\mathfrak{K})$ and $\mu_{\tilde{A}_2}{}^{\kappa+}(0,\mathfrak{q}) \leq \mu_{\tilde{A}_2}{}^{+}((\tilde{u},\mathfrak{q}),\mathfrak{K})$.

Therefore

$$min\left\{\mu_{\tilde{A}_1}{}^{\kappa-},\mu_{\tilde{A}_2}{}^{\kappa-}\right\}(0,\mathfrak{q}) \geq min\{\mu_{\tilde{A}_1}{}^{-}((\tilde{u},\mathfrak{q}),\mathfrak{K}),\mu_{\tilde{A}_2}{}^{-}((\tilde{u},\mathfrak{q}),\mathfrak{K})\} \text{ and}$$
$$max\left\{\mu_{\tilde{A}_1}{}^{\kappa+},\mu_{\tilde{A}_2}{}^{\kappa+}\right\}(0,\mathfrak{q}) \leq max\left\{\mu_{\tilde{A}_1}{}^{+}((\tilde{u},\mathfrak{q}),\mathfrak{K}),\mu_{\tilde{A}_2}{}^{+}((\tilde{u},\mathfrak{q}),\mathfrak{K})\right\}$$

For all $\tilde{u},\tilde{v} \in G\ and\ \mathfrak{q} \in \mathfrak{Q}$,

$$\mu_{\tilde{A}_1}{}^{\kappa+}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_1}{}^{+}\left\{\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathfrak{K}\right\},$$
$$\mu_{\tilde{A}_1}{}^{\kappa-}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_1}{}^{-}\left\{\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathfrak{K}\right\} \text{ and}$$
$$\mu_{\tilde{A}_2}{}^{\kappa+}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_2}{}^{+}\left\{\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathfrak{K}\right\},$$
$$\mu_{\tilde{A}_2}{}^{\kappa-}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$$
$$\mu_{\tilde{A}_2}{}^{-}\left\{\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathfrak{K}\right\}$$

Thus, $max\left\{\mu_{\tilde{A}_1}{}^{\kappa+},\mu_{\tilde{A}_2}{}^{\kappa+}\right\}\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\} =$
$max\left\{\mu_{\tilde{A}_1}{}^{+}\left(\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathfrak{K}\right),\mu_{\tilde{A}_2}{}^{+}\left(\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})*\right.\right.$
$\left.\left.(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathfrak{K}\right)\right\} = max\left\{\mu_{\tilde{A}_1}{}^{+},\mu_{\tilde{A}_2}{}^{+}\right\}\left\{\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\right),\mathfrak{K}\right\},$

and

$$\begin{aligned}
min\left\{\mu_{\tilde{A}_1}{}^{\kappa-},\mu_{\tilde{A}_2}{}^{\kappa-}\right\}&\{(\tilde{u}*(\tilde{v}*(\tilde{v}*\tilde{u},\mathfrak{q}),\mathfrak{q})\\
&*(0*(0*(\tilde{u}*\tilde{v},\mathfrak{q}),\mathfrak{q}),\mathfrak{q}),\mathfrak{q})\}\\
&= min\left\{\mu_{\tilde{A}_1}{}^{-}\left(\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})\right.\right.\right.\\
&*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\left.\left.\left.\right),\mathfrak{K}\right),\mu_{\tilde{A}_2}{}^{-}\left(\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})\right.\right.\right.\\
&*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\left.\left.\left.\right),\mathfrak{K}\right)\right\}\\
&= min\{\mu_{\tilde{A}_1}{}^{-},\mu_{\tilde{A}_2}{}^{-}\}\left\{\left(((\tilde{u}*\tilde{v},\mathfrak{q})*\tilde{v},\mathfrak{q})\right.\right.\\
&*(0*\tilde{v},\mathfrak{q}),\mathfrak{q}\left.\left.\right),\mathfrak{K}\right\}.
\end{aligned}$$

That is $\mu_{\tilde{A}_1}{}^{\kappa-} \cap \mu_{\tilde{A}_2}{}^{\kappa-}$ and $\mu_{\tilde{A}_1}{}^{\kappa+} \cap \mu_{\tilde{A}_2}{}^{\kappa+}$ is $\mathfrak{K}-\mathfrak{Q}$-BFBCI-Imp-Ids of G. ■

4. CONCLUSIONS

During in this paper, we acquainted a $\kappa - Q$-BFBCI-Id of Fuzzy BCI -algebra which is discussed with illustrative examples and proposition of Algebras and also investigated $\kappa - Q$-BFBCI-Imp-Ids . In further future work define as Doubt $\kappa - Q$-BFBCI-Id and $\kappa - Q$-BFBCI-Imp-Ids.

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Maximum Viability for WSN with Energy Harvesting and Cooperation by Drift Penalty and Perturbation Method

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Abstract.

There has been a rise in the quantity of research being done on wireless communication as a result of the possibilities for their wide implementation in a multitude of areas including such building automation, protection, pollution monitoring, as well as other applications. Wireless sensor networks (WSNs) have a limited storage capacity, which reduces the lifetime of edge devices. As a consequence, total system availability and reliability suffer, which is a problem for the industry. When it comes to enhance the battery's life approaches such as power generation and cooperation, which collect power from the external environment and share it among sensor network, are feasible options. Renewable energy and close cooperation are taken into consideration in this work while addressing the combined value function problem for WSNs. Initial results just on Lyapunov slides for propagation delay are obtained, and afterwards we design the enhancement as a stochastic optimum solution with a workable approach using Lyapunov slide results. We also provide an interactive algorithm was implemented the Lyapunov optimization approach with the dispersion approach and the fluctuation approach to execute generated power and movement of electricity, data transmission, transmission power, network optimization. In cloud environments, it makes an important contribution to achieve optimum functionality and a reasonable trade among vitalizing and queuing system backlog even without any relevant data about dynamical system, with no need to be worried about the computational complexity when working with a large waiting line backlog of demands. Because communication system has a linear relationship with battery performance, the simulation findings also illustrate that the proposed approach is possible for real-world use.

Keywords. ***Drift-Plus-Penalty, Energy Management, Lyapunov Analysis, Utility Optimization, WSNs***

1. INTRODUCTION

In the field of wireless sensor networks (WSNs), energy efficiency has emerged as a prominent research topic. One reason for the increased interest in energy efficiency is due to the limits imposed by the batteries that are used to power such gadgets [1]. Because of the availability of low-cost technology, the development needs for data transfer are rising all the time. As a result, wireless sensor networks (WSNs) have the potential to develop into a viable system architecture in which a large number of linked sensor nodes collaborate to acquire and fuse data originating from a variety of sources. Consequently, WSNs have the potential to be extensively used in a variety of fields [2, 3]. In contrast, wireless sensor networks (WSNs) have a variety of challenges, including data limits, data management, rechargeable electricity consumption, and computational power. Fuel efficient connectivity and decreased electricity consumption are required to address the limited lifetime of WSNs, which would be induced by the reality that the sensor networks are powered almost completely by charges. This has been regarded as the most critical problem that must be addressed quickly [3]. In various cellular connections, such as WSNs [4], mobile networks, and infomercial connections, it is being utilized as one of the innovative techniques to regulate energy consumption. Solar power is among the unique solutions in energy monitoring that has emerged in recent years. To address this issue, efforts are being made to employ extracting power, wherein the detectors are fully equipped with energy storage devices that

collect and store power from the external environment, thereby increasing the life of the battery of wireless communication and boost their knowledge.

The WSN (Wireless Sensor Network) is a critical component of the Internet of Things (IoT), and it has spread to a variety of diverse applications that operate in real time. The Internet of Things and wireless sensor networks (WSNs) now have a wide range of essential and non-critical applications that affect practically every aspect of our daily lives. WSN nodes are typically tiny, battery-operated gadgets that transmit data. In this context, energy efficient data aggregation solutions with the potential to extend the network's life lifetime are very important. In contrast, the dynamic properties of the energy harvesting framework make it more difficult to establish some transmission policies that take into account a variety of node features such as harvested energy, energy needs, and the surrounding environment. For example, high energy use may result in an energy outage, resulting in nodes that are unable to function effectively. In addition, because of their limited battery capacity, sensor nodes have a limited amount of accessible energy, necessitating the development of a method that can adapt to the nodes' future status. Taking care of utility optimization in WSNs becomes more complex as a result of all of these factors.

Recent studies on efficiency improvement approaches for thermoelectric generator nodes have been reported in peer-reviewed journals, indicating that there could be some previous research in this area. There is a description in [5 of an adjustable thermoelectric generator that can be connected to the electric cells or storage and that may be used to extend the lifetime of wireless sensor networks (WSNs). Using reinforced training methods for the creation of simulated annealing to cope with power management problems was determined to be the best course of action. Although dynamic programming (DP) often can be used to solve such multi - objective optimization problem, it is often necessary to have thorough understanding of data concerning chaotic settings. This might lead in the computational complexity when faced with a difficult congestion of requests in a queue. A significant amount of attention was paid to the improvement in accuracy on the linear Lyapunov function, which have been provided for energy conservation and price minimization and garnered a considerable amount of attention among some of the proposed schemes. Furthermore, the dispersion technique, which can be thought of as the very first Lagrangian a double methodology for optimization techniques, can also be used to tread a fine line among infrastructure achievement and response time, that can be thought of as the alignment among mobility results and network connectivity, could be used to find a balance with both power distribution effectiveness and low network. To use the Lyapunov drift technique, we are capable of building a mixed system operation, scheduling, and voltage regulation technique that delivered the includes network in a buffer with a restricted length by taking use of the Lyapunov drift technique. However, owing to the restrictions of the network architecture, this technique could only be applied to solitary WSN networks. Courtship of sustainable power and the electrical infrastructure resulting in the formation of a new diversification energy source that is more resilient to climate change. In contrast, the vast majority of studies operate on the premise that electricity demand is autonomous of each other and therefore there is no power interchange among nodes in the network. In these kind of complex systems, the energy produced in the cushion of the iot devices poses a significant challenge towards the development of an effective routing protocol, mainly due to the fact that the current power spending selection may result in a power service disruption in the coming years, which will have an impact on the advancement choices. In such chaotic environments, the electricity produced in the cushion of the edge devices poses a significant challenge to the development of an efficient routing protocol.

Throughout this article, we will be taking into account the multi-hop WSNs system. The following are the most significant contributions made by this publication.

- If we talk about wireless sensor networks (WSNs), we take account both sustainable power and collaborative behaviour, in which networks not only exchange power within itself but also gather power from their environment.
- For the purpose of maintaining system reliability, we set an top constraint on the Lyapunov drift, which means that nodes may only collect power when the size of the energy queue is less than the barrier. Specific network queue backlog constraints are provided, as well as a method for explicitly calculating the energy storage capacity needed by sensor nodes in multi-hop WSNs.
- In order to optimize the system utility in terms of data gathering rate, we define the joint utility maximization as a probabilistic optimal solution. A Lyapunov approach, paired with concepts such as slide plus penalty and perturbation technique, is used to deal with the issue in this instance. A web-based technique for power generation and communication, data transfer, power efficiency, network optimization is developed in this work and combined with some other platforms to provide a comprehensive solution. When a nonlinear Lyapunov function is employed as the foundation for the method's development, it purposely disturbs the punishment scales that are utilized for analysis in order to push the intended waiting time forward into a nonnegative quantity in place to evade the system from being under flown. Using a piecemeal approach, this structure is able to achieve the perfect functionality by considering multiple the

super capacitors and channel assignment strategy while bearing in mind the cranking amps limitation, the information transmission rate constraint, the link requirement, and the power generation limitation. No quantitative understanding of nonlinear method is necessary, as well as the plague of complexity might well be evaded also when working with a large congestion of requests.

- EDPR method, according to simulation data, provides a favorable time-averaged trade off among access and queue size when compared to other algorithms.

The rest of this work is arranged in the following manner: The preceding techniques are summarized in Section 2 of this document. Using the Lyapunov technique, we calculate the maximum bound of Lyapunov drifting and propose an internet platform for resolving the unexpected problem in Section 3. These results are reported in Section 2, along with a Lyapunov means of solving the unexpected problem. Section 4 examines the effectiveness of the suggested method via the use of numerical simulations. The outcomes of our simulations are provided in order to validate our approach. Finally, Section 5 brings our work to a close.

2. RELATED STUDY

Energy management solutions for WSN) nodes with composite energy storage that are now in use do not fully integrate the advantages of SCs and batteries, and battery deterioration continues to be an issue that reduces the lifespan of WSN nodes. According to this study, an adaptive rule-based energy management technique for extending the battery life of solar-powered wireless sensor nodes is presented. Battery deterioration is taken into account while constructing energy models, and the Poisson distribution is used to mimic the variance in power consumption at the node. It is planned to use a rule-based energy management technique that is adaptable to changes in SC capacity and load. When compared to [6,] traditional energy management solutions for WSN nodes are more efficient. In accordance with the findings of simulations, the suggested technique may extend the node lifespan from tens of days to well over a decade. As a result of this method, solar-powered WSN nodes will be available at all times of the day and night during their extended operational lives. The strategy's sturdiness is likewise put to the examination. It has been discovered that the method is adaptable to the capacity and workload requirements of the SC system. When it comes to solar-powered WSN nodes, the suggested technique is universally applicable and seems to be a potential solution to the issue of limited energy.

The short lifespan of rechargeable batteries sensor nodes is a major challenge in the use of wireless sensor networks in a variety of uses. Several strategies were modified and merged by the author in [7] in order to enhance the lifespan of a wireless sensor network. The network under consideration was created for applications involving road traffic monitoring, such as the identification of automobiles, bicycles, and people. For the purpose of determining the lifespan of sensor nodes in various real-world circumstances, extensive tests were carried out in this regard. The obtained findings demonstrate that by rotating the roles of sensor nodes, suppressing unneeded transmissions, and putting the nodes into sleep mode according to a duty cycle, the lifespan of a network for road traffic monitoring may be greatly prolonged compared to a baseline network.

Using a network model in which sensors are randomly distributed across an area to maintain watch on a number of sites of interest, the author [8] investigated the issue of WSN lifespan maximization for a model of the network (POI). Despite the fact that sensors have a constrained battery size, their number is high, and their operating ranges are similar to one another. As a result, not all of the sensors are required to be operational at all times. Furthermore, for efficient monitoring, it is sufficient to watch just a certain proportion of POIs at all times, rather than all of them, on a continuous basis. Our objective is to develop a schedule of sensor activity that allows for the most efficient evaluation of a given collection of points of interest for the greatest amount of time feasible. This paper presents three heuristic methods for scheduling sensor activity: a random and fine-tuning approach, a cellular automata-inspired approach, and a hyper graph model approach. The random and fine-tuning technique is the most straightforward. Because the results of these algorithms do not reflect optimum solutions and may be improved further, they are used as input for a local search strategy using problem-specific neighborhood functions, which uses the schedules acquired as input. An effective approach for assessing battery performance metrics such as capacity, open-circuit voltage, and state of charge (SOC) is proposed by the author in [9]. Four different battery types were exposed to different discharge rates based on the IEEE 802.15.4 protocol in order to observe the discharge parameters of the batteries. It was also tested if the combined influence of leakage currents on battery surface temperature and OCV fluctuations could be seen. It was discovered that lithium-based batteries had shorter relaxation durations than other types of batteries, allowing for rapid energy recovery while preserving rated capacity. During the discharge cycle, it was discovered that roughly 80 percent of the voltage area was flat, with very slight voltage changes occurring throughout.

Several wireless power transmission and energy recovery systems are discussed in detail by author [10], who focuses on delivering a complete assessment of the existing literature on these technologies, as well as on their prospects and problems in dispersed sensor networks [11] [12]. Updated research that are particular to wireless

power transmission and energy recovery techniques are highlighted in this review, including their prospects and possible applications, as well as their limits and obstacles, classifications and comparisons [13][14]. Additionally, performance evaluation of the two radio frequency–based power extractors is explored[15]. The experimental findings demonstrate that the two radio frequency–based energy collectors with excellent power transfer effectiveness may be used for both short- and long-range operations[16] [17].

3. METHODOLOGY

For example, suppose you have a standard inter sustainable power and cooperation WSN service that works on a timetable. A variety of forms of energy, including as electrical currents, air, and renewable power are available to the destination node, which may be harvested by the nodes themselves [18]. As depicted in Figure 1, the provider node is capable of receiving and delivering power, that they're unable to get power from other sources. It is anticipated that perhaps the power gathered would be utilized for the transport of large datasets within the infrastructure. It is described as a regular directional graph G = (N,L), where N = 1, 2,..., N is indeed the collection of edge devices and L is the duration of the chart for the connections between two nodes. Endpoints wherein channels travel into neighbor node are described by the collection N(in) n, whereas vertices wherein channels move out the of source vertex are described by the collection N(out) n. Following that, we establish

$$D_{max} = max_n\left(\left|N_n^{(in)}\right|, \left|N_n^{(out)}\right|\right) \qquad (1)$$

defined as the sum of every node's in-degrees and out-degrees combined

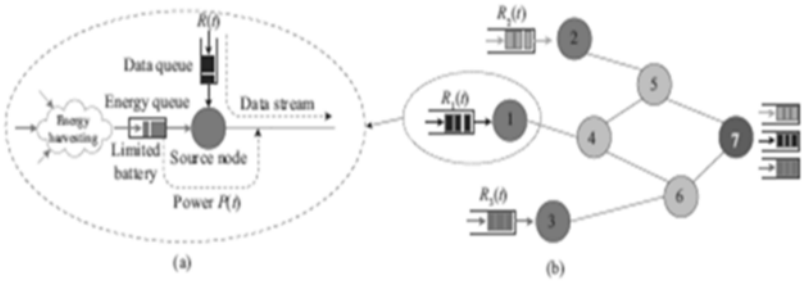

Figure 1: (a) Data retrieving process of a source node; (b) the WSN topology.

3.1. Link Capacity Model

For data transmission to take place in the WSN system, every station should be supplied with enough power to handle the workload. In the time slot t, we define the transmitted power distribution matrix as Pn(t) = n,m 2 N, where n is the number of distributed power units. The essential requirements must be met by Pnm(t) in the event that it is assumed that every unit has a restricted storage safety cushion:

$$C1: 0 \leq \sum_{m \in N_n^{(out)}} P_{nm}(t) \leq P_{max}, \forall n \in N \qquad (2)$$

3.2. Data Queue Model

Using wireless sensor networks (WSNs), information bits are provided to target endpoints in bundles, which would then be relayed throughout the systems. The queue of large datasets is described as: q(t) = q(d) n (t), n, d 2 N, t = 0, 1, 2, and so on, while q(d) relates to the quantity of continuous data d that has gathered on node n by moment sot t and is evaluated in milliseconds, and t = 0, 1, 2, and so on. Within original conditions, it is considered that now the backup and recovery equipment need not hold any big quantities of information, which results in q(d) n (0) = 0 for the data storage devices. Several conditions must be met by the delay of large datasets in order to maintain system stability:

$$\bar{q} = \lim_{t \to \infty} sup \frac{1}{t} \sum_{T=0}^{t-1} \sum_{n,d} E\left\{q_n^{(d)}(T)\right\} < \infty \qquad (3)$$

3.3. Energy Queue Model

The electricity generation, storing, and applies to the way requires that every component be equipped with such a charge that seems to have a limited ability in order to function properly. When it comes to climate change queue backlog, the formula is e(t) = "en(t), n 2 N, t = 0, 1, 2,..., t = infinite. When it comes to the electricity distribution

process, the formula is " = "nm(t), n,m 2 N. Where "nm(t) denotes the source of power sent out by node n to node m, the formula is It is as a consequence that the sum of the serves a motivational function and the electricity sent never exceeds that which has been previously saved in the reservoir. The electricity distribution and transmission systems for every site must fulfill the minimum power requirements at any specific timeframe (t), which is defined as:

$$C4: \sum_{m \in N_n^{(out)}} P_{nm}(t) + \in_{nm}(t) \leq e_n(t), \forall n \qquad (4)$$

We may create a methods on the basis of the assumption that perhaps the devices of a wireless channel have no capacity in their original conditions, en(0) = 0, 8n, which is supported by the data. We had devised a new approach that relies on a more realistic context, which would be discussed in greater detail in Section 3, wherein detectors shouldn't need to collect power all of the moment.

$$h_n(t) = \begin{cases} n_n^{(H)} h_n(t), ON \\ 0, OFF \end{cases} \qquad (5)$$

where hn(t) and bhn(t) are the technically available energy and potential energy, respectively.

In this part, we offer an online method for solving the UOEM issue that is based on the Lyapunov optimization principle. If you are dealing with stochastic queue network difficulties, the Lyapunov approach is a valuable tool. It offers a number of benefits, including the capacity to attain an approximation excellent efficiency; the resilience in time-varying networks; and the theoretical controllability. Assuming that the Lyapunov optimization tool is utilized quickly in our configuration, it is not suitable for systems with the "no underflow" condition, which means it is difficult to deal with the source of energy C4 problem. Therefore, we establish an entire technique that integrates the notions of the dispersion technique and the fluctuation technique, amongst many other principles. For instance, the dispersion approach provides for an exchange here between congestion on the system and the efficiency of essential services, which is advantageous in many situations. The load of the power distribution method may also be disturbed at every prime time, causing the electricity backlog amount to be moved forward into a quasi number and so eliminating stream. Finally, an active algorithm for the EDPR is presented as a cooperative effort.

3.4. *Upper bound of Lyapunov drift*

For starters, a perturbation parameter of the form n, 2 N is defined for the energy queue. After that, the perturbation parameter is used to produce the disturbed parabolic Lyapunov function of the type n 2 N.

$$L(Q(t)) = \frac{1}{2} \sum_{n,d \in N} |q_n^d(t)| + \frac{1}{2} \sum_{n \in N} |e_n(t) - \emptyset_n|^2$$

In the case of Q(t) = q(t), e(t) represents the duration a thread has indeed been supported in the connection As a consequence, the reality that now the number of L(Q(t)) is less implies that a weaker currency of L(Q(t)) may lead in a decreased congestion of power and information queue, thereby increasing the reliability of the region. In addition, the drop in L(Q(t)) causes the information queue to oscillate within a narrow range, which really is advantageous whenever the information queue is experiencing low congestion, for illustration. It also has the advantage of causing the power queue will progress towards a certain corresponding perturbation parameter, which would be the objective level we set in order to accomplish the electricity constraint we established.

In order to maintain robustness and reliability, it is feasible to gradually reduce the Lyapunov drift at every encountering t by applying constant pressure. Therefore, in terms of maintaining system reliability, we must lower the Lyapunov drift (Q(t)), also known as C3.

3.5. *Drift with Penalty Optimization*

Following our discussion of the variable buffer and essential system difficulties, we will move on to the study of the value maximization problem, which will take up the remainder of this section. The challenge of minimizing a maximum bound on the system of equations within every make real - time t may be turned into a main objective is to minimize a maximum bound on the correction factor that use the dispersion strategy, which is discussed in more detail below.

As an additional power variable, we suggest the variable V, which can be any quasi variable. This has been the most important element to consider. It is possible to get the dispersion interpretation by trying to add the punishment declaration to the upper limit on drift. The payment made the following statement:

$$\Delta_v(\boldsymbol{q}(\boldsymbol{t})) = \Delta\big(\boldsymbol{Q}(\boldsymbol{t})\big) - \boldsymbol{VE}\left\{\sum_{\boldsymbol{n},\boldsymbol{d}\in\in\boldsymbol{N}} \boldsymbol{f}\left(\boldsymbol{R}_{\boldsymbol{n}}^{\boldsymbol{d}}(\boldsymbol{t})\right)|\boldsymbol{Q}(\boldsymbol{t})\right\}$$

The challenge in reducing the drift with penalty at each time slot is taken into consideration in the following part, where we build an online method to solve issue P2.

3.6. EDPR Algorithm

As part of the transmission approach for achieving joint utility optimization, we suggest an online algorithm in this part. According to the following definitions, the EDPR algorithm was used to develop this joint power management algorithm:

$$\emptyset_n = \partial(\beta V + R_{max} + P_{max} + \epsilon_{max})$$

4. RESULTS AND DISCUSSIONS

The performance of the proposed algorithm which has been built will be examined in detail in this section. Observe that detector node n collects power whenever its generating capacity is lower than that of the perturbation parameter n, as shown by the power management strategy. This indicates that the technique may achieve close to optimal value and with a low electricity buffering capacity. Advantage maximization is ensured by the high bandwidth technology, which meets our optimizing goal of maximization of utility. It is indeed clear that the complete level movement in forwarding and planning satisfies the requirement C2 because it takes the full rate activity into consideration. Underneath the assumption of zero power requirements, it is feasible to decrease the values "Pnm(t)" and "nm(t)" to their basic essentials by using a combination of voltage regulation, transportation, and workflow scheduling. We also supply favorable variables and create the suitable queues with the purpose of achieving the predetermined maximum limit of the queues, which is particularly important considering that the usage of power devices in the implementation of transceivers is quite feasible.

$$\lim_{t\to\infty} \boldsymbol{inf}\, \boldsymbol{f}_{\boldsymbol{tot}}\big(\boldsymbol{F}(\boldsymbol{T})\big) = \lim_{t\to\infty} \boldsymbol{inf} \sum_{\boldsymbol{n},\boldsymbol{d}} \boldsymbol{f}(\bar{\boldsymbol{r}}_{\boldsymbol{n}}^{\boldsymbol{d}}(\boldsymbol{T})) \geq \boldsymbol{f}_{\boldsymbol{tot}}(\boldsymbol{r}^{\boldsymbol{t}}) - \frac{\overline{\boldsymbol{B}}}{\boldsymbol{V}}$$

Given that Pnm(t) > 0 is not the best decision, we can demonstrate that Pnm(t) > 0 cannot be the ideal choice. Throughout our technique, attributed to the reason that constraints C1 and C4 are actually superfluous, as aforementioned in the segment on energy monitoring, the power generation connectivity can still have necessary power for information transfer. This result is in accordance observations. In our technique, the electricity connectivity will still have sufficient power for transmission of data. Researchers are capable of fulfilling the power flow condition while also increasing the height of the power queue forward into a quasi number in order to minimize stream by carefully shifting the emphasis of taking decisions at every period.

Through the use of simulation, we analyze the overall performance of the proposed EDPR method. Inside the WSN system depicted in Figure 1, there seem to be a total of seven nodes, with the very first three nodes acting as destination node, the next two nodes functioning as relay nodes, and the final node functioning as sink. Receiving data feeds from nodes 1 through 3, which are then routed to the sink node 7 through relay nodes 4 through 6, and then to the sink node 7. It is the responsibility of Nodes 1, 2, and 3 to accept data streams and deliver them to Node 7. The link state Snm(t) is allocated with equal probability to the values 1, 2, and 3. It implies that unit power can transmit two packets while the connection is in excellent condition, however it can only send a single packet when the link is not in good condition.

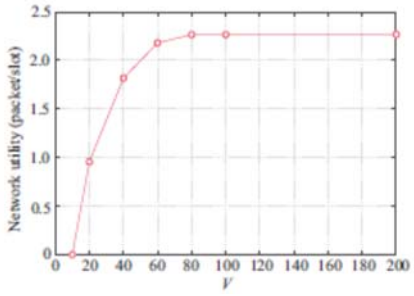

Figure 2: EDPR utility

The utility feasibility of the new EDPR algorithm is shown in Figure 2 for a variety of values of the control variable V. When V is little and there is no data transmission taking place, the utility function is 0 at the very beginning of the process. Increasing V causes the moment efficiency of the entire system to rapidly converged to its optimum solution, which in this example is around 2.27 packets per slot, as the valuation of V increases.

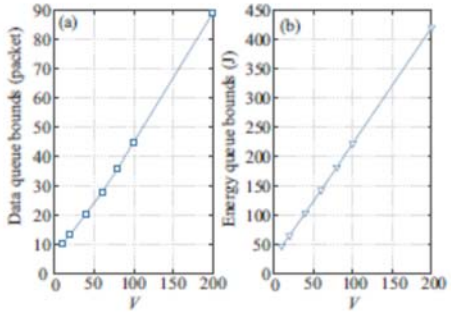

Figure 3: (a) Data queue mean and (b) EDPR energy queue

On the graph in Figure 3, we depict the average data queue limits as well as the energy batch limits with respect to various V. It is logical to assume that a bigger V will result in more queue congestion. Both of them increase in a manner that is close to linear with V, which is consistent with Theorem 2. The resulting practical application is highly beneficial since we can simply design the size of energy storage systems for sensors as a result of this result.

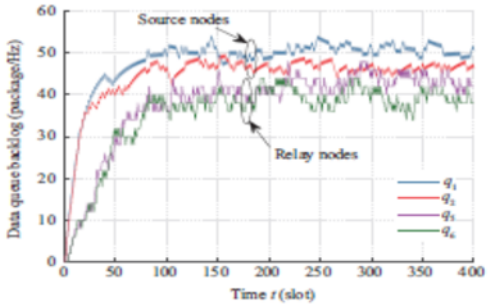

Figure 4: Data queue backlog vs. Time

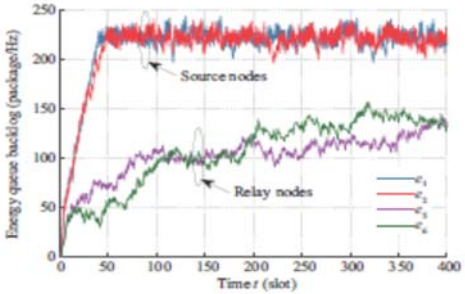

Figure 5: Energy queue backlog vs. Time

In order to research the continuous updating procedure typical of queues, the renewal operation of continuous data queuing q1, q2, q5, and q6 in Figure 4 and energetic queues e1, e2, e5, and e6 in Figure 5 are depicted in the similar circumstance setting with V = 100. It could be seen in the data that the congestion of queues is all restricted to a specific maximum bound, which allows the system to stay stable. The delay of destination node 1, 2 is also bigger than that of the delay of nodes in the network 5, 6, as seen in the graph, which is another point to note. Furthermore, regardless of whether the queue is composed of information or power, the rear nodes gradually tend toward stabilisation when the front nodes had attained equilibrium.

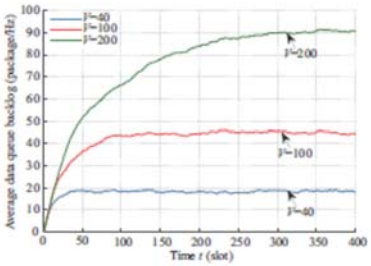

Figure 6: Mean data queue backlog vs. time

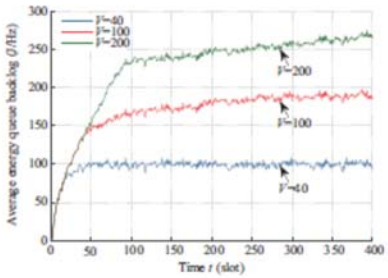

Figure 7: Meanenergy queue backlog vs. time

Information queue and power queue mean backlogs as a time - dependent are shown in Figures 6 and 7, respectively, for a range of controller parameters V in the information buffer and power queue, respectively. With the help of these two charts, we can observe that now the average packet backlog first increases as time slot t increases, and then eventually stabilises together around reasonable figure. Whenever it refers to the influence of V, a bigger V serves to a higher battery of the secure channel, while a lower V serves to the entry of the solid situation into the system occurring quicker in the system. This study provides more confirmation that V does, in fact, impact the barter among electric effectiveness and network connectivity in the context of energy efficiency. If current queues are contrasted with data queues, the frequency fluctuation of power queues is larger, which is logical considering that the stations in the WSN collect and transfer amount of energy.

5. CONCLUSION AND FUTURE SCOPE

Using renewable energy and team cohesion, we explore combined power enhancement in inter wireless sensor networks (WSNs). It is ascertained that a top limitation on the Lyapunov drift is needed for system demand. This top limitation on the Lyapunov drift can also be used to quantify the accurate cell voltage needed for edge devices. The Lyapunov structure is used to come to terms with the probability optimal solution, and we propose an internet algorithm was implemented the dispersion with punishment method with the modification procedure to address the problem. When moment and immediate stabilization restrictions, as well as network conditions, are taken in to account, this technique improves the rechargeable batteries memory and spectrum sharing policy in conjunction with one another. The EDPR technique, which could be used to create the highest amount of value in a distributed environment, does not necessitate the use of statistical data about dynamical system. It also contributes to the construction of a time-averaged compromise between access and queue backlog, which is beneficial in many ways. Aside from that, the simulated findings also demonstrate the linear correlation between the different transfer and queuing sizes, which may be extremely useful in real-world deployments of transmitting data networks, such as those used in telecommunications.

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DFNN: A Novel Deep Learning Neural Network and Traditional Edge Detection Filter for Retinal Blood Vessel Segmentation

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Abstract.
In order to distinguish between the various retinal vascularization framework cells, whether broad or thin, from the endoscopic digital image as well as other ocular systems in the body like the optic nerve head, choroidal, and unusual sores, the recognition and translation of optic disc must be accomplished. The recognition of optic disc has gained significant interest in recent years, owing to the availability of quasi endoscopic microscopy as well as the important details enclosed in the vascularization framework, which is suitable for the detection as well as treatment plan of a wide range of vascular diseases. Ocular vessels recognition research findings are becoming increasingly popular. Specifically, we suggest a novel approach for segmenting blood flow in ocular pictures, which we describe in detail in this paper: Edge recognition filtering and convolutional neural networks are used in this approach, which is based on traditional edge detection filters. To begin with, edge detection techniques are used to recover the vector representation from the data set in the first place. Using the obtained features, an autonomous training is performed to distinguish between pixels that correspond to coronary arteries and pixels that do not correspond to vascular system. When using the publicly accessible datasets including retinal pictures, the generated method is tested to see whether it meets the requirements. On the basis of classification accuracies, sensitivities, selectivity, as well as the region underneath the receiver operating characteristic curve, the suggested program's success is affected. Several different vascular separation values are tested to ours, and the findings are promising. For computerized image processing algorithms, the suggested method is a useful tool.

Keywords.Retinal Images,Segmentation, Edge Detection Filters,Deep Learning Neural Network, Blood Vessels

1. INTRODUCTION

The irregular differences in ocular vasculature provide crucial data to the ophthalmologist in the identification and treatment of a wide range of ocular disease, including Retinopathy of Prematurity (RoP), diabetes mellitus, eye problems, high blood pressure, and maturity level vision problems, as well as in the detection of diseases linked towards the central nervous system stocks. As a result, alterations in the architecture of the alveoli and capillaries of the retinal have an important clinical significance. Endoscopic image processing is a technique used among physicians to assess the health of the retina. There are several ways for performing endoscopic imaging, including using color filters, a burgundy filter, and catheterization using dyes including such sodium fluorescence and material commonly green. When it comes to identifying microscopic diseases and certain vascular anomalies inside the eye and neighboring tissue, the burgundy filter is the most often utilized. Pictures of the eye taken by endoscopic cameras are used by many health doctors to diagnose or treat disorders. These include eye doctors, ophthalmologists, orthoptists, and many others. The eye may be used to diagnose a variety of eye illnesses as well as clinical manifestations. Furthermore, endoscopic pictures may be used to show how some health problems affect the eye or generate abnormalities in the eye. The capable of monitoring the vision for clinical illnesses such as diabetes, age-related vision problems, and neoplasm's of the nervous system, eyeball, vitreous or ventricle [1] [13] is another use of endoscopic imaging. Furthermore, persons with insulin resistance should have their endoscopic imaging checked once or twice a year, since insulin may lead to blind, which could be prevented with laser therapy if physical illness is recognized in its early stages. Furthermore, monitoring retinal alterations in endoscopic pictures is a method of ensuring that persons using anti-malarial medication are not infected [2] [11]. Endoscopic imaging may be beneficial in emergency situations involving persons who have sudden blindness, persistent migraines, or elevated pulse pressure (more than 120 mmHg) [3]. In order to identify high intrathoracic pressure caused by medical disorders including such encephalopathy, benign intracranial congestion, and brain tumors [4], swelling of the face and inflated optic discs may be seen using endoscopic imaging. It is also possible to utilize endoscopic imaging to identify nervous system folding, which signals chronic damage caused by increased intraocular pressure, and/or a lack of blood supply to the visual cortex, which results in the death of the nerve, via the use of fundus imaging [14].

Figure 1: An example of an endoscopic picture from the DRIVE collection

For educational purpose, labeled regression coefficients pictures are required for the classification model. CHASE, DRIVE, and STARE are three image and reputation collections that have already been made accessible for this reason and are accessible online: CHASE, DRIVE, and STARE Some of the approaches that have been described are a mixture of other basic models, which are referred to as different models. They have already been offered as a method of successfully segmenting vessels. The goal behind these techniques is to make use of the unique characteristics of every sensor. It is important to note that these procedures are quite complicated and time-consuming. According to this study, we offer a more straightforward approach of retinal vascular separation that is based on conventional edge characteristics as well as neuronal communication networks. We believe that each of the traditional border designs has its own set of benefits that have yet to be fully realized [15].

After discussing different similar research in Section II, researchers will go on to Section III, where we will describe the materials and technique that were employed in this study. The databases of retinal images as well as the segmentation approach that was employed are discussed. Section IV contains the experimental results as well as a discussion of the findings. Finally, in Section V, this study comes to a conclusion.

2. RELATED STUDY

The separation of optic disc is an essential method for inspecting the blood vessels of the eye. In article [5], a Graphical User Interface (GUI) for detection and segmentation is described, in which quasi segmentation of individual arteries may be accomplished by merely dragging the pointer over a fixed volume. Vessel borders will be drawn out by the computer using edge recognizer that has been applied to it. The GUI also has the capability of applying threshold method with different indicators on separate segments of the same picture in order to completely optimize the feature extraction, with the aid of a sidebar for adjusting the settings as needed. The following features have been added: extraction of the gamma correction, application of CLAHE, and removal of the vitreous outline. Basis of the findings reported in this research, the suggested graphical user interface technique is shown to be superior to the conventional tool called method. When compared to the conventional background subtraction, the suggested GUI also provides the automated comfort of the detection algorithm in a more convenient manner. It is also demonstrated that the Canny sensor benefits from the additional characteristics of the improved edge detection approach. The suggested GUI technique has certain drawbacks, such as the fact that the improved edge detector is still incapable of totally properly corner detection or eventually eliminate noise. The accuracy of the edge detection approach may be increased by further refining the approach. Apart from that, future study might focus on developing a more effective noise filtration to further lower background noise levels. Aside from that, more capabilities may be added to the graphical user interface (GUI) application itself to provide greater ease, functionality, and customization. There is no limit to the possibilities of the GUI interface, and that is only restricted by the imagination of the designer who created it. More work may be done in the future to enhance the functionalities of the graphical user interface (GUI).

As a result of advent of deep teaching and learning activities, they are now being used for a variety of developmental applications, the first being the identification of optic disc veins from photographs of the ocular umbilicus. This is a subject that has recently caught the attention of scientists and experts alike. [6] [12]the author provides a study of the categorization and assessment of improvement strategies that have been applied in recent releases to change and enhance the effectiveness of supervised learning optic vasculature feature extraction methods. Specifically, the goal of this project are to systematically evaluate the categorizations of the government fully convolutional ocular vasculature clustering algorithms, monitor the developments in last several optimization techniques, address the barriers, and make recommendations for possible research instructions. Algorithms, regularization techniques, pooled procedures, model parameters, classification techniques, and ensembles training methods are some of the topics that have been emphasized on articles recently.

A full examination of the idea and implementation of machine learning in visual computer vision is presented in the publication [7] by the researcher. Because of the lack of good moment's diagnostics management, numerous eye illnesses might result in permanent vision loss. Examples of these diseases include diabetes (DR), which is characterized by damage to the retinal capillaries of the unaided eye in the presence of diabetes. A result of recent advancements in picture analysis and machine learning, medical image recognition related to computer recognition methods has been used swiftly and extensively in the context of healthcare pictures analysis, and is increasingly being used to develop ophthalmic in the clinic. Such techniques, as opposed to manual processes, make use of reliable analysis and visualization to discover abnormalities in blood vessels, resulting in increased effectiveness. Recent developments in this field have included the effective use of machine learning, particularly deep learning, to the problem. Specifically, we discuss current developments in deep learning approaches for retinal image processing in this study. Despite the fact that deep learning has been effectively used in other fields, we discovered that just 17 publications have been published on optic disc separation.

When it comes to automated testing for ocular illnesses, techniques for segmenting optic disc are critical to the process. A significant influence is made in computer - aided diagnosis for the early recognition, management, and assessment of cardiac and histopathologic disorders including such myopia, atherosclerosis, diabetes mellitus, and pressure by the physician, as well as for the assessment of these illnesses. The computerized retinal vascular categorization aids the optometrist in doing advance

screening and completing the necessary medical intervention. The author of article [8] investigates several vascular recognition techniques using 2D retinal pictures acquired with a fundus and then compares the results. In just this article, we will examine the problems affiliated with optic disc classification, as well as different classification strategies including such template matching, prototype reaches, paired filtration, container trying to trace, classification techniques, inter strategies, simultaneous reaches, and offering a brief summary on numerical indicators of success for features extraction including such accuracy (Acc), true precision (Trup), and true p.

In ophthalmologic disorders such as eye disease, time of life vision problems, hypertension, and many others, precise vascular delineation of the visual picture is used for identity verification, desktop laser surgery, automated monitoring, and detection. Valid documentation of retinal capillaries at an initial point allows medical professionals to adopt prompt appropriate treatment, which may help to prevent vision loss in the future. When the result of the Bendlet transformation is used to generate a 4-D feature representation, the author [9] demonstrates that it can collect location information far more effectively than the usual discrete wavelet method. A collection of classification models is then performed to determine whether such a pixel is located within a vessel segment or outside of a vessel segment, yielding the best outcome. It is mostly used for sorting to construct an automated identification system which is based upon capillary width, surface roughness, and capillary bifurcation, among other factors. The automatic technique, which takes fundus photos and can make a conclusion without consulting a doctor. When viewing fundus pictures, ophthalmologists must make difficult decisions about whether or not to diagnose an eye issue depending on the deformability of the artery. As a result, an automated monitoring method based on deep neural networks may be the most beneficial for assessing retinal health. An automatic computer-aided diagnostic method was designed by the author [10] in order to overcome the issue. Convolutional Neural Network (CNN) architecture is used in this study to develop an automated grading system, which is a novel approach. In this paper, we have investigated the most recent machine learning methods and developed an attention network that can assess retinal pictures based on their features.

3. METHODOLOGY

In conducted to evaluate and assess the system design, we employed retinal pictures and related manual categories collected from publicly accessible electronic sources (CHASE DB1, DRIVE, and STARE) to evaluate and assess the framework. All of the techniques were created in the MATLAB programming environment [16] [17]. In Figure2, we can see the overall design of our system. As shown in this picture, a feature vector is retrieved from a captured file using a feature extraction algorithm. The extracted features produced as a consequence of this process is utilised as the part of the training process. It is next necessary to neural network classifier so that it can generate visual contours that correlate to the coronary arteries seen in the optic disc.

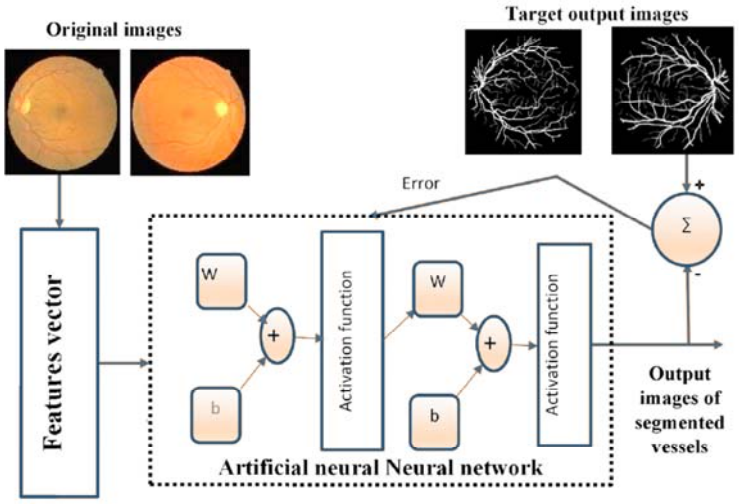

Figure2:The Block diagram of Proposed model.

3.1 Features Vector

We employed a classification model with 8 metrics describing every pixel, which we called a feature extraction. Such measured values have included the picture contour procured with traditional feature extraction filtration (four attributes), the Laplacian ways especially from the Laplacian of Gaussian function (one distinguishing trait), and the morphometric conversion procured (three characteristics).

Contrast contours are distinguished by the quick shift in the various media that around them. Feature extraction may be accomplished by either deduction or sharpening. Diversification is conducted in binary format by deducting two possible values and then divides that number by the distance between any two values, as shown in the diagram. In order to identify the outlines of a picture, numerous inversion filters have already been designed based on this straightforward approach. To execute the differentiation in both the abscissa and coordinate orientations, the operatives often use at least one or two stencils, one for each orientation. These masking are designed in such a way that the total of its values is zero, resulting in a zero value in the regions where there are no edges. The mask of Roberts, Prewitt, and Sobel are by far the most often seen.

Filters that have been intended to obtain best outcomes by passing through multiple methods have been proposed. This is the situation with the Canny filter, where first phase is to filtering the picture using a Gaussian mask before applying the filter itself. To use the gradient filter operation, it is then possible to identify the shapes. An technique is used to calculate the extrema of the outlines that have been discovered and to delete the locations that just aren't part of those extremes. A twofold boundary is can then use in order to prevent the outlines from being fragmented.

A particular contour correlates to either the limiting value of the very first derivation of the output image or the neutral point of the previous iteration with same functional, depending on which is greater. In dimensionless form, the second component may be obtained and use just one masks, the Laplacian mask, and this is the case in decimal form. Laplacian alone is seldom used in practice so because approximate solution is particularly susceptible to noise, which makes it a poor choice. A low pass filter is applied to the picture before the Laplacian operator is used, much as how the gradation operator is used. This answer to the problem of the double derivation's sound susceptibility served as that of the foundation for Marr's work, which resulted in the usage of a Gaussian function as a filter for the first time. Due to the obvious best balance presented by the Gaussian distribution to the Heisenberg rule, which dictates which we can enhance that both interferometric Δx and the harmonic precision Δf at the same time, the selection of this filtering was made. Essentially, this corresponds to convolution of the picture I (x, y) with both the previous iteration of the frequency response h (x, y) of a bandpass filter, as shown in the following equation. We may use the above-mentioned operator as an illustration of how to use the Laplacian of a Gaussian.

3.2 Pre-Processing

The green stream of color photographs provides the highest contrast for distinguishing capillaries from the backdrop when compared to the other two RGB (Red Green Blue) portions of color images. The red and blue streams, on the other hand, are extremely noisy. The green stream was chosen as a result for usage in the different feature collection stage of the procedure. In order to enhance the image resolution of images obtained before implementing every feature extraction filtering, the accompanying procedure was performed on each green channel of images obtained.

We employed an incremental algorithm to decrease the conducted with different between both the anterior chamber of the eye and the exterior area of the lens aperture in order to minimize the incorrect identification of the border of the image aperture by the sentences. This technique is described in detail below. After establishing the topic of focus, this approach consists of repeatedly extending the ROI until the boundary effects is no longer noticeable. For further information on this which was before stage, please see the following link. In addition, a segmentation method has been implemented in order to eliminate additional effects of noise.

3.3 The Roberts Filter

Using the Roberts filtering, you may compute the derivation of step 1 of a function in a continuous manner. The velocity of the equation is represented by this. If I(x, y) reflects the grey level of a pixels (x, y) in a photograph, then the magnitude of the variations in x and y may be expressed in the form, with x representing the grey level and y representing the gradient intensity:

$$G_x = I(x+1, y) - I(x, y) (1)$$

$$G_y = I(x, y+1) - I(x, y) (2)$$

Essentially, this entails convolution the picture with the two methods that follow.

$$R_x = \begin{bmatrix} 1, & 0 \\ 0, & -1 \end{bmatrix} \text{ and } R_y = \begin{bmatrix} 0, & 1 \\ -1, & 0 \end{bmatrix} \quad (3)$$

The frequency of the grade is determined by the following equation:

$$G(x, y) = \sqrt{G_x^2 + G_y^2} \qquad (4)$$

and it is led by the following individuals:

$$D(x, y) = Arctan\left(\frac{G_y}{G_x}\right) \qquad (5)$$

If somehow the boundary is linear (step), the Roberts' filtration will move only one image boundary to the left or over, however the depth of the boundary will be maintained. Nevertheless, disturbance may also be defined as a rapid local fluctuation in gray scale (for illustration, speckled noise); as a result, these filtration are extremely susceptible to noise since they amplify the interference existing in the picture as a result of the sentences. Furthermore, if the contour is of the ramping type, the broad outline produced by these filters is noticeable.

3.4 Operators of Prewitt and Sobel

In order to calculate the elevation, two masking are used: one for calculating the horizontally derivatives and the other for calculating the vertically derivatives of the horizontally derivation. These are the masks that are provided for the vertical and lateral contours, respectively:

$$M_h = \begin{bmatrix} -1 & 0 & 1 \\ -C & 0 & C \\ -1 & 0 & 1 \end{bmatrix} \qquad (6)$$

$$M_v = \begin{bmatrix} -1 & -C & -1 \\ 0 & 0 & 0 \\ 1 & C & 1 \end{bmatrix} \qquad (7)$$

C = 1 denotes that they'll be the operatives of Prewitt, while C = 2 indicates that they'll be the operatives of Sobel. When contrasted to the preceding masks, these shadows have the benefit of being able to produce two different effects. These masking, in conjunction to computing the gradient in a linear fashion, also execute the smoothing operation. Because of this smoothing, these masks are a bit less sensitive to interference than the ones that came before them.

3.5 The Canny Operator

To identify the borders of a picture, the very first step is to minimize the amount of noise present in the actual picture. This provides an opportunity to remove the separated pixels that might cause significant reactions during the computation of the gradients, resulting in wrongful convictions when the gradient is calculated. The optimum detector, which is employed by the shrewd filter, is the first derivatives of the Gaussian distribution function. According to the following equation, the gradients of a 2D Gaussian is given:

$$g_x(x,y) = -\frac{x}{\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}} \qquad (8)$$

$$g_y(x,y) = -\frac{x}{\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}} \qquad (9)$$

The amount of flattening is determined by the value of σ. The height of the mask grows in proportion to the value of σ.

3.6 The Laplacian of Gaussian Operator

It is also feasible to emphasize the contour when the approximate solution of a brightness rupture is zero, as seen in the image below. The Laplacian calculus is consequently responsible for determining the second derivative. The picture is initially normalized using a low-pass filtering, which helps to lessen the noise impact. In the instance of the Laplacian of Gaussian, a Gaussian reduced filter is used as the minimal filter.

An example of a 5 x 5 laplacian of gaussian mask created from either the Matlab software using the "fspecial" function, with a value of σ = 1.42142, is shown in the given construct:

$$G = \begin{bmatrix} 0.0251 & 0.0193 & 00127 & 0.0193 & 0.0251 \\ 0.0193 & -0.0153 & -0.0412 & -0.0153 & 0.0193 \\ 0.0127 & -0.0412 & -0.0795 & -0.0412 & 0.0127 \\ 0.0193 & -0.0153 & -0.0412 & -0.0153 & 0.0193 \\ 0.0251 & 0.0193 & 0.0127 & 0.0193 & 0.0251 \end{bmatrix} \qquad (10)$$

3.7 Mathematical Morphology

This method's primary flaw is that the final contour becomes disjointed as a consequence of the subsidiary approach. The structural filter, on the other hand, may aid in the resolution of this issue. Mathematical morphology combine pictures with tiny matrix, thought up of 0 or 1, referred to as structural components, to form new pictures with new meaning. Constructing components are equivalent to diffraction masks in terms of functionality. Erosion and dilation are the two fundamental operators in mathematical functions, respectively.

Consider the following: B is a tiny optimizing, and I is a grayscale picture. Specifically, the dilation of I caused by a binary image $I \oplus B$ is determined by the continuity formula, where X denotes one of the pixels in the binary picture.

$$\forall X, (I \oplus B)(X) = \max_{p \in B} I(X + p) \qquad (11)$$

The greatest value of the images beneath the bounding box is used to calculate the added features of a pixels acquired when decompression is applied. In those other terms, the inflation of I by B is indeed the collection of all the structural components' initial positions in which the mirrored and interpreted B covers at least a piece of I, and this set is defined as

Erosion may be achieved in a manner similar as dilatation by substituting max for min in the equation. The following is the definition of the erosion of a grayscale picture I caused by the structural element B indicated by the symbol $I \odot B$:

$$\forall X, (I \odot B)(X) = \max_{p \in B} I(X + p) \qquad (12)$$

Or to put it another way, erosion of I by B is the collection of almost all of the structural components' places of origin in which the interpreted B does not intersect with the backdrop of I, or vice versa.

Erosion and dilatation are two actions in template matching that are diametrically opposed to one another. In contrast to the grayscale filters that have been shown so far, method presented in this paper attempts to modify the geometry of the entities. An erosion is used to lower the size of items in a picture, while an elongation is used to increase their size, as seen in the illustration. In addition to the topological top-hat filtration, the feature extraction also provides the architectural bottom-hat filtering. Top-hat screening calculates the structural permeability of a picture and afterwards deducts the output from main image to get the end outcome. Basic operation is accomplished by erosion succeeded by elongation, with the same structural element being used for both procedures in the process. The parametric model is determined by the form that is being identified. In our example, the structural element is 21 pixel length and 1 pixel wide, and it is turned at an inclination spanning the range [0,π] by stages of π /9. It is twisted at an altitude covering the range [0,π] by steps of π/9. The outcome is that we have 9 organization for 9 eroding and dilation outcomes, along with the same number of structural system for 9 top-hat filtration outcomes. The average score of each is employed in this case in order to improve the performance of all boats, regardless of their orientation.

3.8 Artificial Neural Network

Feed-forward systems, also known as MLP (Multi-Layer Perceptron) channels, are comprised of a sequence of neuronal layers that communicate with one another. The first layer receives connectivity from of the input information, while succeeding levels get a relationship from of the layer before them. The last layer is responsible for producing the program's output. Cascading feed-forward neural networks (CFNNs) are a kind of convolutional network that contains condition that causes from the intake for every layer, as well as supplementary interconnections from every layer to the next layer and so on.
Figure 2 depicts the structure of our convolutional neural network. There are four convolution layer and a learning algorithm in this cascading feed-forward deep net. It is made up of an input neurons, an activation function, and four hidden nodes. The first deep learning model has 8 neurons with a fourier transform that is nonlinear activation sigmoid in shape. Each of the remaining buried levels has ten neurons. When it comes to transfer functions, the nonlinear activation sigmoid is used by the concealed layer 2 as well as the hidden layer 4. For the third hidden layer, the file laplace transform is used.
It is possible to write the following mathematical formula for a multilayer perceptron (MLP) with n input nodes, k synapses in a hidden neurons and the other in the activation function:

$$y = f^0\left(b_0 + \sum_{j=1}^{k} w_j^0 f_j^h\left(b_j + \sum_{i=1}^{n} w_{ij}^h x_i\right)\right) \qquad (13)$$

In this equation, f^0 denotes the non - linear activation of both the output layer, f_j^h denotes the non - linear activation of both the hidden layer j, x_i serves as input, and y indicates the output layer. The biased on the output is represented by b_0, while the prejudice on the hidden neurons j is represented by b_j. It is possible to extract the equation created by the CFNN paradigm from of the equation of the MLP model.
CFNN receives as an input a collection of characteristics that would enable it to differentiate between a contour representing the retinal image and another feature representing no contour. The characteristics that were employed are the ones that were discussed in the preceding section. The output y provides a value close to 1 when a vessel pixel is identified and a value of 0 when a vessel pixel is not detected.

4. RESULTS AND DISCUSSIONS

Our technique has been tested on three huge databases (DRIVE, STARE, and CHASE DB1) to ensure that it is reliable. These collections contain two hand classification findings for each picture, each supplied by a different expert from the one who created the information. In order to determine the true data, we use the fragmentation of the very first spectator's data.
We assessed the suggested technique using a number of different metrics. Any evaluated pixel of the picture must either correspond to a container or not in order to be regarded for this function. There are four possible outcomes in such circumstances. When a vessel is categorized as a vessel, it is considered a truly good outcome (TP). When a vessel is incorrectly labeled as a non-vessel, it is referred to as a false negative (FN). When a non-vessel is mistakenly categorized as a vessel, this is known as a false positive (FP). When a quasi is recognized as such, it is referred to be a true negative (TN). Other performance metrics are specified in Table 1 and may be found in the following sections. The receiver operating characteristic curve (ROC curve) displays the true positive rate (TPR) vs the false positive rate (FPR) at various detection levels. The region under the receiver operating characteristic curve (AUC) is another parameter used to test the efficiency of picture classification methods. The greater the AUC, the more accurate the segmentation results are.

Measure	Equation
TPR	TPR = TP/(TP+FN)
Sp	Sp = TN/(TN+FP)
FPR	FPR = 1-Sp = FP/(TN+FP)
Acc	Acc = (TP+TN)/(TP+FP+TN+FN)

Table 1:Performance Measurement of capillary classification methods.

The DRIVE dataset includes 20 color pictures with a resolution of 564*584 pixels for learning and then the same number of pixels for assessment. For training and the remaining, our system was built using examples of 106 images, such as 50,000 pixels from each picture selected at random. The STARE database comprises 20 color retinal pictures at a resolution of 700*605. It should not distinguish between the training photos and the testing ones. The computer retraining for STARE is carried out with the use of ten pictures, each of which contains 75,000 randomly collected pixels. When the test phase is completed, the capabilities of the remaining ten photographs are reviewed. The CHASE DB1 database comprises 28 color retinal pictures with a resolution of 999*960 pixels each. It is similar to the STARE database in that the CHASE DB1 collection does not distinguish between training and test pictures. For training purposes, we are employing 14 photos, each of which has 75,000 randomly chosen pixels. The remaining 14 photographs will be utilized in the testing phase of the project.
The edge - based segmentation desired outcomes with the suggested methodology are shown in Figures. 3, 4, and 5, correspondingly, for the DRIVE dataset, the STARE dataset, and the CHASE DB1 dataset, using the DRIVE dataset as the training sample. That the very first line contains the actual images, the second phrase has the photographs of the vessels identified using the proposed approach, and the quatrain contains the contextual information of the segmentation vessels received from the very first distant analyst in the collection. It is clear that our outcomes are closely related to the program's performance. They demonstrate that now the model is capable of detecting both good times and bad vessels effectively. However, there are still some mistakes. The majority of the mistakes are caused by pollution and other artifacts, which result in false positives. After acquiring the final digital picture, a comment step may be used to lessen the impact of noise on the image.

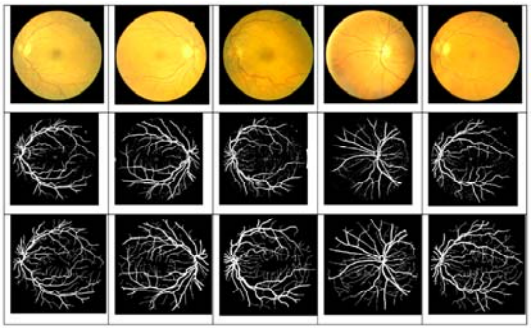

Figure 3: Vascular identification on the DRIVE collection.

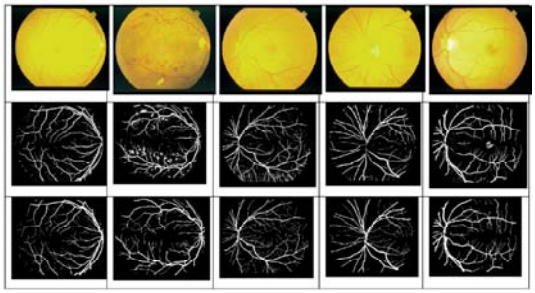

Figure 4: Vascular identification using the STARE collection

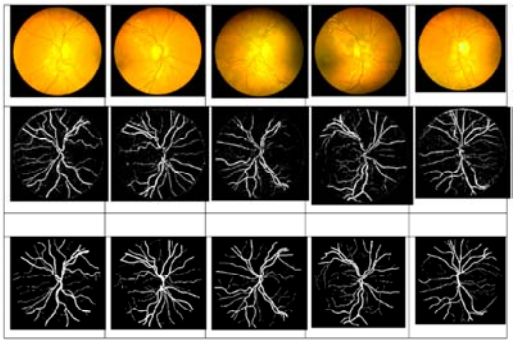

Figure 5:Outcomes of categorization on the CHASE_DB1 collection.

The ROC lines derived for the DRIVE information, the STARE set of data, and the CHASE_DB1 set of data are depicted in Figures. 6, 7 and 8, correspondingly, in the following figures. In Table 2, the evaluation metrics are provided and contrasted to the prior government methodologies, which are also given and contrasted. In the artistic creation, the sign "-" denotes that the matching result was not included. Our performance on all three different datasets was excellent, as shown in the following tables: Using the DRIVE collection, the detection accuracy was 0.7352; the precision and AUC were 0.9480; and the AUC was 0.9678; these values were obtained by using the high specificity. On the STARE collection, we got sensitive, specialization, correctness, and AUC values of 0.7265, 0.9759, 0.9548, and 0.9686, correspondingly, for awareness, selectivity, precision, and AUC. The sensitivities, precision, reliability, and area under the curve (AUC) for the CHASE DB1 collection were 0.7279, 0.9658, 0.9452, and 0.9681, correspondingly.

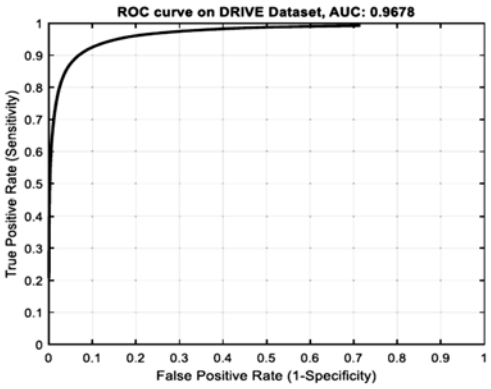

Figure 6:On the DRIVE collection, the ROC curve was plotted.

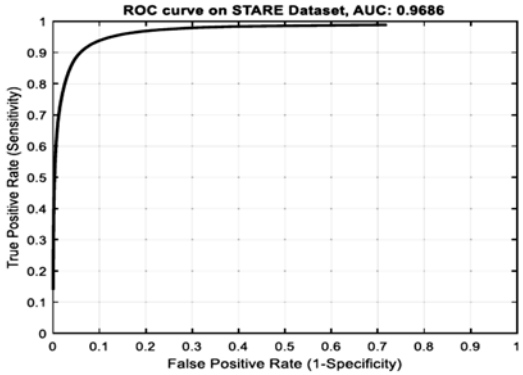

Figure 7:On the STARE collection, the ROC curve was plotted.

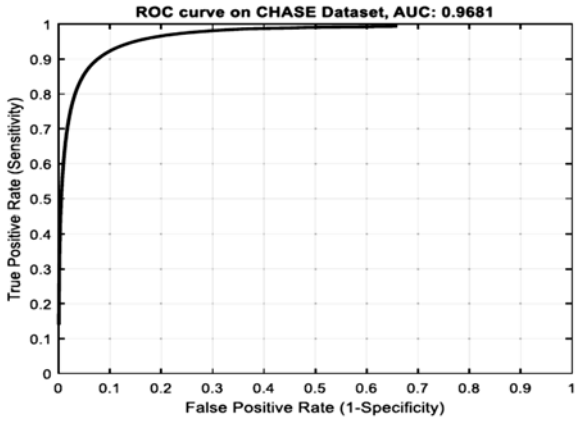

Figure 8:On the CHASE DB1 collection, the ROC curve was plotted.

Dataset	Sn	Sp	Acc	AUC
DRIVE	0.73	0.97	0.94	0.96
STARE	0.72	0.97	0.95	0.96
CHASE_DB1	0.72	0.96	0.94	0.96

Table 2:Measuring Instruments for Evaluation

5. CONCLUSION AND FUTURE SCOPE

Using traditional thresholding and classification techniques, we developed a unique vasculature clustering algorithm, which was presented in this research. In order to build a features vector and used in training a cascade feed-forward computational model, border detecting filtering such as Canny, Sobel, Robert, Prewitt, Laplacian of Gaussian, and morphology filtering are employed in conjunction with each other. The DRIVE, STARE, and CHASE collections are used to train and evaluate this classification model for classification. The results of the experiments reported a strong vessel prediction. Despite the fact that our approach is resilient across a variety of vessel diameters and brightness settings, If the suggested approach is compared with conventional techniques, it shows remarkable performance of selectivity, precision, as well as the area underneath the receiver operating characteristic curve (AUC). The acquired sensitivity, like that of many other approaches, still has to be worked upon. Consequently, we have demonstrated that the concentration of traditional contour sensors produces superior performance in comparison to much more current and complicated approaches for the identification of vasculature. It is our belief that variability in neural network topologies might be established in the next to even further enhances the findings gained by lowering erroneous detection methods in features extraction, which would be beneficial for future research.

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A Smart Machine Learning Architecture for Protecting IOT against DDOS Assaults

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Abstract.

The Internet of Things (IoT) is a collection of millions and millions of systems that are capable of interacting with one another while requiring little or no involvement from the user. The IoT is one of the most rapidly expanding fields of computing; nevertheless, the fact is that in the very adverse domain of information technology, the IoT is subject to a wide range of intrusions of various forms. As a result, realistic remedies to protect IoT networks, such as network anomaly detection, must be developed in order to address this issue. Regardless of the fact that assaults cannot be completely avoided in perpetuity, early identification of an attack is critical for effective defense in the real world. A standard high-end security solution for an IoT system is not suited since IoT devices have limited storage space and computing power, and hence do not provide enough protection. Furthermore, IoT devices are now capable of remaining connected for extended periods of time without the need for human involvement. Consequently, in order to counteract this danger, intelligent infrastructure authentication mechanisms, such as artificial intelligence methods, will need to be developed. In spite of the fact that numerous researches have been conducted in recent times on the use of ML solutions to attack identification challenges, little consideration has been devoted to the identification of assaults especially in Internet of Things (IoT) networks. Through the analysis of numerous network classification models that may be employed in order to quickly and effectively detect attacks on the Internet of Things, this study hopes to make a significant addition to the research. The Bot-IoT dataset, which is a new addition to the collection, is used to assess different detection techniques. A total of seven distinct machine learning algorithms were utilized throughout the project execution, with the majority of them achieving good efficiency. The Bot-IoT database was searched for extra characteristics that might be used during the deployment. These additional innovations were compared to existing studies in the field and were found to be more effective.

Keywords. *Identification of system anomalies, computer vision, the Internet of Things (IoT), assaults, bot-IoT collection*

1. INTRODUCTION

Problems with network security, confidentiality, and protection are becoming more prevalent throughout the world, and cyber security has emerged as a need as a result of the increased use of digital Smartphone and business. Following the rise in the number of Internet-based applications and the introduction of cutting-edge technology like as the Internet of Things, new initiatives to penetrate information infrastructure have been initiated. In computing, the Internet of Things (IoT) is a collection of interconnected devices that have the capability of connecting with one another without the need for individual involvement. The Internet of Things allows many devices that have detectors in domains such as healthcare, agriculture, transportation, and other sectors to communicate with one another across a network of wireless connections. The Internet of Things (IoT) applications are transforming our business and personal life by saving us resources and time. There are also various positives, as well as innumerable chances for the exchange of information, innovation, and progress that come as a result of globalization. As the Internet of Things (IoT) has grown in popularity, these systems have become more vulnerable to cyber-attacks that may compromise their protection, confidentiality, and availability [1, 2].

In part because the Internet is at the heart and centre of the Internet of Things, every security threat which occurs on the Web is also accessible through the Internet of Items, and vice versa. The Internet of Things (IoT) nodes have minimal facilities and infrastructure as compared to other conventional systems, and they do not have human controls. In addition, the fast expansion and widespread acceptance of Internet of Things devices in everyday life makes IoT security challenges more problematic, necessitating the development of network-based security solutions. While modern systems are capable of recognizing certain types of assaults, it is still difficult to detect other types of attacks. In order to keep pace with the growing number of network attacks and the huge increase in total of details provided in connections, quicker and more accurate methods for detecting attacks are necessary [2] [12], and there is no reason to suspect that there is room for more accelerated approach to enhance network security. For example, we might consider ML as one of the most successful computational models for providing embedded intelligence in the Internet of Things (IoT) ecosystem in this situation. For a range of connected security applications, like deep packet inspection, penetration testing, and malware classification, and many others, neural network models are being used successfully. The most difficult difficulty in building a stable network communication system is determining how to

identify and prevent hostile network activities in an efficient manner. A Network Intrusion Detection System (NIDS) may be used as a defensive mechanism against cyber assaults [3][4] [13], according to the authors.
It is possible to define Machine Learning as a smart device's capacity to change or regulate a knowledge-based state or behavior. Machine Learning is regarded to be a vital component in the development of an Internet of Things solution. A machine learning algorithm's capacity to infer useful information from data supplied by devices or people is shown by the fact that it is employed in tasks such as classification and regression problems. In the same way, machine learning may be utilized to offer security services in an Internet of Things network. The use of neural networks to assault detection issues is becoming an increasingly popular research topic, and ML is being employed in a growing number of various purposes in the realm of cybersecurity [14]. Despite the fact that numerous studies in the literature have employed machine learning approaches to determine the most effective methods to find assaults, only a small amount of research has been done on effective investigative techniques that are ideal for IoT contexts.
Unusual case information security and handwriting computer hackers are two methods in which reinforcement learning could be applied to the task of identifying cyber-attacks. Using certain traffic characteristics in known attacks, signature-based approaches are intended to identify and prevent known assaults from occurring. One of the approaches' most important characteristics is its capacity to correctly detect all terrorist vulnerabilities and avoiding the generation of an overwhelming loss in accuracy. [4] [16] employed four different data mining methods as starting tools to learn about the features of numerous well-known intrusions, for illustration, in the field of deep packet inspection. It was also possible to detect infected devices using signature-based approaches, which included recognizing botnet network traffic patterns. The two most significant disadvantages of signature-based techniques are that they need regular human modifications of attack traffic signatures in order to be effective, and that they are incapable of detecting previously undisclosed assaults. The second kind of detection approach is anomaly-based detection, which is described below. This class represents regular network activity, and anything out of the ordinary is regarded as an assault. The capacity of this class to identify unknown assaults makes it a desirable tool for security professionals to use. When using unusual case techniques, the much more major issue to solve is the possibility of high false positive frequencies (FARs), because completely undiscovered (although if permitted) activities may be labeled anomalous. To build a hybrid technique, the characteristic and adversarial learning techniques may be utilized in combination to identify anomalies. As per the researchers, a mixed technique illustration is utilized to increase the recognition rate of common threats while concurrently slowing the rate of false positives (FP) for attack types.
In this research, we provide a contribution to the field by exploring the usefulness of employing machine learning algorithms to identify IoT network assaults as part of a defense against IoT attack behavior. The detection techniques are based on the evaluation of a current collection, Bot-IoT, whose comprises actual and generated IoT network activity, as well as numerous types of attacks [5] [15]. A random forest regression approach was used to extract characteristics from this dataset, which were then analyzed. During the development process, seven different ML algorithms were applied, and excellent results were obtained in terms of performance. The following is a list of the ml algorithms that we used in this research, in alphabetical order: Learning algorithms such as K-nearest neighbours, ID3, principal components assessment, Randomized Forests, AdaBoost, Multi - layer perceptron (MLP), and Naïve Bayes classifier are all examples of those that are used.

Through this study, we may make the following contributions to society:

- By monitoring the characteristics of ml algorithms on a current IoT dataset, it is possible to make improvements in threat detection in IoT networks.
- Generate new information from the data and choose the most relevant features for use in improving the computational efficiency in ML algorithm.
- Make a contribution to the Internet of Things literature. Because there have only been a few research conducted using the Bot-IoT dataset, working with this database may be seen as a potential important addition to the literature.

In the following sections, you will find an outline of the paper: After reviewing similar work and discussing the history in this area, Section III shows our suggested strategy, followed by technical details. Section IV concludes with a discussion of the topic. Section IV presents the results of the experiment together with assessments, and Section V serves as a conclusion to this work by providing a summary of the findings.

2. RELATED STUDY

Because of the rising widespread use of The internet of Things (IoT), hackers can easily are ready to take advantage of the known vulnerabilities that several devices are constructed with from the outset of their development. No reasonable expectation can be placed on users to cope with this threat through their own, and several of the current infrastructure solution providers are either unavailable or impossible to be used for the average user, creating a gap that must be bridged in the future. In [6], the paper proposed an effective handwriting technique to measure, analyze, and recognize potentially dangerous visitors for Network environments in the household electrical communication network, which makes use of surveillance smelling methodologies as well as a fog implementation to supervise aberrant behavior. The suggested solution is focused on two attack and dissemination pathways used by the well-known Mirai botnet, namely DNS and Telnet, which are the emphasis of the suggested system.
Due to the rapid deployment of the Internet of Things (IoT) in a variety of fields, the restricted abilities of such devices pose considerable security risks, noting their connection with Software Defined Networks (SDNs) to offer more flexible services. The author [7] investigated effective threat detection algorithms for application Web of Things (SD-IoT) systems in the context of these infrastructures. First of all and primarily, they are imitations of commonly utilized attack techniques. In the next chapter, we analyze the impacts of multiple attribute values just on prediction performance for multiple attacks, with such a specific focus placed on Randomized Forests (RF) face detection algorithms in significant. Particularly explored is the influence of various RF configurations (wild size and trees thickness, for instance) on the correctness rates and operated overhead expenses. Along with the information we collected, two well-known Iot devices collections were also used in the analysis.

Whenever the given model parameters are used in conjunction with the examined attacks, the data suggest how RF can deliver superior detection performance for the assaults under investigation. It is also worth noting that the classification performance of RF is only significantly reduced with lower woodland widths, which enables for significant savings in walk outgoings to be realized. This demonstrates the viability of the solutions under discussion in Distributed systems with fewer money, as seen by the example.

With the passage of time, an increasing number of devices are being linked to a particular network. If just one of the devices in the network is hacked, then all of the devices in the network will be subject to attack. This makes Intrusion Detection more difficult in any given network. It is virtually hard to identify and intervene manually in this situation. As a result, it is critical to be able to identify diverse forms of assaults with greater certainty while requiring less processing complexity and time to do so. There has already been a significant amount of study done in this field, where the assaults have been evaluated independently. The creator of [8] concentrates on identifying intrusions, such as Internet of Things botnet assaults and other sorts of network threats. In order to do this, they develop a multiclass classification system that incorporates supervised learning models as well as the dimensionality reduction approach. A large number of researches on ML-based IDS have made use of the KDD dataset or improved versions of the KDD dataset. Specifically, we employed a novel dataset, the IoT network Intrusion Detection dataset, for this investigation.

To safeguard home Wi-Fi networks, the author created and developed "A System for Preventing IoT Device Attacks on Home Wi-Fi Router" (SPIDAR) in [9], which was published in the journal Computer Science. Home users may benefit from this system, which comprises of an SPIDAR home Wi-Fi router, an SPIDAR Raspberry Pi, and an SPIDAR web application that both prevents attacks and displays attack data. Moreover, it helps save money by avoiding the need to purchase and install costly intrusion protection software and hardware at home. The company offers two types of prevention methods: the signature-based method, which uses Snort software, and the behavior-based method, which learns and analyses the behavior of IoT devices by using either the benchmark or machine learning in order to improve the system's growth by enhancing the system's performance.

There has been a lack of attention dedicated to the detection of harmful attacks in the setting of Internet of Things networks. The author [10] offers an effective intrusion detection system (IDS) to identify unanticipated Internet of Things assaults by using multiple bagging and boosting ensemble techniques as well as a feed forward artificial neural network to achieve this goal. They utilized a newly released dataset, UNSW-NB15, which included simulated IoT sensor data, to evaluate the performance of the suggested models using a 5-fold cross validation approach, which they found to be effective.

3. METHODOLOGY

A short overview of the database that was utilized, as well as our suggested technique for detecting attacks in IoT networks, is provided in this section. Machine learning approaches are used to discover abnormalities in our suggested strategy, which includes a variety of pre-processing steps as well as real applications [17] [18]. CICFlowMeter was used to extract flow-based characteristics from the raw dataset in the first step (CFM). Initial and foremost, in this first step, the condition characterized technique was performed, followed by the division of the information into 2 segments: learning and assessment. To transform the information into a form which can be utilized by ml techniques, it is important to do information which was before on the information. Following these procedures, the feature selection stage determines which attributes will be employed by the algorithms and which will not. Finally, the deployment of ml algorithms brings our strategy to a conclusion. Figure 1 depicts a high-level overview of the suggested technique. Figure 1.

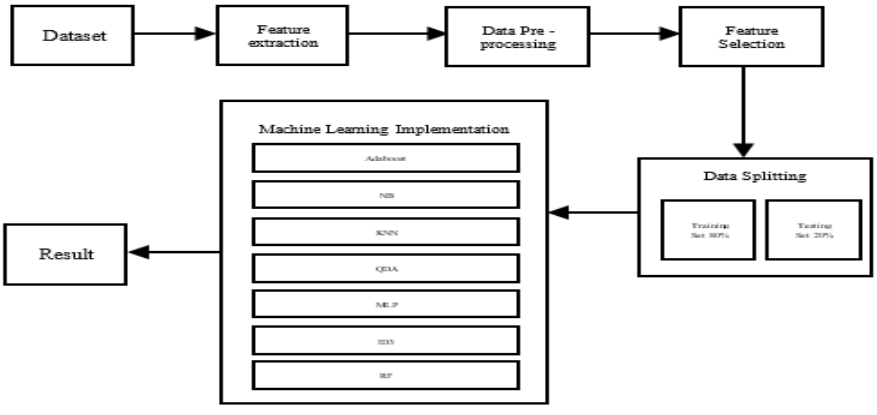

Figure 1: Proposed Approach Overview.

In order to conduct the tests, we used the Bot-IoT database, which was chosen for its frequent releases, broad attack variety, integration of IoT-generated traffic, and capacity to build new features from the input data. There really are three basic sorts of attacks in this collection, all of which have been predicated on botnet situations, and which together includes sniffing, disruption of services, and computer hacking as its objectives. CFM was utilized to extract circulation features from significant traffic samples, which would then be subjected to further examination. Network traffic flow generator (CFM) is a software package offered by CIC that generates up to 84 different network traffic characteristics.

According to what others have said in the preceding paragraphs, the fundamental purpose of the research is to evaluate the efficiency of different methods in the identification of threats on the Internet of Things system architecture. Throughout this

section, we will describe the information, the techniques and algorithms that we used, and the steps we followed to put our results into action.

A. Database

Because ml algorithms are used in the designed for various network security activities, big databases are required in order to assess network flows and discriminate between regular and problematic traffic patterns. Numerous studies have been carried out to build network datasets throughout the course of the years. The bulk of computer science has assessed its conclusions there against generated or actual data from networking. Some of the datasets, such as DARPA 98, KDD99, and N-BaIoT, have been publicly accessible, despite the fact that a significant number of them remain secret, mostly owing to security concerns. The production of genuine IoT and internet traffic databases that incorporate novel Botnet situations is still in its early stages, despite the fact that multiple datasets have already been developed. More crucially, some databases do not include IoT-generated traffic, while others do not develop any new characteristics as a result of the IoT. A number of the assaults were unsuccessful because the test bed employed was not genuine. In other situations, the assault situations were not varied either. Despite the fact that this dataset is reasonably big and clean, it is uneven, with the proportion of normal data being much smaller than the proportion of assault data. The Bot-IoT dataset includes both actual and artificial IoT network traffic, as well as a variety of different forms of assaults.. Bot-IoT data attacks may be divided into three categories: probing attacks, denial of service attacks, and data breaches.

B. ML Algorithms

The Bot-IoT database was used to test seven well-known ml methods: KNN, ID3, Random Forest, AdaBoost, Quadratic discriminant analysis, Multilayer perceptron, and Naive Bayes. The classifiers were evaluated using the Bot-IoT dataset. When selecting these classifiers, the emphasis is on putting together prominent methods with a variety of properties in a single package. The algorithms that were employed in this context are quickly discussed in the next section.

- **K-Nearest Neighbours:**KNN is one of the easiest and most successful algorithms for guided learning. It's used to find comparable data points in the given dataset and link new ones to them. In contrast to the KNN approach, this works well enough on high dimensionality and therefore is speedy as during testing period, it is slow when it comes to producing predictions.
- **Quadratic discriminant analysis (QDA):**Supervised classification issues are well-suited to the QDA algorithm. Assigning samples to one of several categories is done using discriminant analysis, a statistical method. QDA may be used in situations when a category lacks a lot of data. In order to use QDA, more data must be seen than there are categories in the dataset.
- **ID3:**In order to build a decision tree from a dataset, ID3 is utilized. Using a tree-like decision structure, decision trees may be used to classify data. Displaying a technique that has just control instructions is one method. When constructing criteria, characteristics are utilized as "nodes" and the "leaves" are class variables, which are a record's assigned class values. This algorithm, ID3, is utilized in the fields of ML and NLP.
- **Random Forest:**Decision trees are used in RF, a ML technique. A "forest" is generated by combining a variety of various decision tree structures, each of which is constructed in a slightly different manner, according to this approach. When compared to other approaches, this method has numerous benefits, including the capacity to execute effectively on large datasets, its small weight, and its resilience against noisy and anomalies.
- **Adaptive Boosting:**It is a machine learning methodology that relies on classification problems and aims to improve poor classifications. The AdaBoost algorithm's most essential feature is its capacity to handle incomplete data in a database.
- **Multilayer Perceptron:**A feedforward artificial neural network, MLPs is a subset of this kind. ANNs are a predictive model that mimics the natural mind's ability to learn and synthesize new knowledge. The input, output, and hidden layers all exist in an MLP. For its first training, MLP makes use of a method known as back-propagation, which is a kind of supervised learning.
- **Naïve Bayes:**One of the most extensively used supervised algorithms; the NB is well-known for the clarity of its underlying assumptions. Because the traffic classification characteristics employed may be reliant on each other in some way yet are handled separately by the NB classifier, since it requires fewer samples and is simpler to implement, NB has several advantages for users. The connection and interactions between features are not accessible to NB, on the other hand, since it treats each feature as a standalone entity.

C. Implementation Steps

The five key stages in our method are image enhancement, information or before, refers to the things, image segmentation, as well as the application of ml algorithms (multiple linear regression).

- **Extraction of features:**Flow-based characteristics were obtained from the original network traffic data using CFM. Networking existing traffic converter CFM is a traffic flow characteristic generator supplied by CIC that generates 84 different networking characteristics. There is an option to download a CSV file of the datasets, as well as a visual summary of the characteristics derived from the file. Classifiers' prediction ability may be improved by extracting additional dataset characteristics from this approach.
- **Data pre-processing:**In order to make the database acceptable for machine learning, pre-processing methods are employed. As a result, this stage also involves deleting unnecessary or damaged data samples, which makes it more effective and precise.
- **Splitting Data:**Data are essential to the machine learning model because they allow it to learn. Test data are also needed to assess the algorithm's effectiveness, so that we can observe how well it performs. About 80% of the Bot-IoT database was deemed training data, while the other 20% was deemed testing data in our research.

- **Selecting Features:**In order to develop a secure environment for IoT systems that is both lightweight and suitable for training and testing methods, it is essential to reduce the number of features and only employ those that are absolutely necessary. As a means of selecting relevant characteristics, we implemented the Random Forest Regressor method. Many studies have shown how successful random forest regression is in shrinking a dataset. More than 80 network traffic characteristics may now be reduced to seven, making the model train and react faster. Figure 2 depicts the whole dataset's relevance weights for the various attributes.

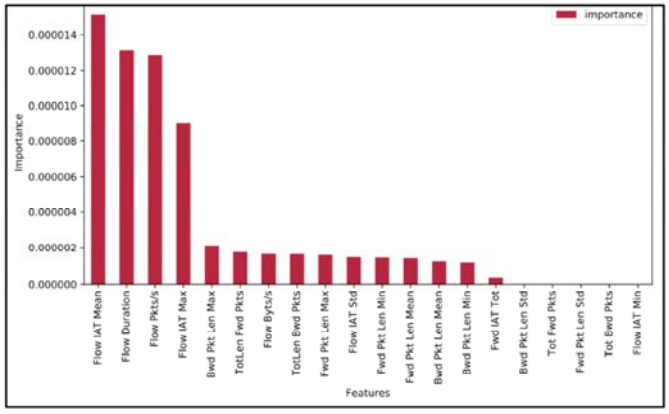

Figure 2: Feature Importance of dataset

- **Implementation of ML Algorithms:**Using Python deep learning packages, we conducted all of our tests. So every incursion in the group of statistics was studied in three phases: independently on every invasion, with a set of best aspects for each invasion combined, on the entire database with the series of great attributes combined, and finally on the database server with both the seven great attributes acquired in this showcase sampling stage. The complete list of possible attacks are shown in TABLE I.

Flow IAT Mean	Flow Duration	Flow Pkts/s
Flow IAT Max	FwdPkt_Len_Max	TotLenFwd Pkts
Fwd Pkt Len Mean	Tot Bwd Pkts	Fwd IAT Tot
Flow IAT Std	Flow Bytss	Tot Fwd Pkts
Flow IAT Min		

TABLE I. A COMPLETE LISTING OF AVAILABLE FEATURES FOR ALL POSSIBLE ATTACKS

4. RESULTS AND DISCUSSIONS

A. Evaluation Metrics

Measures that are relevant and applicable to the job at hand are critical for evaluate the effectiveness of machine-learning models. The following are the most important performance indicators for correctness, sharpness, f-measure, as well as remember, as represented by the formulas following table:

$$Precision = \frac{TP}{TP + FP} \quad (1)$$

$$Recall = \frac{TP}{TP + FN} \quad (2)$$

$$Accuracy = \frac{TP + TN}{TP + FP + TN + FN} \quad (3)$$

$$F - measure = \frac{2}{\frac{1}{Recall} + \frac{1}{Precision}} \quad (4)$$

B. Results

The assessment of ML algorithms on the dataset was divided into three steps, as described in the preceding section. Each assault in the dataset is treated as a distinct case for applying machine learning algorithms in phases one and two. In phases three, the top seven features from the feature selection stage are used to apply ML methods across the whole dataset. Following are the outcomes of all the experiments. The arithmetic means of the 10 performance assessment methodologies for each ML algorithm are shown in the tables.

Attack Names	F-Measures						
	NB	QDA	RF	ID3	AB	MLP	KNN
HTTP	0.72	0.85	0.96	0.96	0.96	0.95	0.96

UDP	0.73	0.92	0.98	0.98	0.98	0.97	0.98
TCP	0.71	0.85	0.99	0.99	1.0	0.74	0.99
HTTP	0.72	0.82	0.95	0.96	0.95	0.95	0.96
UDP	0.72	0.83	0.97	0.97	0.98	0.98	0.97
DOS_TCP	0.64	0.74	1.0	1.0	1.0	0.78	0.99
Data exfiltration	0.72	0.76	0.96	0.97	0.97	0.94	0.97
Keylogging	0.72	0.82	0.95	0.95	0.95	0.91	0.98
Service_Scan	0.73	0.83	0.95	0.95	0.95	0.94	0.94
OS_Scan	0.72	0.76	0.94	0.97	0.98	0.97	0.99

TABLE II. Distribution of Results Based on the Kind of Attack.

Phase 1: Machine learning methods may be used to each individual assault. Table II shows the results of seven different ml methods employed to 10 distinct attack types. if the F-measure is equal to zero, for the purpose of excluding equivalence, the various definitions are examined: clarity, reliability, recollection, as well as duration.

If one looks at Table II, it can be seen that all of the algorithms, with the exception of the Naïve Bayes classifier and the Algebraic approach (QDA), were able to detect more than 90 percent of the different types of assaults tested.With the best score in six of the ten trials, the ID3 algorithm proved to be the most effective in the battle against DDoS attacks. In fact, ID3's top score is shared by at least one other method in every challenge. Its minimal processing time, however, puts it ahead of the others. Naive Bayes, the algorithm with the lowest F-measure, was utilized in all jobs. It got a poor score, in part because of the DOS TCP assault. The speed of Naive Bayes was much superior than that of the other methods, despite its lower accuracy. Also worth mentioning is the QDA, which had a dismal efficiency ranking of #2 among the algorithms tested in this study.

Phase 2: The best aspects of each assault were integrated using machine learning methods on the complete dataset. The whole collection of data is tapped into at this point. We employed seven distinct ml algorithms to analyze the full dataset, and each assault had its own feature set. As shown in Table III, 13 characteristics were retrieved for each assault.

ML Algorithm	Accuracy	Precision	Recall	F-Measure	Time
NB	0.78	0.84	0.78	0.75	5.056
QDA	0.88	0.89	0.88	0.87	6.1964
RF	0.98	0.98	0.98	0.98	27.0328
ID3	0.99	0.99	0.99	0.99	19.3447
Adaboost	1.0	1.0	1.0	1.0	308.9403
MLP	0.84	0.88	0.84	0.83	1011.5001
KNN	0.99	0.99	0.99	0.99	2052.1801

TABLE III. Assessment of Results from Phase 1

Table III shows that AdaBoost had the best showing, closely by KNN and ID3, with AdaBoost coming out on top. For this feature, ID3 takes priority over KNN, which is much slower. Naive Bayes had the lowest score of any algorithm, at 0.75. NB and QDA were the quickest in terms of speed. Even while KNN scored well in terms of effectiveness, it was still much slower than the competition.

Phase 3: Implementing machine learning techniques to the whole information using the seven most important structural interventions during the characteristic evaluation phase.

ML Algorithm	Accuracy	Precision	Recall	F-Measure	Time
NB	0.79	0.85	0.79	0.77	4.0472
QDA	0.87	0.89	0.87	0.86	4.4056
RF	0.97	0.97	0.97	0.97	28.9246
ID3	0.97	0.97	0.97	0.97	17.0899
Adaboost	0.97	0.97	0.97	0.97	238.8618
MLP	0.84	0.87	0.84	0.86	949.6977
KNN	0.99	0.99	0.99	0.99	1615.9852

TABLE IV. Use of the RF for all datasets to execute the features that were discovered.

The algorithms' F-measure effectiveness did not change much, however the running times of all the methods were significantly decreased. The procedure in Table IV uses 13 characteristics, but just 7 attributes are utilized in Table III, which results in a faster execution time. In order to speed up the machine learning model, the number of features was lowered.

Table V shows the final outcomes of the execution in comparison to a previous research. The research done by Ferrag et al. [11] in 2019 was used as a basis for this comparison. Why? Because we employed two machine learning approaches that were inspired by previous work using the same dataset. Random Forest and Naive Bayes are two related machine learning methods. The set of features employed in our work differs significantly from that of theirs. Our set of features was derived from CFM, whereas theirs was based on the source. An assessment criteria was established based on the rate of recall (Recall). Table V

compares the findings of the two investigations. The Random Forest method employed in our research is superior than that used in [11], and the same can be shown for most types of attack with the NB approach, when the results are compared. We can observe that the additional characteristics employed in our study improved the efficiency of both methods.

Attack Names	Ferrag et al		Our Work	
	RF	NB		RF
HTTP	82.26%	50.78%	96%	71%
TCP	88.28%	78.67%	99%	70%
UDP	55.26%	78.50%	98%	72%
HTTP	82.20%	68.68%	95%	71%
TCP	81.77%	65.56%	100%	63%
UDP	82.99%	100%	97%	71%
Data exfiltration	86.55%	66.55%	96%	71%
Key_logging	70.12%	65.62%	95%	71%
OS_Scan	82.20%	68.68%	94%	70%
Service_Scan	69.82%	65.21%	95%	72%

TABLE V. Two Algorithms are Compared for their Performance.

5. CONCLUSION AND FUTURE SCOPE

In this post, we describe how we employed ml approaches to discover IoT network attacks. The Bot IoT was used as a database in this instance due to its daily reports, extensive attack diversification, and wide range of network elements. Following the analysis of the raw traffic traces, we used CFM to obtain a range of relevant flow-based properties that might be used in other applications. The 84 network traffic characteristics described by CFM serve to characterize network flow. It was decided which attributes would be employed in the machine learning techniques using the Randomized Forests Linear regression methodology, and the importance of weight calculations was determined by deploying the technique and determining the importance of value calculations. The calculations for this project were completed by merging two different methodologies. For the purpose of determining relevance values, two techniques were used: the first way assigned a different relative importance to every charge kind, while being in the second technique the relevance scales for all assaults were pooled together again and calculated as a single group. As a final step, data was subjected to testing using a diverse range of machine learning techniques. According to the F-measure, these techniques and their performance ratios are as follows: The F-measure ranged from 0 to 1, as did the Naive Bayes, QDA, Random Forest, ID3, AdaBoost, MLP, and K Nearest Neighbors scores. Seven supervised algorithms were tested in this study. Performance evaluation of certain unsupervised methods would be an exciting scenario effort. In addition, we used a variety of machine learning techniques on their own. Ultimately, we want to build a multi-layered model that incorporates many ml algorithms.

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IoT-Enabled Toxic Gas Leakage Detection using Wireless Sensor Network in Industrial Locations

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Abstract.

In labs, factories, stores, and commercial locations that utilize or retain harmful pollutants and toxic fumes, the leaking of these materials is regarded to be one of the most severe catastrophes that may occur. For big manufacturing petroleum facilities, the identification and visualization of the risky region of poisonous gas leakage and detonation are critical research issues. Poisonous gas leakage and exploding are two examples of mishaps that may cause substantial damage to a facility. Many attempts have been made to remedy this problem, including the use of a huge number of specialized surveillance equipment, to no avail. These specialized instruments offer gaseous concentration was measured inside the parameters of their respective ranges. Nevertheless, due to the consistency of oxygen transfer as well as the insignificance of poisonous fumes, it is hard to detect as well as visualize the ongoing dangerous environment of oxygen transfer using only the dispersed intensity news stories. As a result, the use of only the dispersed intensity findings is not recommended. It is proposed in this study that wireless sensor nodes be used to identify and visualize a potentially harmful location (WSNs). In this suggested system, an estimates vary widely method is utilized to ofgovernmental a WSN, and the border region of exchange of gases is determined based just on framework network in order to distinguish the risky area. In addition, the resilience of the suggested strategy in the event of component failures is examined in this research. It has been discovered that the failure of one or more nodes has a unique effect on the accuracy of risky area identification. In addition, the influence of five estimates vary widely techniques on the reliability of unsafe region identification is examined in this work.

Keywords. Leakage Detection, Continuous Object Detection, Wireless Sensor Networks.

1. INTRODUCTION

Hazardous gases are defined as those that exhibit poisonous or reactive activity, and they may be classified according to one of following parameters: combustible, corrosive, or oxidizing gases are classified as detrimental to live things or as strong oxidizing or highly poisonous gases. [1] [2] [3] [4] As a result of the pressing necessity to install monitoring and alerting equipment for odorless, hazardous, and poisonous gases and vapors in areas where they are present, rudimentary techniques that may be harsh have been used to safeguard the existence of the general population in these areas. The concentration of poisonous gases (particularly carbon monoxide) while approaching mines was detected by miners using canaries maintained in a specific glass enclosure until the 1980s (see Figure 1). Because the impact of toxic substances on canary islands is higher and more rapid than on people, employees were warned to any potential risk by 'bird sensors,' which were placed around the facility. The technology contained an oxygen chamber, which allowed the bird to survive despite being exposed to hazardous fumes. [3]

For huge petroleum factories, it is critical to identify and visualize the potentially hazardous region where poisonous gases are seeping. The presence of many harmful gases in petroleum facilities, such as sulfuretted hydrogen (H2S), hydrogen chloride (HCl), and sulphur dioxide, is well documented (SO2). When these poisonous gases begin to flow, they have the potential to trigger explosions that causes significant economic damage. For instance, if the SINOPEC Maoming Petroleum Group ceases production once per day, the organization would suffer a financial damage of over ten million RMB. Explosions can pose a major danger to the safety and wellbeing of nearby residents who live in close proximity to the leaking site.

Many techniques for detecting and visualizing the quantity of hazardous gases have indeed been developed in order to avert this type of catastrophe and lessen the danger of poisonous gas poisoning to nearby residents. These approaches, on the other hand, make use of sophisticated monitoring instruments to deliver gas concentration data that are within their respective limits [12] [13]. Due to the obvious consistency of exchange of gases as well as the cloaking of poisonous fumes, it is hard to detect and visualize such a constant object just by using widely dispersed intensity news stories, as seen in Figure 1. By just using dispersed intensity reports, however, it is possible to identify and visualize such a constant object. In a real-world setting, the grey shadow seen in Figure 1, which would be supposed to represent poisonous fumes, is not visible because of the lighting. The opacity of poisonous gases makes it impossible to see the boundaries of gas flow at their source.

Most dangerous and poisonous vapors need particular management circumstances due to the fact that they may cause a variety of health problems, including mortality or lasting damage, if not handled properly. Ammonium, arsine, monoxide, hydro bromine, chlorine gas, hydrogen cyanide, hydrogen sulphide, nitric oxide, nitrogen dioxide, ozone, phosgene, phosphine, and

sulphur dioxide are examples of chemical inert ingredients that are often found in the environment. A growing range of organic substances are gaining attention. These include infused, uncharged, and aromatic hydrocarbons, polychlorinated substances, organic silanes, esters, aldehydes, and ketones. Given the ease with which they vaporise, volatile organic compounds (VOCs) are a group of chemicals with a very high vapour pressure that are grouped together [4–6] [15]. VOCs are the most dangerous to humans because of their high vapour pressure. Based on the OSHA (Occupational Safety and Health Administration) workplace hazardous materials information benchmark, the National Fire Protection Association (NFPA) developed a number system from 0 to 4 for categorizing fuel potential danger ratings. The numbers 0–4 represent negligible, subtle, modest, significant, and drastic hazards, respectively, in accordance with the OSHA standards required.

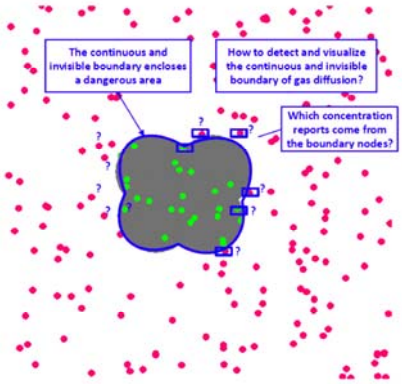

Figure 1: 200 hundred sensors for detection of harmful gases.

Because poisonous gas mistakes occur in a continuously region, connected supervision is essential to encompass the constant area. In this study, the continuously region is known to it as the high risk area. It is possible to perform connectivity and saturation monitoring via the usage of Wireless Sensor Networks (WSNs) [14]. These systems use geographically dispersed independent devices to sense the external environmental status of a given area or object. This research demonstrates how a WSN identifies and visualizes a potentially hazardous region. The identification and display of the potentially hazardous region allow for the visual control of exchange of gases in the workplace.

The following are some of the great discoveries made by this article:

1) It is recommended that a detection technique be used to identify the potentially hazardous location where poisonous gases are seeping. This system makes use of five estimates vary widely techniques in order to accomplish the efficiency characteristics of a surveillance system, which is beneficial in that it simplifies the computation of the risky region in question.
2) The influence of various estimates vary widely methods is readily demonstrated by evaluating the reliability of the 5 techniques in recognizing a potentially risky region.
3) According on the varied node failure probabilities, the projected size of a risky region might vary significantly.

The chapters are arranged in the following order. Section II summarizes the relevant research on gas patterns that indicate that has taken place. The network design and enable this feature are introduced in Section III of this document. Section IV outlines a detection technique for identifying potentially hazardous areas where poisonous gases are seeping. Section V presents the findings of the assessment as well as the relevant analysis. Further work on framework networks and network design variables in relation to area detection is discussed in Section VI, which is divided into two sections. Finally, Section VII brings this study to a close.

2. RELATED STUDY

In [7], the section discusses a semiconducting networked various sensor, which is comprised of a semiconducting wireless sensing sampled circuit, a fuel signaling warning and mobile communication loop, and a wireless transmission frequencies message received circuit, among other components. Designed for remote sensors of hydrogen fluoride vapor in industrial facilities, the technology is simple and effective. The polarities and amplitude of the detector output voltage are taken into consideration while designing, integrating, and classifying the hydrogen fluoride gas detector. It is possible to create an integration framework for signal processing circuits for sensor output signals. A modeling framework for future research again for remote monitoring network parameters of hydrogen sulfide fluoride gas was described in this project, and the detector distinctive feature measurement and precision comparative modeling experiments for the surveillance system, as well as the interaction range exam innovate for the messaging system and the data analysis innovate on the impact of environmental moisture on the primary source material of the surveillance system, were all successfully completed. When it comes to software, the connectivity nodes' flow chart has been improved. Because the framework of an internet of things varies depending on the required field, poisonous gas surveillance systems intelligent sensor connections must concentrate on trying to extend the cable network cycle time in order to be effective and efficient. When used in conjunction with decentralized spectrum sensing, the program's serviceability can be significantly extended without impacting its regular function. For this reason, this particular topic integrates the condensed embedded sensors that have emerged over time with an air surveillance system again for computation of data transmissions in order to reach the goal of yet more reducing energy usage of the scheme. An test in simulated world evidenced that when the LmF human brain is blended with fuel detector innovation, it is possible to perform subjective proof of identity as well as statistical analysis on individual fuel and statistical analysis on blended flammable gas. The data analysis studies in this field also introduces a method for further integrating the miniaturized hydrogen fluoride chemical sensors unit with sensing technologies, integrating the miniaturized hydrogen fluoride chemical sensors unit only with embedded controller, and expanding the cordless implementation of the sensing element, among other benefits.

A micro hotplate heaters framework was used by Nikolic and colleagues [8] to develop a semiconducting hydrogen fluoride sensor system. When it comes to its framework, the device's micro hotplate is a "sandwich," meaning that the top and bottom layers are both made of SiO2, while the inner layer is composed of Si3N4. Besides inscribing the dielectric material at the bottom section of the micro hotplate, the thermal transfer route of the micro hotplate can be whittled down, as well as the electricity needed to reach the predefined temperature range can be lowered. A energy consumption of approximately 100 mW can be used to guarantee that the micro hotplate is warmed up to 300°C, based on the results of the exploratory estimations. This shows that the use of MEMS technology in the sensing area has resulted in a significant reduction in the energy consumption of the micro hotplate hydrogen fluoride sensor module.

Researchers have developed a collection of information that is premised on a solar energy source, smart sensor connectivity, a hydrogen fluoride gas surveillance system, as well as a household burglar alarm framework that is premised on WSN and GSM technology. Whenever a potentially hazardous situation arises, this framework might play a critical role in generally pro, highly flammable hydrocarbons fluoridated water gas leakage detection, and fire prevention able to monitor. [9] It does this by sending an alarm notification to the borrower's mobile phone in place to guarantee the safety of the household. WSN technology has also been used by some researchers in the development of a water quality analysis. The pH value, contamination, heating rate, and cloudiness of water can all be supervised, allowing the environmental safety agency to provide direct information to businesses such as economy, orchard, and marine that are reliant on local surface water quality [10] [11] [16].

Due to the fact that other sources of waste can be discovered graphically and by flavors, polluted air is the most significant issue. Polluted fumes are difficult to detect because it is colorless, odorless, and tastes like nothing at all. Because of this, there seems to be an expanding market for carbon emissions monitoring and controlling systems in the climate surroundings. Because of this job, the currently available processes in industrial zones have been altered; however, the modified framework could also be used in homes and at the place of business. With the help of four sensors, the author [11] devised a dangerous gas closely related to the concept. Using an Arduino microcontroller, this paper presents a design that can be used to detect a variety of potentially hazardous gases. The presence of toxic gases such as butane (also known as LPG), methane, and carbon monoxide is detected and converted into a Digital display. A liquid crystal display (LCD) will showcase gas concentrations as a percentage of their total volume [17] [18].

3. METHODOLOGY

In Network Model, to simulate the dangerous gas surveillance system, a two-dimensional graph was created and then analyzed. For each sensor network, the transmission radius is denoted by R. In this case, the Euclidean gap between adjacent nodes is smaller than R, and they are considered to be neighbours. Each sensor node transmits its own data to the neighbours within a one-hop distance. Also taken into account in this research is a network structure with changing node failure rates 2.

The dispersion of a specific type of gases was represented as an increscent round, with the centre of the circle representing the location of the gas explosion in this case study. No attention was given to the influence of natural elements including such weather, velocity, and pressurization on the dispersion of gases. According to this nonlinear model, that there are no evident distinction between the various gas mixtures; nonetheless, the rates of dissemination, the potential to generate explosives, and the degree of harm to the planet and global health of the two substances were clearly distinguishable. According to the findings of this investigation, the poisonous gas sensor network was only designed to identify the harmful region of gas diffusion.

The installation of significant deployed sensor nodes was necessary to ensure the connection of the system that was utilized to identify the oxygen transfer. The units in this system were completely interconnected with one another, allowing it to identify the harmful region of exchange of gases.

Distance Charts are graphs that show how close two points are to one another. In this research, entire network, which was shown to be one of the most important elements impacting detection capability, was depicted as a closeness graph.

Five traditional closeness graphs are extensively in use and researched: the GG (Gabriel graph), the RNG (Relative Neighborhood Graph), the Del (Delaunay graph), the Delk (Localized Delaunay graph), and the YG (Years-Gradient graph) (Yao Graph). Whenever they are employed to accomplish the planarization of a surveillance system, it is a critical stage in the detection scheme because it allows for the identification of risky areas where poisonous gases are seeping into the environment. The Appendix contains extensive descriptions and images of the five closeness graphs, which may be found here.

3.1 Planarization

The planarization of the fuel surveillance system was accomplished by the use of based on classical estimates vary widely algorithms, each of which corresponded to five closeness graphs. Table I contains a definition and a list of the characters that will be used throughout this work.

Signs	Description
G	Network graph
S	Sensor nodes Set
E	A series of edges
$s_1, s_2, \ldots \ldots, s_n, u, v$	Sensor node
e_{uv}	Edge to connect u and v
$d_{u,v}$	Euclidean distance between u, v, w
R	Communication radius
r	Gas leakage area radius
(x_i, y_i)	Coordinates of the *i*th node

TABLE I: Symbols and Definitions

4. GAS LEAKAGE DETECTION SCHEME

The following are the measures to take in order to discover and calculate the risk region around a leaky poisonous gas container.

STEP 1: Planarization.

The very first step is to organize the infrastructure that monitors poisonous gas emissions. Figure 2 shows a planarization instance. The optic fiber is planarized as that of the horizontal graphical GG and $LDel^2$, respectively. In Figure 2, there really are 200 biosensors, and that they are randomized implemented in a 600 x 600m^2regions to identify poisonous smoke, and that there are no malfunction nodes. Every one of these endpoints are involved and linked with one another to begin building a surveillance system. Since the contact between different base stations varies depending on the range between any of these pair of nodes, it's indeed feasible that such node seems to be capable of communicating with much more over just one endpoints, that also helps make this same network model be not flat. GG and $LDel^2$ are being used to accomplish the polarity of the routing protocol.

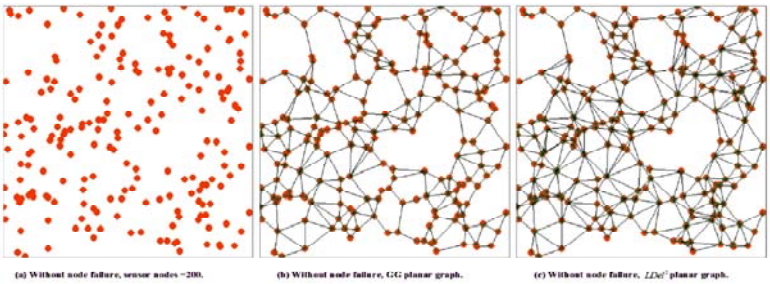

Figure 2: GG and $LDel^2$ are planarized without Node failure.

STEP 2: Every sensor network communicates its data to the neighbours within a one-hop distance. There is also a condition indication to show whether or not a node has detected harmful gases inside the broadcasted data.

STEP 3: Finding the internal border nodes and putting together the interior boundaries helical shape are the first steps. In Figure 3, a node that has identified dangerous gases acquires knowledge from its one-hop neighbours, and if at most one neighbor node can't detect the poisonous gases, the node is considered an internal border node, as indicated in the diagram (a). An internal boundaries loop is formed by connecting every one of the elements on the inner border to one another.

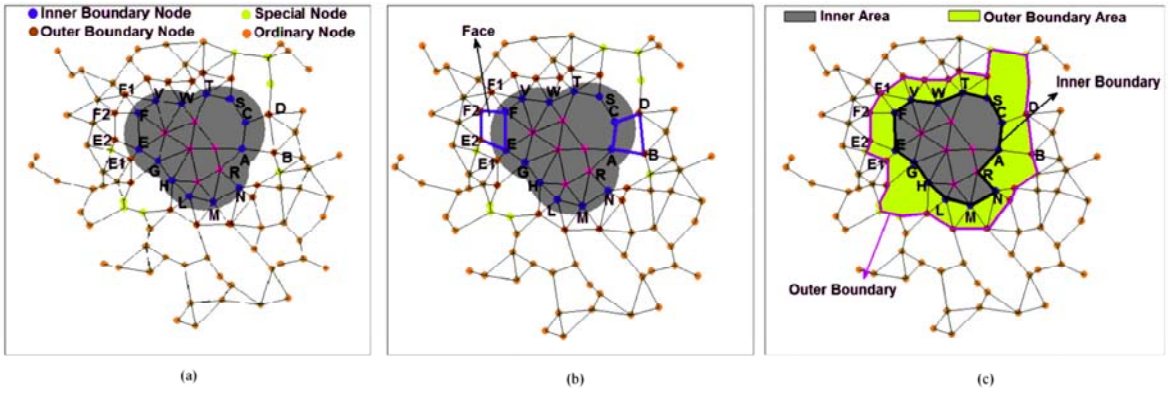

Figure 3: Identifying of the dangerous zone developed by the escaping noxious fumes.

STEP 4: Identifying the external demarcation vertices and establishing the external demarcation helical shape are the first steps in this process. Despite the fact that a base station is except in a leakages area, it currently receives data from its 1-hop nearest neighbors. An external demarcation node is defined as something that has discovered noxious fumes in at least one of its 1-hop neighbor nodes, as illustrated in Figure 3. (a). It is important to link all the external grid points to one another in order to form an external demarcation loop. Because all of the external grid points are unable to be closely correlated to one another, another normal access points could be used to allow someone to interact to one another through use of those certain normal nodes. As illustrated in Figure 3, such normal endpoints are referred to as "special nodes" (a).

STEP 5: Creating the perimeter of the outer border zone. There really are two inner bounding nodes, designated as A and C, and two outer demarcation nodes, designated as B and D. They are close neighbours (A and C, A and B, C and D, and B and D), and that they are connected by the shortest distance through the landscape. The "face" is defined as an area that's also encapsulated by nodes A, B, C, and D, as well as the relatively short paths, as illustrated in Figure 3. (b). As seen in Figure 3, the outer border region is made up of a combination of several faces (c).

STEP 6: Building the inside of the building. Those networks are designated as the internal side in Figure 3. Its interior region is bounded by the following nodes: A; C; S; T; W; V; F; E; G; H; L; M; N; and R. As seen in Figure 3, the nodes A; C; S; T; W; V; F; E; G; H; L; M; N; and R are designated as that of the internal grid points (c).

STEP 7: Determining the potentially hazardous region. The risky area is indeed a polygon with uneven edges. Eq. 1 is used to compute the magnitude of the risky region in question.

$$S_{area} = \frac{1}{2}\sum_{i=1}^{n}(x_i y_i + 1 - x_i + 1y_i) + \frac{1}{2}\sum_{j=1}^{m}(x_j y_j + 1 - x_j + 1y_j) \qquad (1)$$

where n and m are the numbers of medial and lateral border nodes, respectively, and n identifies the amount of internal different nodes.

5. RESULTS AND DISCUSSIONS

A. *Simulation Set-up*

The experiment was carried out with the help of NetTopo. Sensor networks were placed in a 500m × 500m area at randomness, and the median of every result was calculated using 100 distinct architectures based on the distribution of the networks. There have been a spike in the volume of sensor network from 100 to 1,000. Throughout this experiment, the following implications can be drawn: the gaseous exchange occurred in an ideal circle, the diameter was increased from 60 m to 90 m (at a rate of 5 m/s), and the leaking origin of the vapor was positioned in the middle of the circle (see figure). Table II contains the values of the input variables.

Attributes	Values
Size of Network	500m x 500m
No. of nodes	(100-1000)
Radius of gas	(60- 90) m
Transmission radius	60m
% of failure nodes	5%, 10%, 15%, 20%

TABLE II: Simulation Parameters and their respective values.

B. *Dangerous Area Detection and Node Failure*

A typical difficulty in a real-world surveillance situation is the breakdown of the surveillance nodes, which occurs as a result of the nodes' dynamic performance concerns. A breakdown is deemed to be a component in a system when, for instance, the power of the network is depleted due to its usage.

igures 4 and 5 demonstrate that the identification of a potentially hazardous region of seeping poisonous fumes was carried out using two network topologies: one which did not come into play component failures and one that would take into account component failures.

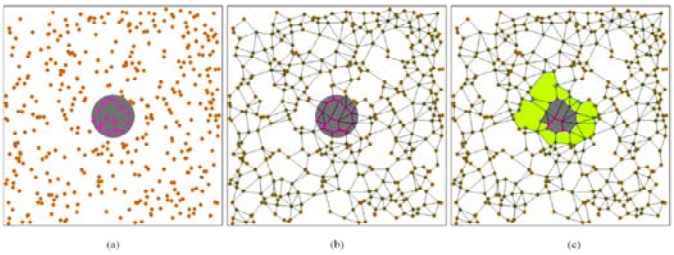

Figure 4: Identify the risky situations without node failure

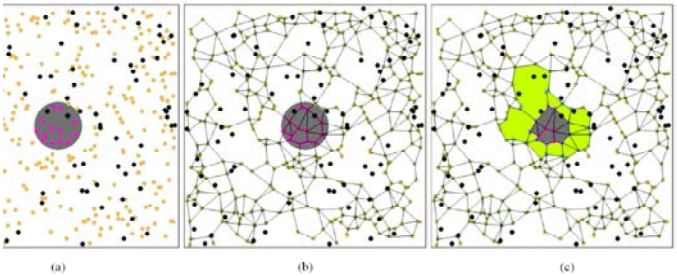

Figure 5: Identification of risky situations in the presence of failures.

C. *Performance Comparison*

Using four distinct scenarios, we were able to evaluate the scheme's effectiveness in identifying the harmful area: I variable quantities of sensor network distributed, (ii) changing proportions of failing nodes, (iii) changing circumferential durations of poisonous gas propagation, and (iv) varying planarized networks.

Effectiveness while varying the number of transistors is measured. In Figure 6(a), it can be seen that whenever the quantity of devices in the system is fewer than 200/300, the channel's complete connection cannot be ensured. With 100 nodes, the estimated hazardous area size is 0 because the risky region can indeed be identified, resulting in the estimated hazardous area size being equivalent to 0. It is more accurate to determine the network size when there are 200/300 nodes, instead of when there are more over 400 components of the system. Whenever the size of the network exceeds 400, it is possible to ensure complete connection between them.

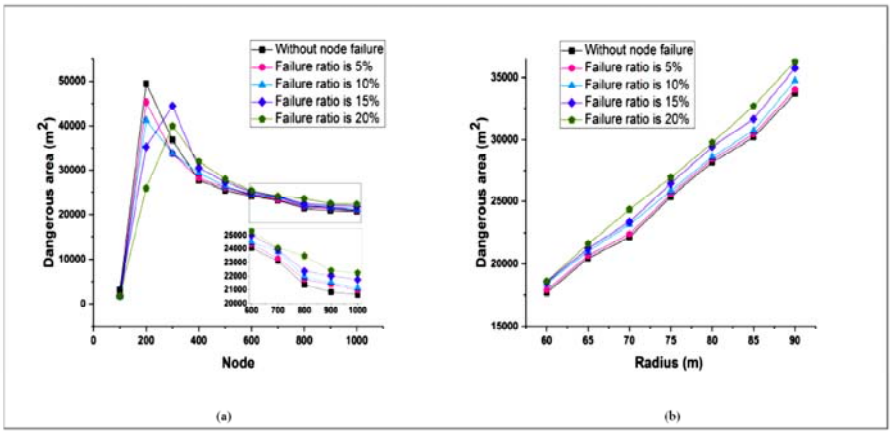

Figure 6: length of the identified unsafe region

Effectiveness when varying the proportions of failing nodes is used. Five percent, ten percent, fifteen percent, and twenty percent failed nodes were included in our surveillance platform in order to examine the influence of the breakdown percent on the detection of a potentially harmful location.

Figure 6(a) illustrates that for networks with 400 to 1,000 nodes, the length of the identified unsafe region was bigger than the smallest of the system when taking into account node failure (see Figure 6(b)). If the proportion of nodes that failed was greater, the computed size was also bigger.

Figure 6(b) illustrates that the estimated region size again for system that did not take into account component failures was smaller than the estimated surface area again for system which did take into account component failures, and that the greater failure % resulting in a greater estimated surface area.

Effectiveness of the Hazardous Exchange Of gases with Various Radius Distances of the Poisonous Exchange Of gases The proportion of nodes that failed in our surveillance system was set at 5 percent for this reason. When the network was entirely linked, the size of the identified risky region expanded, as seen in Figures 8 and 9, indicating that the network was fully connected.

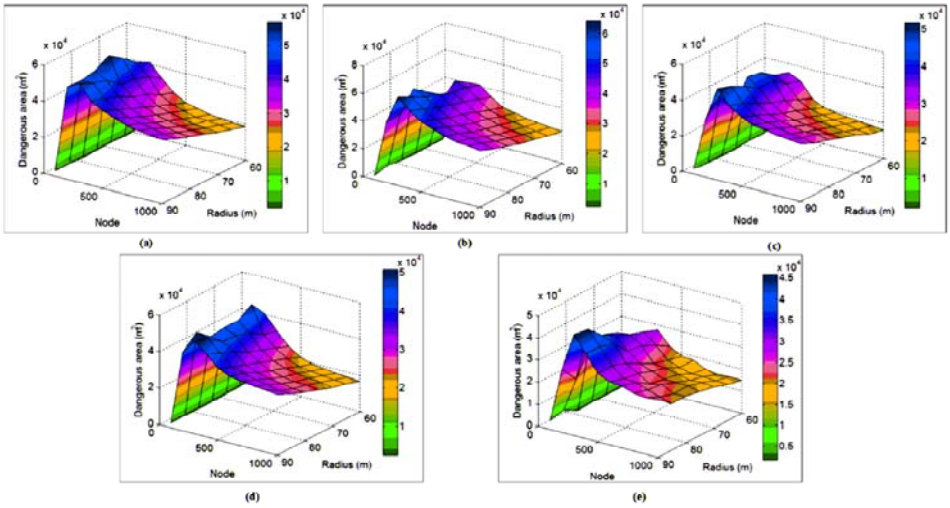

Figure 7: Correlation amongPoisonous Gas Dispersion and Unsafe Region

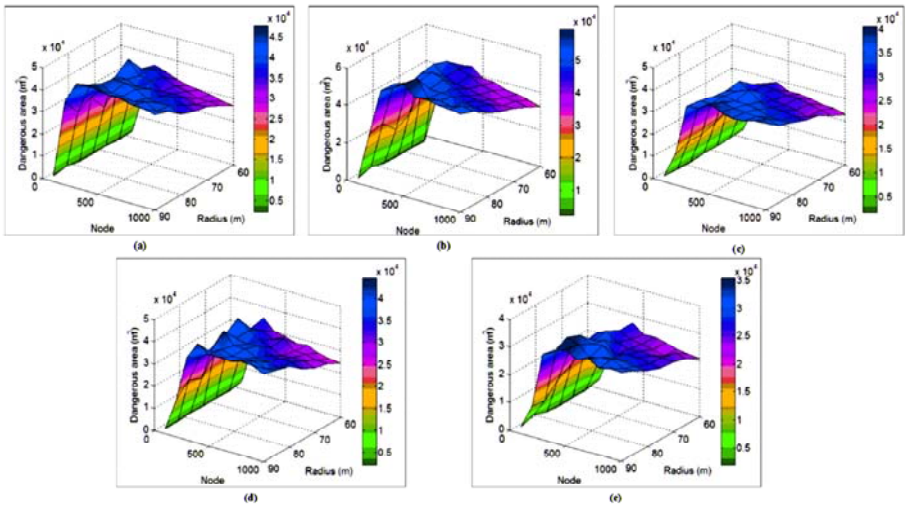

Figure 8: Correlation in between Perimeter of Poisonous Gas Dispersion and Length of the Discovered Unsafe Region

Various Planarized Charts Produced Differing Results. The findings shown in Figures 8 and 9 demonstrate which the length of the discovered unsafe region differed depending on the kind of planarized charts used to identify it. The adoption of the YG graph resulted in the lowest area size being achieved. This finding demonstrates that a range of identification capabilities for the identification of risky areas may be attained by using a number of framework charts in various ways.

This chapter identifies the work done on planarized charts as well as the variables of the network model are capable of area recognition.

A. Planarized Graphs

The length of the Hazardous Zone that has been identified. As seen in Figures 8 and 9, the length of the discovered risky region changes depending on which planarization technique is used to identify the threat. Planarization methods are used to planarized a surveillance system, which is a key step in the recommended detection strategy. Distinct planarization algorithms have been designed for each type of planarized chart, resulting in a different type of planarized system. Figure 2 illustrates an illustration of this. Faces of varying sizes and numbers were created by the numerous planarized systems that were used. These people's looks were the most frightening part of the scene.

The length of the sampled area is proportional to the amount of connections and the positions of those nodes. Figure 9 illustrates four unique scenarios in which the length of the identified risky region is equivalent to 0, as shown in the figure.

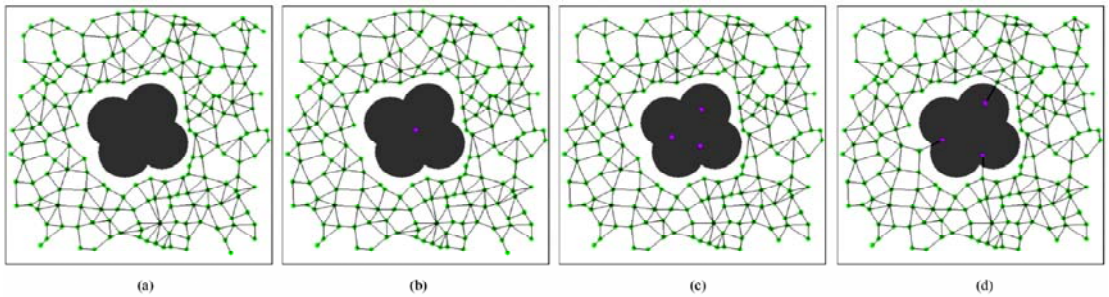

Figure 9: Detection of a Risky Regionin Four Instance.

Figure 9(a) depicts the absence of a network in the vicinity of the escaping chemicals. In this example, the overall amount of estimated faces is equal to one. In Figure 9(b), there seems to be an abandoned node (a node with no neighbours) in the vicinity of the fuel leak. It is also impossible to form a face in this situation. Figure 9(c) shows three nodes that are orphaned. Figure 9(d) shows the fourth scenario, in which the three inner terminals only really have one neighbor on the outside border. Because these three inner networks are not linked to one another, it is impossible to design a face out of them. If it is not possible to create the face, the predicted size of the risky region is equivalent to one hundred percent.

In that other example involving a node breakdown, the malfunction had an impact on the structure of the system that was being monitored. A network failure issue, for illustration, in the vicinity of a leaky gas source might result from one of the four particular scenarios stated above. It also has the additional effect of resulting in a computed surface area of 0. A node failure issue occurring in the outer border region would cause the reported size of unsafe area to be bigger than it would otherwise be if the issue did not exist (and vice versa).

Complexity. The planarization stage of the proposed intrusion detection system is carried out using planarization techniques, which are then used to create the planarized systems in the first phase. Let's just be the node density level in a system, and let n become the maximum number of devices in the system. In O(nlogn), the greatest planarized graph building method is implemented, while in O(n3), the very worst planarized chart production algorithm is implemented. This research employs a method whose computation time is O(n3) for the construction of GG and RNG, $O(nlog_n)$ for the construction of Del and LDel2, and O(n2) for the construction of YG. Each node sends out a limited broadcast in order to get the inner and outer boundaries nodes, which are then used to generate the external perimeter face region. By using planarization techniques, the planarization techniques are able to limit the length of the outer border face area by creating connecting networks. Using different planarized graphs, the size of the created outer border face regions varies, and this varies in turn causes the size of the identified unsafe area to vary as well. The component responsible for getting the outside boundaries face area takes at most $O(\Delta^2)$ time to

complete. The two essential characteristics of the suggested technique, planarization and determining the outer boundaries face area, are responsible for the time complexity of the strategy. Whenever the maximum number of nodes is constrained by a constant, the temporal complexity of the scheme is no more than O(n3) at most.

Consumption of Energy. When data is sent between directly linked nodes in a planarized system, the topology of a network must not be too high, since the chance of interfering and accident increases among some of the strongly linked nodes. It is therefore essential to retransmit the data in order to lessen the effect of the interruption and collisions. The energy usage rises as a result of this resend. The level of the network has an influence on the amount of energy used by the node.

B. System Model Parameters

Network Density.A potential strategy for extending the channel's lifespan is to increase the amount of connections in a particular location. Having said that, if all of the devices in the system are in the functioning state of course, the likelihood of disturbance, collisions, and overcrowding in the system during transmission of information will rise. Furthermore, the presence of several nodes spanning a topic of focus will lead to the formation of duplicate data in that region.

For a system to be connected, the thickness of the connection is indeed an essential component to take into consideration. Whenever the amount of nodes within the network is sufficient to achieve complete connection of the networks, the discovered outer border region is closer to the reality of escaping gases than when infrastructure is not fully linked with the suggested detection technique.

Cost. The cost of an infrastructure is divided into two categories: the implementation cost and the connectivity cost. The cost of deploying a network is determined by the amount of nodes. Lowering the amount of mobile stations is a realistic strategy for lowering the cost of the network. The number of nodes, on the other hand, has an influence on the precision with which the harmful region is detected. In the field of identify and assess, finding the optimal combination of price and reliability is a critical challenge.

The cost of a connection is proportional to the quantity of contacts. The transmission of information here between nodes consumes energy. If the quantity of interactions can be decreased while the power of the terminals is saved, the cost of the connection may be brought down as well. Because of this preservation, the network's life expectancy may be increased significantly.

6. CONCLUSION AND FUTURE SCOPE

Target value true recognition has garnered a great deal of interest recently. Poisonous fumes are a type of ongoing item that is both unseen and poisonous. Its limit is very difficult to determine with any degree of accuracy. In this study, a recognition system for detecting the potentially hazardous region of escaping poisonous smoke is suggested. The harmful region is comprised of the inner northern border of the seeping chemicals as well as the external boundaries region. In the suggested detection technique, five planarization techniques were employed to planarize a surveillance system, which was then utilized to identify anomalies. This kind of planarization enables us to generate a variety of topologies. In this section, we examine and discuss the influence of these five planarization techniques on the identification of the potentially harmful region.Even as amount of nodes within the network grows, the size of the unsafe region that has been discovered shrinks. Even as diameter of the exchange of gases rises, the length of the identified harmful region grows in proportion to the length of the gas flow. When comparing the schemes that take network breakdown into account as well as those who did not, the length of the discovered unsafe region was much larger in the strategy that did. As the proportion of breakdown nodes rises in proportion to the number of devices in the network, the length of the identified unsafe region grows as well.

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An Optimized Wireless Network Performance for Secure Data Transmission and Quality of Service

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Abstract
Performance analysis and optimization are becoming increasingly critical as wireless local area network technology becomes more prevalent. Wireless channel, on the other hand, is more error-prone than conventional LAN. Network operators may now appropriately manage traffic needs via users and hotspot locations thanks to the advent of WLAN. The problem of perform consistently to Quality of Service of cellular data networks provides interactive smooth and pervasive services as well as extremely high data rates, which is a matter of consideration. We look at the current issue of network degradation and how it affects the provision of such continuous connection in this research. Most indications for network performance optimization include packet loss, packet delay, and jitter. Need for information services with high dependability, fast response times, and ubiquitous connection continues to rise as wireless networks advance. Wireless networks' intrinsic differences from landline networks sometimes influence these concerns. As a result, network traffic measurements such as latency, packet loss, and packet delay in particular wireless situations have encountered certain performance issues. To address these issues, we looked into network performance optimization strategies and suggested a framework for efficient WLAN performance based on a Type 1 Fuzzy knowledge-based approach. We gathered statistical operational field data and used the suggested model to simulate it. The results reveal that congestions on the typical network environment are minimized, indicating efficient network performance.

Keywords.*Quick Response Time (QRT), Quality of Service (QoS), Packet loss, Packet delay and Jitter*

1. INTRODUCTION

The implementation and use of wireless networks has increased dramatically during the last few decades. Wireless network availability and utilisation have an impact on technological innovation [1]. The majority of our gadgets connect to the internet via a wireless network, thus network speed is critical. A high network performance facilitates mobility and communication, particularly in our industry and other industries. Wireless systems of the present generation can deliver high-speed data services at rates that are far faster than those of the prior generation. As a result, need for information services with high dependability, quick reaction times, and ubiquitous connection continues to grow at a rapid rate, creating opportunities for efficiency and optimization. Electronic equipment, antennas, digital signal processing techniques, network control protocols, and cryptography all play a role in enhancing wireless performance networks. Application of computational intelligence techniques in network, operation, and optimization seeks to improve QoS [2] in a wireless network with this method. The rising number of mobile users, along with the overwhelming demand for network providers' services, has an impact on network QoS, resulting in a strong need for optimization.

2. RELATED STUDY

Wireless efficiency has been investigated in a variety of research. Below is a summary of some of the previous work. As a crucial component of current communication technologies, communication has long piqued researchers' curiosity. IEEE 802.11b has grown in popularity in recent years, owing to its benefits of user mobility, cheap acquisition costs, and ease of deployment, making it suitable for both home and commercial Internet access. The end-user experience, on the other hand, has frequently fallen short of what technology can provide. When compared to other WLAN technologies, the IEEE 802.11b WLAN has a low throughput. The focus of author [3] is on

increasing IEEE 802.11b network performance. In Riverbed Modeller software, the IEEE 802.11b network architecture and characteristics were analysed using quaternary key shifting modulation and discrete event simulation techniques. The results revealed that increasing the data rate from 1Mbps to 11Mbps, which is the optimal number, boosted throughput and resulted in an 80% reduction in latency, as well as a near-zero reduction in retransmission attempts. The results also indicated that increasing the buffer size from 1000 bits to 12800 bits, which is also the optimal value, boosted throughput by around 90% with no data loss because the buffer would take longer to fill up, and nearly no retransmission attempts were made. This research will help to improve the IEEE 802.11b network's Quality of Service, lowering the cost of device acquisition and overhauling.

According to [4], the effect of a lowest to highest traffic ratio on Wireless LAN efficiency was examined. The simulation findings demonstrate that depending on the network size and network conditions, the high/low priority traffic ratio has a varying influence WLAN.

Many studies and improvements are now being made to the IEEE 802.11 standard-defined access mechanism to the physical environment. To give QoS to particular flows in network traffic, a range of research methodologies, such as Colored Petri Net [5] and machine learning, are applied.

One of the important research topics for improving wireless network performance is ensuring the QoS by delivering a enough level of activities to fulfill the traffic needs. For communication system engineers, Reference [6] provides a broad roadmap to increasing QoS [7]. The MAC sublayer can also be improved in order to improve service quality. Nano-network networks, for instance, may benefit from an upgraded MAC protocol that increased efficiency, energy economy, and reduces collision risk [8]. It provides an in-depth look at strategies for improving the BEB algorithm, which is used to retransmit messages in wireless local area networks using the CSMA/CA protocol. It's important to note that in Reference [9], the incoming traffic is divided into three types: ordinary, severe and crucial, each with its own priority and delay time. It facilitates the delivery of time-sensitive and crucial information. Furthermore, as shown in References [10,11], this causes considerable network performance reduction in the event of a heavily loaded network. It is recommended in Reference [12] that radio resources be distributed equally among several data streams via channel binding and a revised channel access mechanism. Adjustments may also be made to the MAC layer settings on the fly. For example, a dynamic Contention Window (CW) tuning strategy based on collision likelihood [13].

The kind of wireless network and its architecture were taken into account when developing certain recommended enhancement strategies. For dense IoT-networks [10], WSN, and 5G-NET [11], or a signal-based MAC protocol for temporary networks, Reference [14] proposes a strategy and technique for on-the-fly QoS slice orchestration. The average latency can be cut in half as a result. Furthermore, the average throughput is lowered by 8%.

3. METHODOLOGY

A system is a collection of interconnected, interdependent pieces that create a complex whole [15] [16]. The overarching plan or model that outlines how the system will achieve its information needs is known as the systems design. Creating system-level technical specifications and best system designs, as well as assessing the design's capabilities to satisfy the system need, are important actions in system design [17] [18].

3.1. Proposed System Architecture

The core organization of a system is manifested in its elements, their relationships with one another and the environment, and the rules that govern its design and growth.

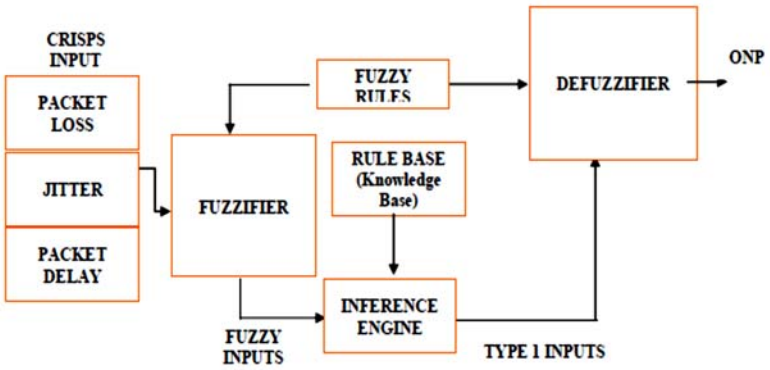

Fig. 1: Architecture of the Proposed System

A system is a collection of interconnected components designed to accomplish a certain goal. Creating system-level technical specifications and top-level design concepts, as well as analyzing the design's capacity to satisfy the system requirements, are vital steps in system design.

3.2 Data Acquisition

Data collection is the process of gathering, measuring, and evaluating correct insights for study utilizing tried-and-true methods. Based on the information received, a scholar may evaluate their theory. Data collection is often perhaps the most important stage of any research project, regardless of topic. Various statistical tools are employed depending on the kind of study being conducted. In order to make statistical research decisions, the most essential purpose of collecting data is to gather relevant and correct information. In this research, the lifetime of the system was tested.

Our goal is to make things more efficient.. There are a variety of ways to evaluate the speed of the network because of its distinct nature and architecture. Packet loss, packet delay (latency), and jitter are the performance matrices used in this study. When analyzing and measuring the performance of a network, system, or device, latency and jitter are two crucial measurement factors. Varied applications have different latency and jitter requirements. VoIP. Latency and jitter are commonly used by network administrators, operators, and engineers as fundamental benchmarking indicators for Quality of Service (QoS) validation. Before a network can be optimized for effective Quality of Service (Qos) provisioning, it is necessary to assess and monitor network performance with a thorough understanding of how latency and jitter impact network performance. Table 1 provides data for a performance measure of a wireless local area network gathered over the course of a week based on the network performance metric.

Date	IP Address	Download Speed	Upload Speed	latency (packet delay)	Jitter	Quality Score
6/14/2020 21:55:0	102.89.2.166	2.40 Mbps	0.15Mbps	255 ms	28 ms	Good
6/14/2020 22:13:42	102.89.2.166	2.14 Mbps	0.23Mbps	227 ms	238 ms	Good
6/14/2020 22:17:47	102.89.2.166	0.75 Mbps	0.28Mbps	228 ms	5 ms	Fair
6/14/2020 22:24:37	102.89.2.166	4.07 Mbps	0.41Mbps	226 ms	6 ms	Poor
6/14/2020 22:31:11	102.89.2.166	2.44 Mbps	0.44Mbps	220 ms	9 ms	Good
6/14/2020 22:44:40	102.89.2.166	4.70 Mbps	0.52Mbps	224 ms	6 ms	Good
6/14/2020 22:50:38	102.89.2.166	2.11 Mbps	0.85Mbps	232 ms	67 ms	Good
6/14/2020 22:51:48	102.89.2.166	5.20 Mbps	0.56Mbps	234 ms	6 ms	Good
6/14/2020 22:53:48	102.89.2.166	3.55 Mbps	0.83Mbps	221 ms	10 ms	Bad
6/13/2020 22:59:33	102.89.2.166	4.68 Mbps	1.23Mbps	230 ms	5 ms	Fair

Table 1: Network Performance sample dataset

Table 1 illustrates the data transfer speeds, with the download speed being higher than the upload speed for many customers. This is common because most high-speed Broadband connections, such as cable modems and DSL, are asymmetric, meaning that browsing speeds are substantially faster than posting speeds. Because most people spend far more time getting than uploading, high-speed Internet providers have prioritized browsing in their systems. As a result, if your transfer rate appears to be worse than your download speed, this is most likely normal. Figure 2 illustrates our download and uploads speeds.

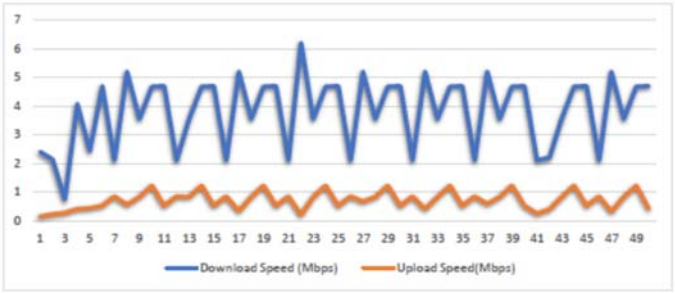

Fig .2: Download vs Upload speed

In addition, table 1 demonstrates how lag and flutter influence to network overall performance. Packet latency and flutter are naturally linked, but they are not the identical. Production delay, queuing delay, transmission delay, and propagation delay are four main components of packet delay, which is a crucial statistic in networking. It has an influence on the user experience and can alter depending on a variety of things. Jitter is caused by delays, notably

delays with inconsistencies. Jitter is the difference in delay between two packets. It frequently leads to packet loss and network congestion, as seen in Figure 3.

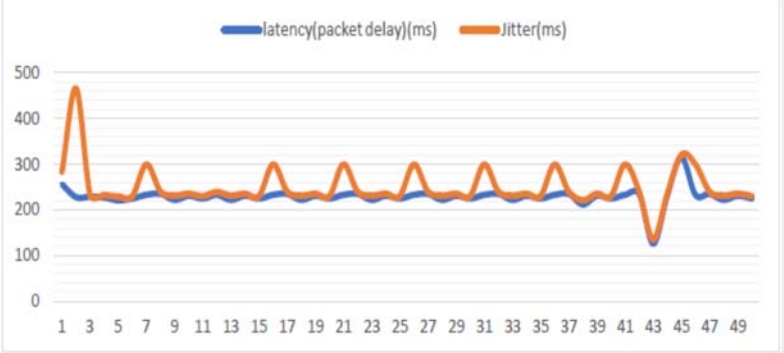

Fig 3 Latency vs jitter

3.3 Rule Base

A rule is a linguistic phrase that explains the connection between the input and output language variables. A dependent clause is the most basic form of a fuzzy rule.

Rule No.	PL	JI	PD	ONP
1.	LOW	LOW	LOW	GOOD
2.	LOW	LOW	MID	GOOD
3.	LOW	LOW	HIGH	GOOD
4.	LOW	MID	LOW	GOOD
5.	LOW	MID	MID	GOOD
6.	LOW	MID	HIGH	AVERAGE
7.	LOW	HIGH	LOW	AVERAGE
8.	LOW	HIGH	MID	AVERAGE
9.	LOW	HIGH	HIGH	BAD
10.	MID	LOW	LOW	GOOD
11.	MID	LOW	MID	AVERAGE
12.	MID	LOW	HIGH	BAD
13.	MID	MID	LOW	AVERAGE
14.	MID	MID	MID	AVERAGE
15.	MID	MID	HIGH	AVERAGE
16.	MID	HIGH	LOW	AVERAGE
17.	MID	HIGH	MID	BAD
18.	MID	HIGH	HIGH	BAD
19.	HIGH	LOW	LOW	BAD
20.	HIGH	LOW	MID	BAD
21.	HIGH	LOW	HIGH	BAD
22.	HIGH	MID	LOW	AVERAGE
23.	HIGH	MID	MID	GOOD
24.	HIGH	MID	HIGH	BAD
25.	HIGH	HIGH	LOW	AVERAGE
26.	HIGH	HIGH	MID	BAD
27.	HIGH	HIGH	HIGH	BAD

Table 2: Rule Base

3.4 Model Formulation

The metrics of network service quality as observed by the client are shown in network quality. Because each network is unique in its nature and architecture, there are a variety of methods for assessing its performance. Basically, rather than measuring performance, it may be described and simulated; for instance, state transition diagrams can be used to model processing efficiency, or a Network Simulator can be used. Depending on the functional and measurement technique, network performance is measured using factors such as latency, jitter, packet loss, and throughput, among others. The general performance parameters that are most commonly considered in wireless networks are investigated in this study paper.

Packet Delay (PD), Jitter (JI), and Packet Loss (PL) are examples of these issues (PL). The Fuzzy Logic System's fuzzification procedure will use them as input variables. The length of time it takes packets to arrive at a certain endpoint, expressed in milliseconds, is referred to as packet delay (DE). Jitter (JI) is the undesirable variation from genuine periodicity of a supposed periodic signal in electronics and telecommunications, which causes drop of synchronisation between data delivered, calculated in ms. The proportion of packets that are dropped during transfer is referred to as packet loss (PL).

3.5 Fuzzy Logic System

We've gone with a T1 FLS based on [8] as demonstrated in. Figure 5: A Fuzzy Model of Type 1.

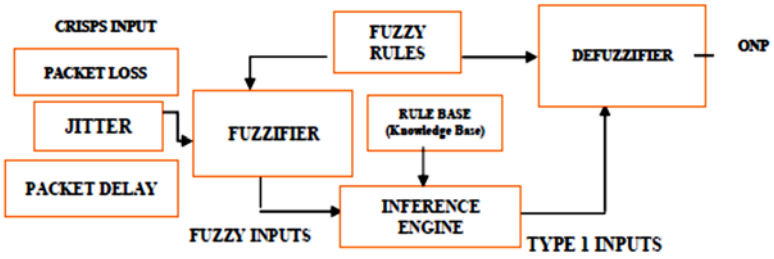

Fig 5: Type 1 Fuzzy Model

3.6 Design Architecture

The theoretical network model used in this work is the Fuzzy Inference Network, which comprises mostly of the MATLAB GUI that provides the foundation for constructing Fuzzy Rules and Membership Functions. The following diagram depicts the Information Processor, Knowledge Base, which is made up of both a data structure and a Fuzzy Logic Model, and User Interface. While structured data (e.g., packet delay (PD), jitter (JI), and packet loss (PL) are employed in the system design, the knowledge engine is comprised of both structured and unstructured data. Figure 6 depicts the study's conceptual architecture.

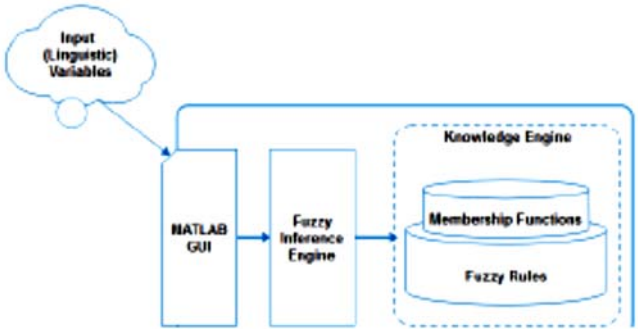

Fig 6: FIS Framework

The membership functions are used in the fuzzification phase to assess the grade of membership of the entries of the specified input variables. The crisp data are changed to fuzzy variables in this manner. The final result supplied in the various rules is then mapped to intermediate outcomes evaluating fuzzy sets using this method. The degree of user satisfaction with quality of service is represented by the OPN output. Optimum Network Reliability [Good, Average, Bad] is the outcome fuzzy linguistic factor and its words.

3.7 Membership Function Definition

The triangle membership function is used, as stated before in the preceding paragraph. To link together different ranges of input and output variables, a fuzzy group with almost the same identity as the region is employed. Additionally, 3 fuzzy sets for the endogenous variable and 3 fuzzy sets were created for the three different input parameters that were detected.The Semantic Universe of Discourse is summarized in the following tables.
A service provider's data and expert knowledge are used to create the fuzzy rules. The network is the master in this example, and the participation plots below explain how the rules are implemented in creating the various membership plots.

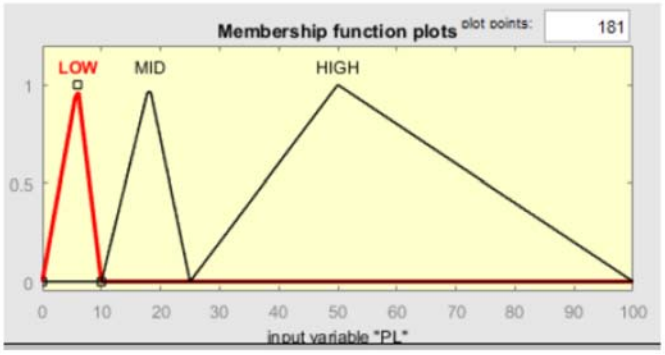

Fig 7(a) Packet Loss(PL)

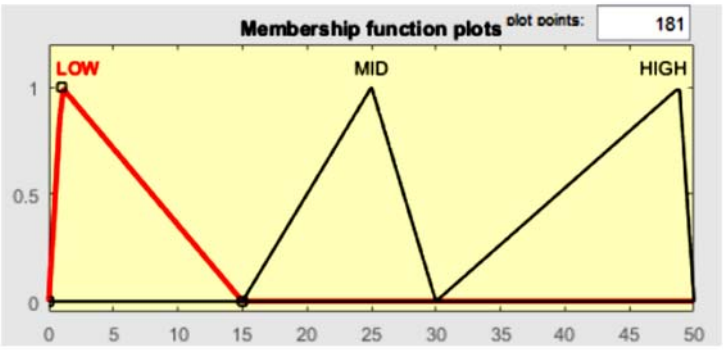

Fig 7(b) Jitter (JI)

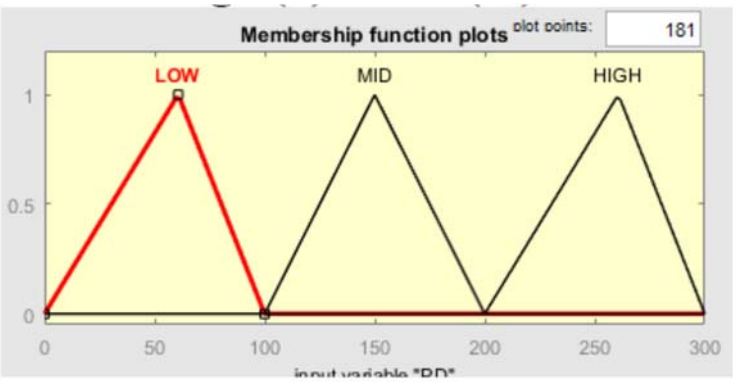

Fig 7(c) Packet Delay(PD)

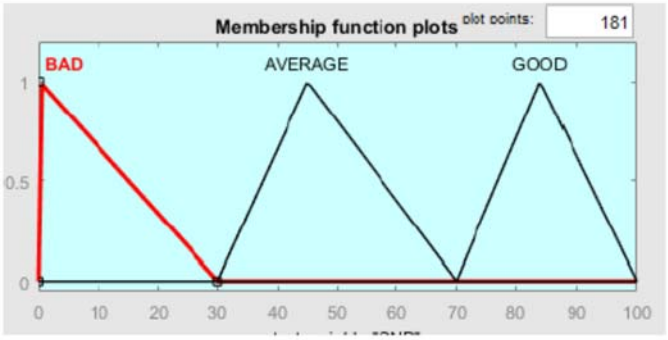

Fig 7(d) Optimized Network Performance(ONP)

Fig.7a, 7b, 7c, and 7d shows Inputs and output triangular MF plots for i) Packet Loss (PL), (ii) jitter (JI), iii) Packet Delay (PL) and (iv) Optimized Network Performance (ONP).

3.8 Defuzzification

The defuzzification operation is the inverse of the fuzzification process. Turning a fuzzy collection of data into a crisp number is the defuzzification process. Maximum, centre of gravity, and the middle of maxima are the most often utilized defuzzification algorithms. In this study, the discrete centre of gravity, also known as the Centroid of Area Defuzzification technique, is used. In order to determine the FIS result, every rules are valued according to its normalized weighting factor, and all rule results are combined.

The Crisp output

$$z = \sum_i^{27} Y'_K Z_K = \frac{\sum_i^{27} Y_K Z_K}{\sum_i^{27} Y_K}, \qquad (4.8)$$

Where Y'_K is a discrete universe, and $\sum_i^{27} Y_K Z_K$ is its membership value.

4. RESULTS AND DISCUSSIONS

This study employed a fuzzy logic system that includes a rule viewer for adjusting various input parameters and determining how the output would change depending on different instigations.We utilize the MATLAB Fuzzy Logic toolbox functionalities to run the simulation, including the user interface and fuzzy inference, to aid the trial choice for the optimal network efficiency. Figure 12 depicts a Surface Plot for Packet Delay vs Packet Loss. Table 3 shows the inputs needed to analyze Triangular MF:

Conditions	Inputs			Outputs	ONP
	PL (%) (0-100)	JI (ms) (0-50)	PD (ms) (0-300)	TRI MF	
1.	50	25	150	10.33333	BAD
2.	25	40	300	50	AVERAGE
3.	30	23	50	49.52934	AVERAGE
4.	17	35	60	50	AVERAGE
5.	29	50	150	50	AVERAGE
6.	45	17	250	84.72055	GOOD
7.	10	19	280	50	AVERAGE
8.	7	18	97	84.94276	GOOD
9.	100	50	300	50	AVERAGE
10.	78	10	4	49.80792	AVERAGE
11.	60	25	200	50	AVERAGE
12.	4	50	45	50	AVERAGE
13.	80	12	140	49.50063	AVERAGE
14.	45	25	45	84.70212	GOOD
15.	70	23	12	84.77512	GOOD
16.	100	56	45	50	AVERAGE
17.	34	4	56	49.19221	AVERAGE
18.	12	12	78	84.88135	GOOD
19.	29	23	90	49.64233	AVERAGE
20.	67	45	130	11.4192	BAD

Table 3: Tested Inputs (Simulated Data)

The modeled input data for network performance are shown in Figure 13. When the time it takes to transport packets to their destination is long and all other input parameters are median or low, the network performance is poor; nevertheless, when the delay is short, it is easy to achieve ideal network performance. These three factors are the ones that obstruct network performance the most during congestion, and they're crucial when it comes to maximizing network performance for QoS provisioning.

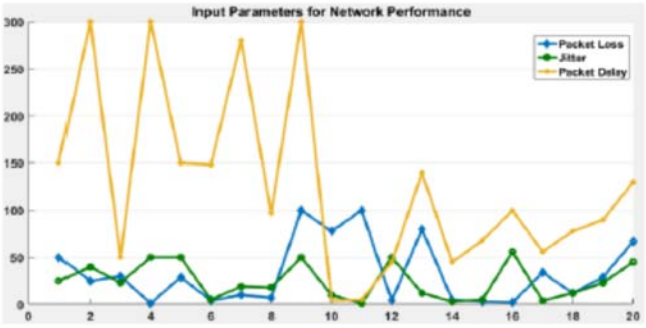

Fig. 13 Network Performance Inputs

Figure 14 also shows the result of the simulated network quality, which includes packet loss, flutter, and lag. These three characteristics are used to improve the network's efficiency over the present system, which employs a queue mechanism to accept packets to the destination depending on queue length.

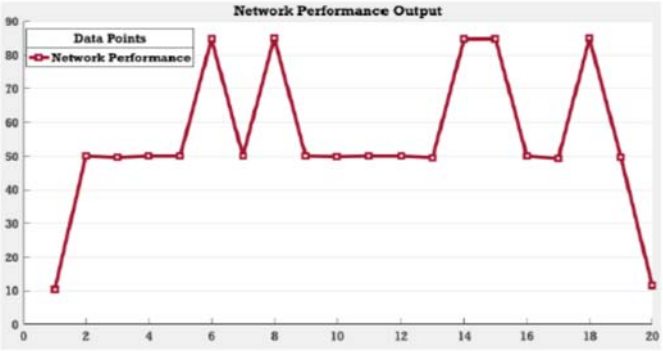

Fig. 14: Network Performance Output

In an analysis of the existing system, which employs a queuing algorithm, some flaws are revealed, including the inability to achieve effective bandwidth utilization and the ability to drop packets for as long as possible due to the queue size, both of which hinder network performance and can result in poor quality service delivery as well as poor performance for network services. Moreover, the current system demonstrates that the AQM algorithm is incapable of dealing with specific packet delivery risks.

While adopting an Interval Type 1 Fuzzy Logic model, the suggested system outperformed the AQM algorithm in terms of overall performance. A further benefit of the Interval type 1 model is that it allows for a decrease of uncertainty in network performance optimization, which results in an improvement in the efficiency and quality of service provisioning of Wireless Networks.

Nowadays, one of the most important criteria in today's fast-paced world of information technology is the desire for better and higher-quality service in wireless networks. In today's society, information has risen to the top of the list of most traded items. The everyday information required by modern organizations, schools, governments, and even people must be accessible in real time. In order to efficiently access this information, there is a need for high-quality service delivery, which will in turn improve network performance....

In contrast to wired network access systems, wireless network access systems have more complex difficulties with regard to the supply of quality of service (QoS). A number of factors contribute to this, including the high BER, low throughput, user conflict and frequent movement, radio interpretation, and other types of traffic characteristics that affect wireless connectivity networks. A number of data delivery problems have emerged as a consequence of wireless access worries, including slow peripheral connectivity, transmission mistakes, dropout and wasteful

reprocessing, traffic congestion and out-of-order packet data transfer, delay and instability. In order to offer optimization strategies that increase customer service satisfaction while simultaneously boosting income for network service providers, an intelligent strategy is essential.

5. CONCLUSION AND FUTURE SCOPE

Essentially, the creation of an Optimal Networks Performance (ONP) was studied in order to fulfil the need for Quality of service (QoS) provisioning and high network performance, among other things. The paper investigates the issue of existing loopholes, which may have the potential to alter the supply of the needed seamless connectivity. The work therefore describes a typical WLAN deployment configuration by identifying necessary network parts and offering the comparable accessible service providers in the form of a network diagram. Once again, a Computational Intelligence technique was used in conjunction with a Type 1 Fuzzy Logic system, and the resulting operational field data was exposed to a simulation process. Using the sample network conditions, the results reveal that efficient congestion mitigation may be achieved. The outcomes of the research add to the body of knowledge on efficient network performance. As a result, the assessment performed using Triangular Membership Functions was successful (TMF). Within a specified service region, show improved WLAN performance via the use of QOS provisioning techniques.

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Schemes for Secure Key Agreement and Authentication in Wireless Body Area Networks

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Abstract.
In recent years, technological breakthroughs in wireless communication as well as systems engineering, electronic components, fitness bands, and nano-materials have resulted in the development of a new approach in Internet of Things (IoT)-based system that focuses known as Wireless Body Area Networks (WBANs). Wireless Body Area Network (WBAN) is a fascinating sector that, if used in the procedure of health records surveillance, has the potential to enhance the overall standard of living. Nevertheless, the portability and public source provided by wireless connections have led to a series of security flaws, which might also end in the compromising of sensitive wellness data concerns. Consequently, there was a requirement for the development of a method to respect and protect wellness information from all types of security breaches. In recent years, a trust management system has been presented, which is predicated on the premise that perhaps the foundation node is trustworthy. Despite this, it does not appear to be practicable in practice. The authors therefore present a minimal encryption method that is composed of three layers of security and provides anonymized key exchange protocol and verification for information sent via a wireless network. When tested against different known computer hackers, including the ground station penetration assault and sensor networks account hijacking; the authenticated key agreement technique demonstrates its effectiveness in protecting against them. The system was officially confirmed using BAN logic and unofficially modeled to use the Automatic Verification of Internet Safety Protocols and Apps (AVISPA) tool, both of which were used to verify the system. The suggested secret negotiation and system is to ensure was further evaluated in light of the findings of other comparable studies, which were also considered. The simulation outcomes and detection techniques show that the suggested enhanced scheme has addressed the many shortcomings that have been found in terms of memory needs, computing expenses, and verbal exchange costs, among other things.

Keywords. Patients' medical surveillance; verification; WBAN; connectivity; cyber threats.

1. INTRODUCTION

Because of advancements in circuits and gear arrangement, the length of biomaterials has been decreased to the point that they can now be worn on clothes or the organism, or perhaps even inserted within the body, without compromising performance. Wearable health devices are expected to see a significant increase in their use worldwide as a result of continued expansion in the planet's population, trying to improve average lifespan, rising chronic illnesses, expanding use of bio-sensors throughout sporting events, and increasing prevalence of medical equipment in physical training [1] [26]. With the digital revolution, particularly the sensing connection, the possibility of health monitoring has been made feasible, allowing for an improvement in the standard of living. With the assistance of this omnipresent equipment, the health of the individuals can now be tracked in real time, something that has never been possible before. As a result of the WBANs, individuals have more freedom to go about their everyday lives while knowing that their healthcare is being adequately looked after by a highly trained medical professional.

Because of its promising future in a wide variety of uses, WSN is attracting increasing attention from both academic and commercial. In its most basic form, WSNs are intended to distribute a group of wearable sensors across an isolated region, gather and communicate environmental information to a base or distant location, and then to gather and communicate further environmental information. The raw information is then analyzed online or in person in accordance with the technical specifications before being sent to a distant server for a full evaluation [2] [19] [25]. When a sufferer is outside of the hospital, patients to access may be very valuable to physicians. Wearable medical sensor networks (WMSNs) are at the heart of this concept, and their deployment is critical to realizing the full promise of this innovation. Wireless Medical Sensor Networks (WMSN) in application areas have made significant contributions to the advancement of the healthcare business in the twenty-first century [3][4] [23] [24]. Wireless sensor networks (WSNs) in multiple health sectors are expanding at an extraordinary speed in both advanced and emerging nations in order to deliver a high level of treatment to patients. The devices then collect biomedical signals from the individuals, including such cardiac rates, beats, warmth, and so on, via the use of wireless technology. Healthcare personnel may access global surveillance in real time using portable devices, which they can carry with them. In this regard, wireless sensing technology may provide important instruments for the surveillance of the wellbeing of the individual and the medical management on a continuing basis. As a result, ongoing study into wireless sensor networks is an attractive and rapidly expanding field of medicine. There are several entities that make up the Internet of Medical Things

(IoMT), including treatment centres, state hospitals, hospital instruments, and consumers of e-health. In a Wireless Body Area Network (WBAN), clusters and cores of sensor systems that operate in, on or around a person and serve a variety of health and non-medical purposes are connected [4] [20]. As a result, in an old-world scenario, the development of universal care would include constant health monitoring and the least amount of effective interaction among client and therapist. Users and the gateway both typically have a large amount of storage and processing capacity, but sensors may vary over time. A sensor is equipped with restricted resources, such as a small amount of memory and a small amount of battery power. Because of this, it is vital to make efficient use of the sensors. When someone illegally obtains patient information, the patient's right to privacy is violated. If a patient's data is compromised, medical practitioners may make an inaccurate diagnosis, which might have life-threatening repercussions. A encrypted communication infrastructure is consequently required in order for business to thrive. Unpatched vulnerabilities such as weak cryptographic techniques [5] have been investigated, and these include verification, data transmission verification, inactive credential sensing, key impersonating, as well as attacker capabilities, among others. As distributed systems become more widely deployed, multi-server settings will become more safe and resilient in their provision of communication networks [6].

In order to monitor physical aspects such as vital signs, hypertension (BP), warmth, Electrocardiography (ECG), as well as other parameters, portable or implanted equipment are placed to the body of the patient and communicate with one another using wireless technology [22]. As a result, WBAN offers a comprehensive evaluation system for individuals that are both convenient and effective. The usual design for WBAN is shown in Fig. 1, which consists of collecting information from sensors and delivering it to a patient database over communication networks, where a specialist doctor may readily see patient data in order to evaluate and treat as needed.

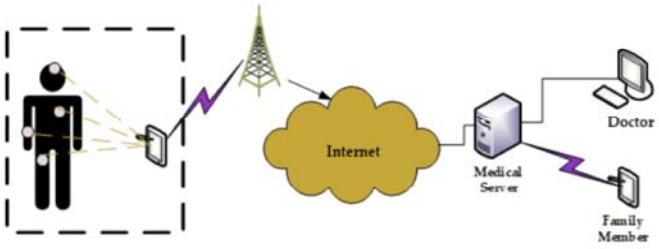

Figure 1: The WBAN's characteristic architectural style.

In the publications, it has been discovered that there are numerous different types of authentication mechanisms available; a report written by Rehman et al. divides the security mechanisms into 4 segments, which are biological, data encryption-based, proximity-based, and communication-based [7]. Other categories, but at the other hand, may be found in the literature [8, 9]. Identifies the central identification techniques rely on the physical characteristics of patients to establish trust [10] [21] [27]. WBAN devices with limited resources may benefit from these strategies to a sufficient degree. However, a significant disadvantage is their susceptibility to denial-of-service (DoS) assaults, and it is hard to assess biomedical parameters that are similar across all devices on different portions of the person's body.

The chances of achieving the desired verification systems offer reliable verification when used in conjunction with a key establishment, but they need additional storage and are computationally demanding. Nevertheless, as compared to typical asymmetric methods, Elliptic Curve Cryptography (ECC)-based techniques spend less computational power, while featherweight systems spend far less computational power when linked to ECC-based techniques.

The most significant aspect of this research is to close the security vulnerabilities highlighted by Kompara et al. [11] by altering their method to address the issues that were discovered, which are as follows:-

- On the basis of hashing and XOR algorithms, we have presented an improved key negotiation and best strategy for use in distributed systems. Adding new features to existing encryption techniques, the proposed technique goes beyond the security characteristics provided by the initial condition and incorporates new ones such as defence against Intermediate Node (IN) penetration, data transmission impersonator, and central node mutually acceptable threats on top of the existing encryption techniques.
- We have formalized our system by using BAN reasoning, and that we have informalized it by utilizing one of the most well-known tools specifically developed for this reason, known as AVISPA.
- When related to competitor identification systems, the suggested access control has lower memory and transmission costs, resulting in superior efficiency.

The remainder of the article is arranged as follows: Chapter 2 describes a problem definition, Section 3 portrays a prototype system as well as an implacable enemy prototype, Section 4 gives the proposed technique, Section 5 indicates the typical program's vulnerability scanning, including encryption techniques, authoritative and unofficial assessment, Section 6 portrays the achievement study to compare of our arrangement with result of these findings, Section 7 portrays conversation on our arrangement, and Section 8 contains an inference and recommendations for further research.

2. Related Study

The Internet of Things (IoT) offers tremendous promise in the field of social and healthcare technologies. Some Internet of Things (IoT) information in this report, including such body region monitors, enhanced medical systems, monitoring devices, mobile internet platforms, collection and presentation of medical studies, and so on, are particularly interesting. The method [12] was shown to be subject to damage on the client, destruction of keys offsite, and temporary assault on discussion important information by Shuai et al. in 2019 [13]. The suggested technique makes use of improved elliptical encryption and is safe enough to protect consumers from pattern remembering assaults as well as attacks on lost or damaged contactless payment

verifiers. This framework was established by the author in order to prohibit the transmission of information to outsiders. In order to facilitate communication with computations and settings, the method is accurate, simple, and simple. In order to verify the suggested structure, comprehensive detection accuracy was carried out with the help of the AVISPA tool.

An Elliptic Curve (ECC) based three-factor wireless communication sensor identification technique was created by Li et al. (2019) [14], which used error checking algorithm and fluency engagement strategies to handle biometric information and secrecy moving forward. Besides using the flexible checkers and nectar list approaches to tackle the issue of regional credential lookup, while fighting assaults on portable devices, the mushy inspector and nectar listing approaches were also used. Even though Li et al. employed the fuzzy checker approach and asserted that their remote medical monitoring internet layer [14] fulfilled various safety requirements, we discovered that it was not able to survive repeated replay assaults.

In 2019, Shuai et al. [13] developed a three-factor authentication process that is both inexpensive and efficient for controller of On-Body Wireless Networks (OBWN) clients, which they deployed in 2019. The suggested approach makes use of a special hashing chained system in order to ensure prospective users' privacy, as well as a fictitious identification is provided to prevent synchronization attacks from being launched. The suggested framework uses a pseudonym identification strategy to ensure user anonymity while also providing the possibility of secrecy via the use of an one-time hashing chain mechanism. The researchers [15] have demonstrated that their technique [13] still suffers from three security flaws: download vocabulary depreciation assaults, empowered cyberattacks, and password recovery problems.

It is necessary for significant quality to have enough of capacity, dependable and functional network technologies and power processes as well as high-quality service support (QoS). Inter environments are used by caregivers to guarantee that smooth solutions are supplied to finish. Health clinical devices sense a large amount of data that must be transferred through servers, which is difficult in a single component. By enabling a multi-server system, hospitals healthcare devices can create a large amount of data that must be communicated via servers. Because the information being transferred is sensitive, it is crucial to evaluate safe online interaction while ensuring data security. The opponent may attempt to disrupt the delivery and either discard or change the narrative as a result of this. In order to safeguard the information, several studies have introduced security mechanism; however these schemes are subject to certain assaults among other things. In such a successful transformation in a dispersed client, nevertheless, the lack of an identification technique that allows multi-server privacy is still a concern. According to article [16], an authenticating users technique for a multi-server context is developed, which makes use of wearable medical sensing devices (Cross-SN). The technique is accomplished via the use of a smart card, a password, and unique user identification. The suggested technique makes use of cryptographic algorithms, as well as Burrows–Abadi–Needham (BAN) logic, to guarantee authentication mechanism and assess the stability of the model. It provides appropriate security against responses, impersonator, and powerful malicious activities, as well as encrypted connection in multi-server entities that connect with one another. It is free to use.

3. METHODOLOGY

Authentication mechanism formation is performed in a minimal manner using the signature scheme proposed by Komapara et al. [1]. Figure 2 depicts a three-tiered network model of their design, which is representative of their approach. In their architecture, layer 1 featured a sensor node designated by the letter N, which acquired data but was limited in terms of resources. The Intermediary Node (IN) is often a smartphone, which is referred to as tier 2. Information from sensor network (N) is received at this tier and sent to layer 3, which is the Hubs network (HN). In many cases, helicopter nurseries (HNs) are large medical servers with a lot of resources, and their job is to provide secure and convenient universal health care services to the community.

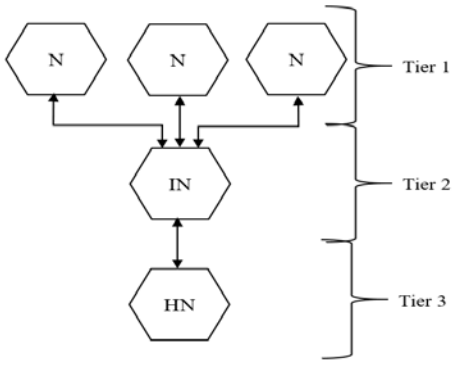

Figure 2:Modeling of the Kompara et al. system using networks

This technique is divided into three parts: startup, enrollment, and verification. Initializing is the first step. Setting and registrations are carried out by the job System Administrator (SA) under the premise that now the route is protected, whereas the verification stage is carried out from the role Head of Network (HN) under the premise that now the route is accessible. The researchers have made the assumption that the encrypted channel is accessible for SA in order to communicate information among N and UN. When it comes to the authentication step, though, this presumption is not made, and as a result, the attacker may be able to participate. A mutual key is used to create a secure interface between N and HN, and it is the duty of HN to expedite the transaction of verification and consensus on a similar key.

a. ANALYSIS OF KOMPARA'S SCHEME

Following a thorough examination of Kompara et al. [11]'s system, the following three forms of assaults were identified as being under research in their model:

Using the example of Figure 2, the job of IN in the aforementioned strategy is to convey all response message to HN while also saving tuple. It should also be noted which neither IN nor IN itself is validated by HN, despite the fact that both are used to verify N. As a result, it may become a weakness that can be exploited to launch an IN takeover attempt. As collaboration is the primary function of IN, giving up IN would result not just in disrupting the entire teamwork but also making it possible for an opponent to retrieve individuality in order to commence some other consecutive target in order to make concessions the network device as a result of the negotiated settlement of IN. When IN is either a wristwatch or a smartphone, the likelihood of it being stolen is great. As a result, the likelihood of IN remaining uninsured is extremely small in these kind of situations.

It has been pointed out by the creators of the previously described system that if IN is penetrated, which is a possibility, the variables id_N and x_N may be divulged, resulting in sensor node spoofing attacks, as previously indicated. After successfully seizing the node and collecting the correct parameters as previously indicated, an attacker may become a member of the verification phase by impersonating the node using HN.

Therefore, the technique is predicated only on the assumption that HN is safe, that is untenable in a pragmatic way due to the possibility that HN will be compromised if the method is used. Despite the fact that it is nearly impossible for any opponent to generate a valid integer (β,η,μ), this will only be possible if the opponent has access to the central controller (which is not the case) (HN). As a result, penetrating the HN could disclose all of the knowledge, including the combination lock, which is symbolised by the letter k_{HN} on the computer.

In this section, we will explain the network approach and the competitor model of our suggested method.

b. NETWORK MODEL

In our approach, we had preserved the three-level network topology presented in [11], although the connection among N and IN is somewhat distinct from the connection among N and HN. Because it does not save any information about the connection between N and HN, the IN operates as a relaying node, giving it less influence over the interaction between the different networks. A N-IN communication is done when information through one or even more Ns is now to be transmitted to a destination other than HN. Consequently, the IN plays a supporting function in the overall communication by collecting information from sensors and relaying it to the HN. Figure 3 depicts a network model of the Internet.

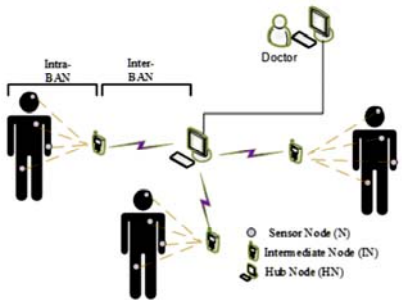

Figure 3: Our technique is based on a network concept.

c. RIVAL MODEL

We made the assumption that an enemy could carry out the following:

- The HN is regarded as reliable, as well as an attacker might not have been able to recover the key code k_{HN} if the HN is compromised.
- The attacker may be able to decrypt the proper communication route and fraudulently introduce data, as well as change or replay previously sent material;
- An intruder may get access to the encrypted keys by corrupting the N, with the goal of interfering with reciprocal established connection. Furthermore, because of financial constraints, N also isn't actually safeguarded.
- When we exercise a well based on the dynamics for our technique, we presume that individuals conversing are using insecure communication routes.

4. SECURITY ANALYSIS OF SUGGESTED METHODS

This chapter consists of three sections. First, we will describe the security mechanisms that the suggested scheme provides in order to protect against additional internet. After that, we discuss casual testing of the present scheme that use the AVISPA tools as well as, finally, we discuss comprehensive security validation of the suggested method utilizing BAN logic.

A. SECURITY FEATURES

It is in this section that we describe the robustness of our system against the assaults indicated above, in addition to the assaults described below:

Replay attack is the most straightforward kind of assault, and our technique is secured against it by introducing a timing t_N at the beginning of the verification step. The date is inserted in such a manner that it could be changed by the attacker. If a communication is repeated after just a period of time, the alteration will be obvious, as well as the communication will indeed be refused as such. It is also necessary to use a randomized nonce r_N when repeating the information since the nonce varies with each request. As a result, it is not feasible to launch a replay assault.

1) SENSOR NODE IMPERSONATION ATTACK

The suggested approach offers security against such a sort of attack since the opponent has no means of knowing the descriptive values of $Z_N;x_N$ that are necessary to build a valid tuple that can be used to progress more with the verification process after the first authentication step.

2) TRACKING AND ANONYMITY ATTACK

Due to the fact that now the network IN is just operating as a relaying that passes communications without saving data, a monitoring assault is not feasible due to the fact that no data can be generated via IN. A consistent thing is used for the calculation of tid_N, that's just transient and would be modified within every transaction for node N to UN. This means that this variable was picked at randomness and could be predicted by an opponent. As a result, our strategy is resistant to these threats.

3) BASE STATION CAPTURE ATTACK

The opponent might acquire the HN by using the HN hijacked information assault and in this scenario; the opponent would also be able to grab the universal key K_{UN} in our system. Other crucial factors, such as $x_N^+, \beta, \eta, \mu, k_s$, cannot be constructed since the universal key K_{UN} has been modified by the Xor operation, which has added a new random vector e_N. As a result, the opponent has no means of knowing since information is not made publicly available. As a result, our strategy is likewise resistant to this assault.

4) FORWARD/BACKWARD SECRECY

It is impossible for a malicious opponent to infer the former key pair and the following authentication protocol if he forges key exchange k_S. This is due to the fact that k_S is generated using variables and x_N^+, which are in turn dependent on the hashing algorithm and a complete new randomized value, respectively. Furthermore, having k_S does not provide information on both of these characteristics. As a result, this strategy is effective against this assault.

B. INFORMAL PROOF USING AVISPA

AVISPA is a tool that evaluates the security of our system and we give it here as an example of casual validation using this instrument. AVISPA's High-Level Protocol Specification Language (HLPSL) has been used to design the standard, which was then tested in the field. HLPSL style is converted into Intermediate Format (IF), that is then processed by back end inspection methods such as On the-Fly Model Check (OFMC) and Constraint Logic-based Attack Searcher (CLAS) (CL-AtSe). Such approaches provide evidence about whether a strategy is secure or otherwise, and if it can withstand proactive and reactive assaults.

Several HLPSL roles, including the administrator (SA), sensornode, and hub node, are used to perform the startup, enrollment, and verification processes. By utilizing the ecosystem role, it is possible to describe invader information, worldwide limits, and the scheduling with one or even more encounters. The following are brief explanations of the various roles:

1) ROLE SYSADMIN

The SA is aware of most other agencies, the key generation, hidden keys such as KUN and KN, as well as the identification of N, which is the IDN. The startup and certification steps of our identification strategy are carried out by this role. In this example, the elements XN, AN, and ZN are defined as memory locations, as well as the contents of these factors are determined to use the Hash function. These data are subsequently sent to N using a secure channel.

2) ROLE SENSORNODE

This job is responsible for carrying out the duties carried out by N during the verification stage of our system. Sensornode (N in our system) is analogous to the administrator job in that it is aware of all clients, the asymmetric key, have sent routes, instance variables, hashing algorithms, and protocol IDs. On the communication page, it gets the signal supplied by SA through the security gateway and executes the operations defined in the suggested verification stage, after which it lets people know back. Not to note that it is among the most significant positions that is directly involved inside the verification process that deserves to be mentioned here.

3) ROLE HUBNODE

It is yet another crucial function that the United Nations plays, and it takes an active position in the verification process. It is identical to its previous roles in that it understands all clients, the symmetrical key, its private keys, instance variables, hashing algorithms, protocols IDs, and the send/receive channels, among other things. It received a response from N and decrypt the data it with the help of a symmetric cryptography he created. It uses the public channel to carry out the remainder of the functions that were described during the authentication step. The secret key is then calculated at the conclusion of the programme.

4) ROLE SESSION

All of the agencies and roles that were discussed before are invoked in this HLPSL code. Aside from that, basic fixed elements are identified, and the have just sent routes for SA, N, and HN are denoted as SSAch, RSAch, SNch, RNch, SHNH, and RHNch, accordingly, in the following tables.

5. RESULTS AND DISCUSSIONS

Here we examine the energy usage, storage, computing, and transmission losses of our strategy in order to assess its effectiveness. The fact that we make this comparability with a state-of-the-art verification system possible since they are connected to one another and many of them are an improvement over previous work, as mentioned in Section I, is worth emphasizing here. As a result of this analysis, the effectiveness of the suggested authentication technique is also highlighted. The security characteristics comparison in Table 1 further demonstrates that our system meets all of the security criteria on which we place particular emphasis.

	[17]	[18]	Ours
Z1	Y	N	Y
Z2	Y	Y	Y
Z3	Y	Y	Y
Z4	N	Y	Y

Z5	Y	Y	Y
Z6	N	Y	Y
Z7	Y	Y	Y
Z8	Y	Y	Y
Z1: IN compromise attack, Z2: Replay attack, Z3: Sensor node impersonation attack, Z4: Hub node spoofing attack, Z5: Tracking and anonymity attack, Z6: Base-station capture attack, Z7: Forward/backward secrecy attack, Z8: Man-in-the-middle attack			

Table 1: Comparing safeguards to peer research is a good idea.

According to our design, the N contains the tuple (id_N;x_N; a_N; Z_N) as well as the key exchange k_S. Because IN is our scenario doesn't really retain anything value, but rather merely serves as a relay node, there is no need for any memory. The UN holds variables such as K_{UN};id_N;K_N as well as the key agreement k_S, which are each 160 bits in length. Kompara et alapproach's saved four values on HN that were connected to N, but only three variables are kept on the UN in our scheme. As a result, our method requires less storage space in this aspect. We will assume that N contains parameters with $|id_N|=|x_N|=|a_N|=|Z_N|=|K_{UN}|=160$ bits every, as shown in the table. On the next page, you will find a review of the installation costs amongst peer systems.

	N	IN	UN(HN)
[17]	800b	0b	160b
[18]	640b	640b	(320+160n)b
Ours	800b	0b	(480n+160)b
n: No. of sensor nodes, m: No. of the intermediate node, b: bus			

Table 2: Storage costs are compared to the cost of peer work.

As shown in our diagram, the sensor node (N) delivers the tuple (tid_N, a_N, b_N,t_N) to the intermediate nodes (HN) via IN, which just relays the information to the receiver without changing something to it. Assuming that $|t_N|$ is equal to 32 bits, the connection cost N ∏UN is 3(160) + 32 = 512 bits, and the transmission cost UN∏Nis 3(160) = 480 bits. Table 4 displays a comparison of our strategy with that of our competitors.

Peers	N ∏ IN	IN ∏HN	HN ∏ IN	IN ∏ N
[17]	672	672	640	640
[18]	672	1344	960	480
Ours	512	512	480	480

Table 3: When compared to peer work, the communication overhead is lower.

The variables t_{xor} and t_h should be used to reflect the long it takes to perform one XOR algorithms and one Hashing. As part of the authentication step, N conducts six XOR actions and three hashing algorithms, totaling nine in our approach. Assuming that the XOR action requires little computing, the actual calculation is that of the hashing algorithm; as a result, it is denoted as $3t_h+6t_{xor}\approx3t_h$in the representation. In a complete scheme, a total of 10 XOR actions and 6 cryptographic algorithms are done, which is denoted by the notation $6t_h+ 10t_{xor}\approx6t_h$.

Because our hashing is almost equal to Komapara's approach (apart from a little increase in the hashing), the computational cost and power efficiency are identical to those of Komapara's method. A 32-bit Cortex-M3 microprocessor operating at 72 Megahertz, that was also used by Kompara et al. and Li et al., requires 0.06 ms, but an XOR controlling operation takes too little time to complete, according to the authors (see Figure 1). This results in a hashing algorithm taking 0.18 milliseconds for N and 0.36 milliseconds for UN to complete. With regard to peers in the field, Table 4 provides a comparative analysis of processing costs and timelines in relation to competitors.

In this part, we make it easier to compare our plan with other schemes by providing a table of comparisons. Because no data is saved on our scheme, the available storage cost is lower than the installation costs of the majority of the plans evaluated in Table 2, with the exception of the system that has a memory usage that is equivalent to our scheme. Additionally, while comparing the costs of transmission, it has been shown that our plan incurs a fairly modest amount of money. When comparing our scheme to other procedures, it is also apparent from Table 4 that our method accrues no additional cost when delivering a

message from IN to UN, and we have reduced the good communication price between IN - HN and conversely, as seen in Figure 4. So it is both economical and inexpensive in this sense, making it an excellent choice. Furthermore, it is worthwhile to emphasize that now the transmission price for our method is the cost of sending information between N to UN (in our example) and conversely.

Additionally, the computational overhead and calculation time for our system, as given in Table 4, have been determined by comparison to those of other methods. It is also clear that our method incurs a tiny increase in processing cost and time when compared to Kompara et al. [11], but we consider this to be a small price to pay for an improved and efficient approach. The United Nations is a generally formidable organization that can readily handle this task. Furthermore, Table 6 displays the specifics of our program's energy usage and compares it to those of others.

Peers	N (mJ)	HN (mJ)
[17]	0.021	0.036
[18]	0.036	0.048
Ours	0.021	0.043

Table 4: Examining the energy use in relation to peer work

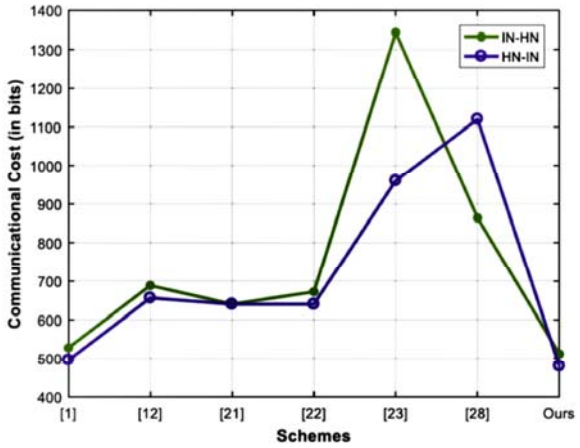

Figure 4: The expense of information in relation to peers.

In this study, we offer a novel anonymized, minimalist approach that is both simple and effective. We conducted an analysis of the Kompara et al. [11] system and identified a few security weaknesses in it. The first weakness is an IN compromises attempt, which is created by storing the identity id'_{IN} of IN throughout the established connection, which remains intact throughout the process. The adversary may estimate the identity of the victim and use that information to start the penetration assault. By not storing anything on IN and using it just as a reporting node, we are able to defend ourselves from this kind of assault. The second issue is data transmission impersonating, which is a result of the first assault and is a repercussion of it. The progressive and irreversible hash function was used to safeguard another secret integer, which has the identification id_N and is safeguarded by the progressive and irreversible hash function. The approach presented by Kompara et al. is reliant on the assumptions that HN is trustworthy and that the private key k_{HN} cannot be disclosed even if HN is leaked (as has been shown). Given that this assumption appears to be impractical in practice, they had provided a fix in our approach by updating the primary key to reflect this fact. This leads to a different password manager that is inaccessible to the adversary, unless the adversary gains access to the key management system via some other means (HN). Furthermore, we have maintained our emphasis on making our scheme as light as possible. As shown in Fig.13, the language and communication price of our system is much lesser than the price of the peers' plan. Because HN (in our case, UN) is often used as a service and has more demanding capabilities than N, which would be a resource constraint, we have kept the bulk of the operational weight on it. This has resulted in lower processing resource consumption for N than the similar values for HN, as seen in Figure 5.

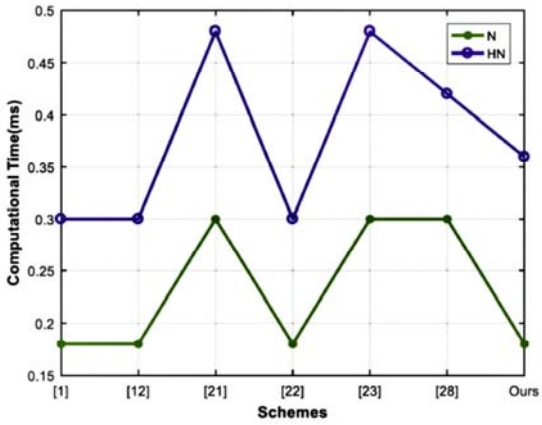

Figure 5: The cost of computing in contrast to other competitors.

6. Conclusion and Future Scope

Our major focus has been on reviewing the recently provided method by Kompara et al., as well as highlighting a few weaknesses such as data transmission deception, IN breach assault, and military radar takeover assault are all possibilities. We presented a technique to address these issues while maintaining the secrecy and inexpensive security mechanisms that was previously used. Furthermore, we have shown reciprocal authentication scheme negotiation of our system utilizing BAN reasoning, and we've also presented an unofficial assessment using the AVISPA program, which demonstrated that perhaps the new system is resistant to very well threats and may be used in a production environment. Also included is a calculation of the actual quality of our system in terms of data collection and transmission, processing, and power consumption. Lastly, we conducted a comparison of our approach with some of the most current relevant research. As a consequence of the simulated data and security assessments, it has been shown that the suggested digital certificates are not only resistant to a variety of common threats, but they are also economical and ultralight in storage capacity, connection, compute expenses, and duration.
A possible future step would be to combine this better authentication technique with physical measurements in order to reap the advantages of both technologies.

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Productive Energy Consumption for Cluster Selection in WSN using Modified LEACH-Based Routing Scheme

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Abstract.
Wireless Sensor Networks assist in maintaining reports regarding of different forms of natural variables such as temperature, dampness, and so forth, and then to transfer those circumstances in the form of voltage transmission to a central location. The Little Energy Adaptive Clustering Hierarchy has a difficulty with the number of groups that it can produce while using limited power. The presence of numerous of groups in every round causes disruption to the WSN structure. New LEACH is presented in this study in order to provide a longer lifespan and more efficient energy on the design of wireless sensor networks. In New LEACH, the Ground Station is in charge of selecting the centroids, and it takes into consideration the additional power of every group. This may ensure a set clustering algorithm are produced on each cycle, which can be guaranteed. Furthermore, this functionality even has the potential to lessen the strain on power consumption of every unit, resulting in a lifespan system that is superior than LEACH. Furthermore, the distribution network is more flatly connected to the feature assessment than the previous irregular topology on LEACH, which is a significant improvement. The Enhanced LEACH method for Cluster Head (CH) identification is the primary subject of this paper. Compared to the previous LEACH scenario, the new LEACH computation has much superior efficiency based on the Quality of Service (QoS) metrics of active unit, longevity, power usage (throughput), and effective power.

Keywords. Wireless Sensor Networks; LEACH; Quality of Service (QoS); Cluster selection; efficient energy

1. INTRODUCTION

A wireless sensor network (WSN) is made up of a collection of little, inconspicuous detectors. A sensor is composed of many components, including a central processor, a power component, and components for wireless transmission. Sensor devices are in responsible for supervising the surroundings, recording the physical status of objects, and transmitting gathered information to ground stations [1, 2, 3, 4, 5, 6]. The domain of danger and natural catastrophe identification is where WSN activation is taking place. Among some other issues, it is used to aid in the detection of disasters, quakes, storms, and collapses, among some other factors. One kind of application is the early identification of disasters, wherein sensor networks may be constructed and linked to specific equipment that really can monitor displacements, which signals the presence of seismic events. So that it can broadcast data to the community as rapidly as possible and also that managing damages ground shaking and injuries may be minimized to the greatest extent feasible [2].

Efficiencies in the sensor node (SN) have been studied in the context of a connection that becomes unreliable once the first sensor node (SN) fails [3]. Keep in mind that SN had minimum space, a short lifetime, and computational restrictions. As a result, a major difficulty emerges, such as how to control power usage and memory at units which have low capabilities but superior efficiency. Despite the fact that the WSN software has expanded the capacity just on detector in order to assure long - lasting battery, the device still need a connection that spends energy more effectively.

Integrating energy consumption into computerized broadband network is one straightforward approach to comprehend connectivity in computerized system architecture. Nodes in the WSN have limitations such as short battery life, which necessitates the changing of batteries on a frequent basis, contributing to economic growth and complication. Modifications to the battery may regulate the functioning of the WSN node, however the capacity, expense, and mass of the battery will all rise dramatically as a consequence. Techniques for increasing the battery life of sensor nodes (SN) that are energy efficient have been extensively researched.

The duration of SN, on the other hand, is strictly restricted. Despite the fact that this approach extends the program life and reduces the amount of time required to replace the WSN batteries, the connection still needs additional power. Other factors to take into account at WSN include growth requirements, high availability, environmental situation, and so on. This would be used to cross reference different WSN techniques or protocol implementations. Despite the fact that hygrometers are very significant in a variety of facets of our everyday routines, SN's shortage of power sources is a fundamental limitation that causes the process to be slowed.

The navigation arrangement is dependent on its most common constellation at the present in the WSN, which would be the Low-Energy Adaptive Clustering Hierarchy (LEACH). This really is due to the fact that LEACH has been shown to be an energy-efficient networking technology. This routing method is quite efficient when it comes to transmitting data to the Base Station (BS) [4]. This protocol may be used to gather data and transfer it to BS via one or more-unit clusters, depending on the situation.

There seem to be numerous varieties of LEACH which have been updated by running groupings of units to enhance energy consumption, and these variations are listed below. [5] presented a rise in strength LEACH-C, which stands for Low Energy Adaptive Clustering Hierarchy-Central Construction, as a result of the study conducted (LEACH-CC). This approach, which converts the distance of units into cluster formation, may be used to optimize the dispersion of system power allocation. When contrasted to its comparison, the findings reveal that LEACH-CC may increase the longevity of a system significantly.

Analytical and numerical studies are used to monitor the effectiveness of the assessment process and structure presented. A network that lasts a lifetime, organized in an adaptable and power manner. This method is being used to maintain energy equilibrium and to prolong the life of a connection. Power and maturity level systems are among the testing should be done on the most essential criteria in the world of wireless sensor networks. According to the comparative and assessment of current methods, CH-leach results in a decrease in energy usage during LEACH and DEEC.

Innovative LEACH based routing approaches, which are modeled that use the NS-2 simulation system, are the focus of this study, which also explains them. While choosing the Cluster Head (CH) in the Modern LEACH proposed method, the conversion efficiency of every node is taken into consideration. As a result, avoid introducing reduced connections into CH. Additionally, it seeks to increase the lifetime and boost the effectiveness of sensor nodes. Because of this, a new LEACH pathway predicated on LEACH-based renewable energy was developed to disseminate all network devices that were spread to the standard of and across the Ground Station. After which, by going to compare LEACH as well as New LEACH on Entire life, Power Efficiency, Bandwidth, and information obtained at BS, it was determined which was superior.

2. RELATED STUDY

When it comes to wireless sensor networks, the low-energy adaptive clustering hierarchy (LEACH) is a navigation system that is suggested to effectively control the energy utilization (WSNs). The receive additional in this method [6] are organized into clusters, as well as the group leaders are selected randomly by the sensor devices. Sensor hubs in every group broadcast information automatically to the cluster formation, eliminating the need for any intermediate processing. Cluster heads collect information and relay it to the ground station. Because the network nodes are randomly chosen, the power dissipation is distributed equally across all sensor network in this configuration. Unfortunately, since the spacing here between recently appointed neighboring nodes and core network may not even be appropriate in large size WSNs, this approach results in a disproportionately higher energy usage in these networks. LEACH algorithm with predictable cluster formation based on the required range among all detector cluster members seems to waste fewer power than randomized cluster formation, at least based on intuition. Despite the fact that this strategy extends the lifetime of the WSN, it is operationally expensive when used to huge WSNs. Using the cluster formation metric, we are able to choose the cluster center in our study. We detect a considerable decrease in energy use while using the LEACH protocol, despite the fact that the methodology has less skill required. They also demonstrate that predictable choosing of member nodes depending on the proximity centrality metric outperforms random assortment in terms of the lifespan of WSN. Since their extensive usage in medical services, environment tracing, emergency preparedness, farming, surveillance regions, and flame locating, among other application scenarios, wireless sensor networks (WSNs) have drawn a great deal of interest. It is necessary to enhance the lifespan of WSNs in order to expand their usage in a wider range of applications. Grouping with the ideal cluster head is among the most successful strategies for extending the lifespan of a network's connections (CH). In this paper, the author presents an optimization algorithm (PSO) approach application of fuzzy logic (FL) low-energy adaptive clustering hierarchy (LEACH) approach [7]. Group creation is accomplished via the use of a combination PSO as well as a K-means grouping method. FL is used to choose the principal CH (PCH) and secondary CH (SCH) from a pool of candidates. Comprehensive computations were carried out with the help of a computer simulation in order to verify the effectiveness of the patterns. Also considered were standard techniques including fuzzy c-means (FCM) grouping and FLS-based Systematic sampling to ensure the sustainability of WSNs for atmospheric remote monitoring, the LEACH-Fuzzy grouping procedure, and LEACH depending on the power expenditure equilibrium. The findings revealed that the suggested protocol successfully controls power usage in order to increase wireless communication efficiency while simultaneously maximizing bandwidth. In the simulations, network lifespan was increased by more than 46 percent, and assignment consists was increased by 17.6 percent, according to the findings. Due to the concern that the small sampling of LEACH Reactive Routing cluster heads in a wireless sensor network (WSN) will result in the limited lifespan of hubs and the connectivity, an e-leach method based on power betterment is suggested in paper [8], which maximizes the hierarchical clustering stage by taking into account all power as well as length variables, and exposes the approximate value of node remaining energy, as well as the length among hubs and ground station as parameterization towards the criterion in the cluster head selection stage. An entirely new threshold judgement formula is developed, and also the cluster head network is chosen in accordance with it, such that the network that is closest to the ground station, has the most transmission power and the least regarding power transfer is much more likely to be chosen as the cluster head. The modeling findings demonstrate that the e-leach method may increase the lifespan of a connection and its nodes while also providing enhanced results. The Internet of Things (IoT) is a popular term in advanced technologies, and it is expected to turn actual objects become artificially intelligent things. In order to be successful, the Internet of Things must encourage Gadget diversity, Manageability, Analysis of big data interaction through presence cordless smart sensors, Energy-efficient remedies, Segmentation as well as monitoring skills, Personality skills, Mechanism for dealing and database administration, and Ingrained user privacy retaining processes. Grouping is critical in the Internet of Things design, since it allows for the creation of cooperative, cross, and complex interaction amongst disparate items, which is vital for the Internet of Things. This paper is focused on creating an adequate way of communicating amongst identical gadgets via an agglomerative clustering technique, as well as on how effectively groups may be established in a mobility and adaptive uniform wireless connection [9]. ACHs-LEACH method is an alteration to the widely used wireless

communication routing protocols, LEACH and Modified-LEACH(M-LEACH), which outperformed the original protocols in terms of power consumption, bandwidth, network congestion, packet transmission, and other performance indicators (e.g., packet delivery ratio). Research is concentrated on choosing the Cluster-Head(CH) and Assistant Clustering Heads(ACHs) in order to lower the show's power consumption and hence extend the network's lifespan. They also attempted to integrate the removal of rogue sites, which might also pose a threat to the protection of information, as well as the re-clustering of the whole connection when a mobile node moved into some other group. A novel strategy is proposed in [10], in which the author suggests a new method for improving the lifespan and data transmission time of wireless sensor networks (WSNs) by minimizing the package delay time [11] [12]. In the next section, we compare the simulation performance of the proposed method with those of the basic LEACH protocol with fixed parameters.

3. METHODOLOGY

Creation takes place in stages. The LEACH technique is divided into two major phases, which are the steady-phase and the setup-phase. The setup phase is the period of time during which groups are formed on the network. From the definition of a group head node through the connection of non-CH nodes to every cluster head, everything is automated. Some computations are used to determine the location of the cluster head[13]. After every criterion has been computed, a simple random sample between 0 and 1 is assigned to the node. As a result of the criterion computation, two parameters are produced. When the node that was picked to become the leader of the group in the earlier round would be granted a criterion with a score of 0, the node is considered successful. As soon as an unit has not really been picked as the neighboring nodes in the earlier cycle, the criterion assessment is conducted in accordance with a predetermined formula. Then there will be a rule that applies if the sum of different numbers is within a certain target value. When the number of nodes is fewer than that of the criterion, the cluster head serves as the node for the round. If it is greater than the criterion, the nodes are considered to be the associated component [14] [15]. The implementation stage is the continuous, wherein the high bandwidth process is performed, spanning from moving information in the group to the Ground Station through CH, as seen in Figure 1. Figure 1 depicts the LEACH method procedure during group establishment.

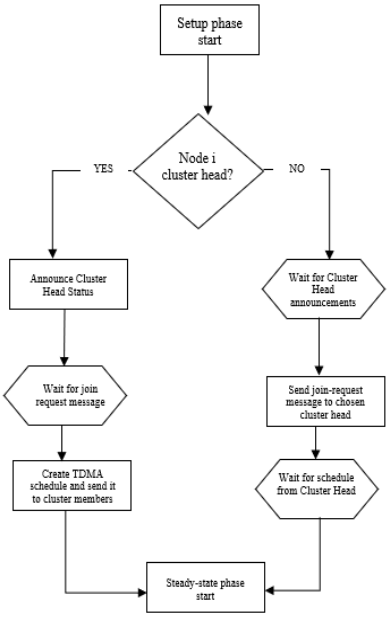

Figure 1: Algorithm for the Setup Phase

The initial stage is the choosing of the sensor nodes. This pick is based on a number of different criteria. It is necessary to identify the required group amount (k) during first phase, where k is an essential input. The very next step is to figure out what the criterion is for another individual node. The criterion (Pi(t)) provided in equation (1) is used to calculate the calculator to determine:

$$P_i(t) = \begin{cases} \dfrac{k}{N - k + (r \bmod \frac{N}{k})} & : C_i(t) = 1 \\ 0 & : C_i(t) = 0 \end{cases} \qquad (1)$$

Inside the cutoff computation in equation (1), there seem to be two types of target value to consider. The formula for the first output value is derived from the condition $C_i(t) = 1$. This feature ensures that now the unit has never been a group leader in the $(r \bmod \frac{N}{k})$ previous session or round. While r denotes the amount of meetings which have been previously conducted, N represents the total number of sites, and k denotes the required clustering results. While $C_i(t) = 0$ is the second/last best approximation inside the formula, $C_i(t) = 1$ is the first output value (1). As a result, every node serves as the cluster head once every N / k rounds.

To choose the cluster head to use the minimum option in equation (1), the group membership or site placed on the system should be aware that perhaps the CH is a site in round or round-robin phase of the algorithm. A warning demand is distinguished from other requests by including the ID of the demand as well as a headers even by site that would be the cluster

head inside the response sent from the unit that would be the cluster head. Each non-CH node identifies its own group by picking the CH that requires the least amount of telecommunication power, which is determined either by transmit power obtained by transmitting letters to all of the CH that are nearest to that site.
As far as the node construction process and CH choice and group members are concerned, they are in stable state (CM). Whenever an unit transmits information from the CM towards the CH, the cluster head determines the amount of information to be delivered to the node based on the slot that has been allocated. Because the length of every high bandwidth session for every site is fixed, the total time related to information communication is determined by the amount of nodes in the network of clusters, which is a constant. It is necessary for the CH to remain operational at all times during the steady phase in order for information from the CM to be saved in the groupings.
Whereas if transport length and information recipient are both included in bundle one, then perhaps the quantity of electricity used to transfer data may be determined using the equation (2):

$$E_{Tx}(l,d) = E_{Tx-elec}(l) + E_{Tx-amp}(l,d) = \begin{cases} lE_{elec} + l_{\epsilon fs}d^2, & d < d_0 \\ lE_{elec} + l_{\epsilon fs}d^4, & d \geq d_0 \end{cases} \quad (2)$$

In addition, the following equation (3) describes the energy allowed to obtain information:

$$E_{Rx}(x) = E_{Rx-elec}(l) = lE_{elec} \quad (3)$$

For the purposes of these equations, E_{elec} in equations (2) and (3) means that the power consumed by communication systems to function loops, so although E_{amp} represents the power consumption by communication systems to enhance data signal so that transmissions arriving just at recipient even now reach the basic significance which restricts the recognition of data transmissions to the listener, which is referred to as distance between transmitter and receiver [14].
NS-2 computations of the LEACH and Modern LEACH procedures with a variety of settings will be discussed in detail in the next section.

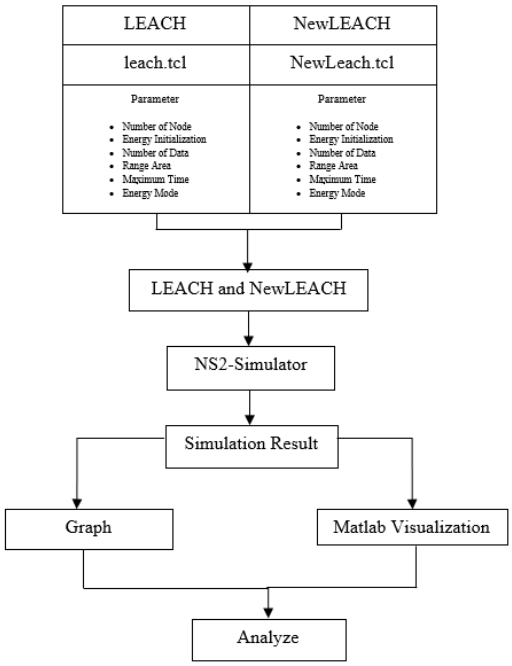

Figure 2: The LEACH and Modern LEACH designs were created utilizing a variety of factors.

a. New LEACH Protocol Algorithm

The Modern LEACH protocol, that we suggest in this research and which improves on the efficiency of the LEACH protocol, is the name of the procedure we offer in this research. The LEACH protocol, which is built on the dispersed group key method, has a range of benefits. However, this procedure doesn't really give an ideal situation for the number and location of sensor nodes. Since the group is adaptable, wherein adaptable refers to the ability to easily modify (oneself) to certain surroundings. As a result, the establishment of grouping that is just not ideal as during initialization stage has little impact on the overall performance of a connection. A central management technique for gathering a large number, on the other hand, will generate groups with uniformly dispersed head clusters throughout the network if the approach is used. This is the foundation of the New LEACH, which makes use of a centralized classification model which have the same target sequences as the LEACH protocol as its predecessor.
The Modern LEACH technique is used to pick centroids, and it is used to make this decision. During in the Modern LEACH configuration stage, every device broadcasts towards the BS data about its geolocation and metabolic rate levels. Whether there are any sites that were below energy, BS guarantees that now the power burdens are spread evenly across all sites by computing the average physical and neurological and identifying whether there are any nodes with above-average power generation. This is done in order to identify units that have the potential to be cluster chiefs. When data is sent to the cluster head from a site besides the source node, this approach ensures that the quantity of electricity used by the unit besides the network model is kept to a minimum.

A situation exists if the central server and circuit consisting both connect; in this case, the BS transmits a communication with the cluster formation ID for every node on the network. In contrast, if the cluster members ID doesn't really equal, the unit will identify the TDMA slot for information transfer and afterwards the unit will rest until it becomes time to transmit information itself.

The variables that were utilized to compute the power estimation equation from the circuit were as follows: New LEACH NL(ni) power estimate for cluster head selection is represented by Equation (4):

$$NL(n_i) = (1-\alpha) + \frac{\sum_0^j NL(n_j)}{d_{out}^{ji}} / \sum_{k \in NH} d_{out}^{jk} * CO(n_j) * \alpha \quad (4)$$

The vote is based on eqn (4), where NL is the neighboring group again for k. The electorate is based on equation (4).

The remaining part of an unit is not taken into consideration by the LEACH protocol for picking a cluster head. It may enable units with extremely little power to be become cluster leaders, as well as early failures from groups that can have a negative impact on the longevity of the whole connection. Furthermore, since the LEACH protocol doesn't really take into account excellent sites when selecting a cluster head, some problematic nodes may be promoted to cluster heads, causing distorted data to be gathered or inaccurate statements to be sent.

By using the novel approach in LEACH, while selecting cluster heads, we take into account the power of the node, so eliminating the reduced node from becoming a cluster head among two adjacent groups. The following is the procedure for the novel LEACH routing scheme, as seen in Figure 3:

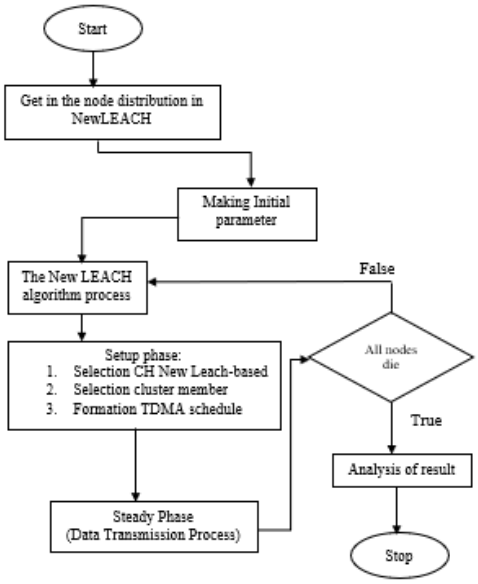

Figure 3: An illustration of the Modern LEACH networking system's diagram

As shown in equation (4), the Modern LEACH comprises the separation distance towards the BS, the length among sites to every node in the network, the computation of the minimal expenditure from the Modern LEACH energy, and doesn't even include CH as it did in the preceding stage. This will save money and effort since it will exclude sites which does not match the standards to be CH from the beginning and priorities the sites which are most eligible to be CH.

We think that the quantity of n elements has indeed been dispersed throughout the M x M network's geographical region. The position of the Ground Station serves as the channel's core hub. The following is the outcome of the modeling:

a. The connections are all chosen at random.
b. All terminals are identical in that they all begin with the same amount of energy.
c. All stations get the capability of receiving and transmitting data in both directions.
d. If stations' energy reserves are depleted, they are no longer functional in the connection.

4. RESULTS AND DISCUSSIONS

a) Network Simulation Parameters

In the next experiments, we utilize the same values for beginning energy that we used in the recent techniques. The settings for the experiment are set up as given in Table 1.

Parameter Name	Value
Initial Energy	2 J
Area of simulation	1000*1000 m^2
Number of Node	100
Packet Size	2000 bits
RSSI Threshold	-60dbm
Simulation Time in Round	3600

Table 1: Variables for the Simulation

b) Simulation result and comparison

The number of living nodes vs the number of rounds is such statistic that used study circuit longevity. The dependability of a fantastic technique, notably LEACH and Modern LEACH, is assessed by comparing the amount of people who are living vs the amount of deaths in a round. Every season's observations showed how much power the component has left in it, based on the quantity of power it has left. The assessment of the variety of living nodes versus cycle would've been carried out using the situation depending on the position of the Ground Station in the cable network core. The arrangement of the connections is purely unpredictable. The following chart displays the relationship between the number of nodes active as well as the amount of each round identified BS in a mobile nodes topology:

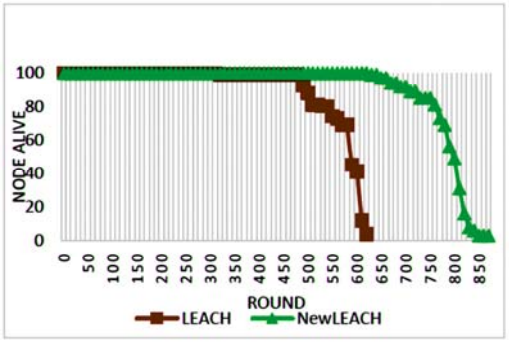

Figure 4: Among LEACH and Modern LEACH, there is an active node.

Based on the chart in Figure 4, we may infer that now the Modern LEACH versus round against technique performed best than just the LEACH algorithm in terms of total quantity of living nodes, with the triangular shape just on network performing better than just the standard size.

The findings of the subsequent experiments include the average lifespan, power consumption, productivity, and effective power of every test plus the number of groups used in the test.

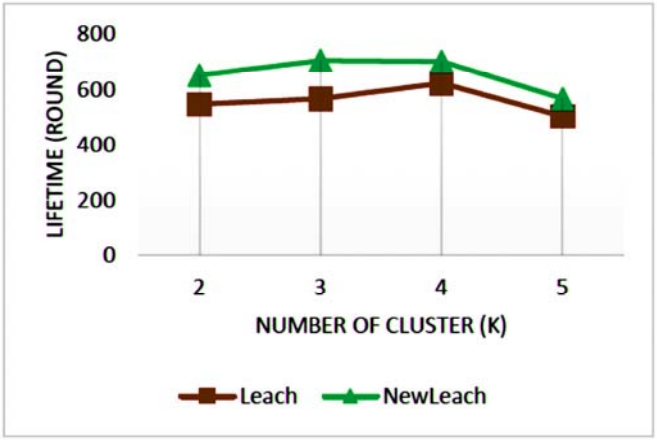

Figure 5: LEACH and Modern LEACH have a long shelf life.

Based on Figure 5, it could be inferred that now the Modern LEACH method outperforms the LEACH method in terms of lifespan vs the number of nodes. The triangular form from the network usually appears higher on the network than that of the standard size of the number of nodes that are currently present.

Diagram of power consumption for LEACH and Modern LEACH is shown in Figure 6.

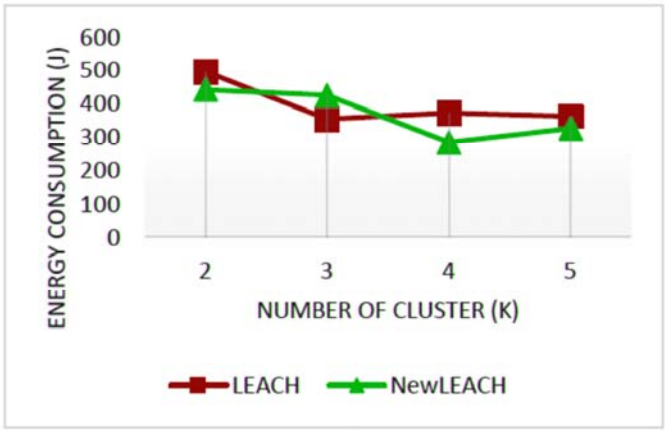

Figure 6: LEACH and Modern LEACH both use a burst of power.

The power consumption shown by the pyramid form of the chart is not certainly lower than that of the power consumption shown by the standard size of the chart for every number of clusters. In cluster 3, overall power consumption for Modern LEACH has increased at a faster rate than that of the demand for LEACH. When the number of nodes is increased to three, the range between the CHs in every one of the three clusters is longer than the length between the CHs and the BS in the original procedure. This results in a significant increase in energy usage since topology is used in an ad-hoc manner.

For LEACH and Modern LEACH, a chart of performance is shown in Figure 7.

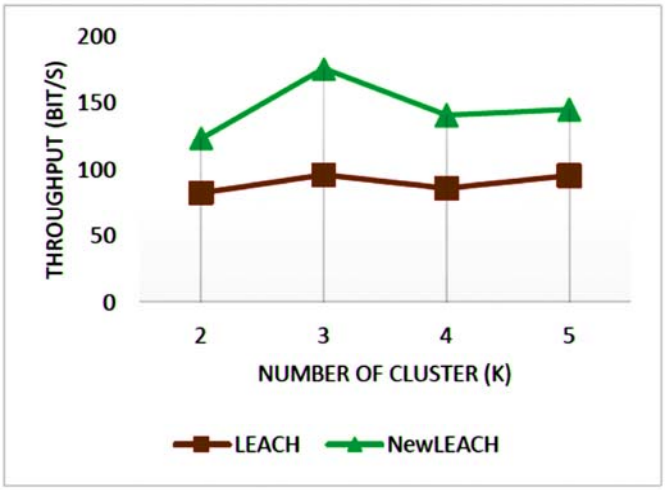

Figure 7: LEACH and Modern LEACH both have high output.

When it comes to performance, the pyramid form from of the data transmission graph seems to be superior than that of the standard size. Interestingly, this really is the identical information that was previously obtained for cluster 3 in Modern LEACH.

Diagram of Effective Power for LEACH and Modern LEACH: Figure 8 shows the relationship between these two variables.

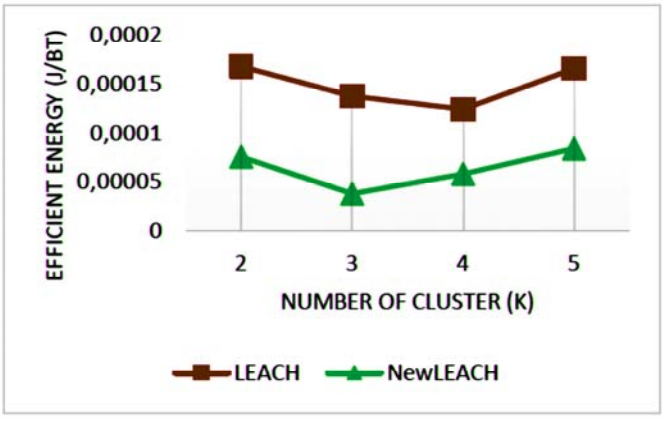

Figure 8: Efficiencies in LEACH energy production and the introduction of new LEACH technologies

Based on Figure 8, it could be stated that now the Modern LEACH technique outperforms the LEACH method in terms of lifespan vs the number of nodes generated. In terms of Effective Power, its high efficiency in this area demonstrates that the Modern LEACH technique is significantly more effective than the LEACH methodology based just on BS position on topology selected at random.

5. Conclusion and Future Scope

Our suggested system, which uses the Modern LEACH technique, outperforms the LEACH method in terms of various Quality of Service metrics: alive unit, lifespan, power consumption, capacity, and sustainable power use. The choosing of the cluster head is very important in the process of achieving the cheapest power for WSN. Also when picking a CH, our proposal takes into account the remaining energy of each node, which prevents nodes with low energy from becoming CH and instead chooses the network with the maximum energy from across all nodes in each cluster.In the future, if a high number of sensor nodes is reached, the protocol may be applied in the real world, allowing the results achieved to be maximized in accordance with the outcomes of the model. We also want to use simulation to test the effectiveness of our approaches in large-scale settings.

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An intelligent Service Based System on Wireless Sensor Networks for supportable consignment Transportation

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Abstract.
Goods mobility may benefit from intelligent service supply systems. It is difficult to build these systems because they must take into account so many variables that are impacted by the attributes of such diverse and complex systems. It was the goal of this proposed study to design an adaptive intelligent essential services framework that can identify contextual information from a broad range of services and embedded devices in WSNs. Additional flexibility is needed for the intelligent essential services framework so that it can analyse unique examples of unanticipated and undesirable scenarios in the freight transport procedure. We explored the issues of multi-dimensional specifications of collected information and the selection of suitable AI techniques for the classification of relevant data in order to solve the issue of acceptable contextual data supply. Favouring prospective service provision by maintaining high-quality data supply routes and preventing wireless communication channels from being overburdened are the goals. Data warehouse conceptual frameworks, situationally data identification algorithms, and artificial intelligence (AI) approaches for recognising transportation circumstances are all included into the suggested method. The prototype system's algorithmic analysis is shown utilising a suitable simulation platform in experimental study.
Keywords. Smart System; Context-Aware Services; Wireless Sensor Networks (WSNs); Consignment Transportation

1. INTRODUCTION

The integration of intelligent components into freight transportation systems is a hot topic among researchers right now [1, 2]. Modern tools that use novel digital resources that can adapt to a wide range of communication infrastructures and vehicle automation tools are being developed [3]. When developing smart support systems, additional research is needed to detect information from WSNs [4, 5]. WSN architecture must be flexible to cope to the varied nature of ITSs, as well as new techniques of communication and information technology.In the creation of ITS technologies, the most critical need is that these processes do not disturb motorists while they are on the road. An effective transportation management programme must ensure that users get what they need when they need it, where they need it. In addition, it should be tailored to the demands of the users, making just the required adjustments to ensure the safety of the transit process. A intelligent software delivery system for freight transportation management was the goal of this study. The designed system attempts to achieve the objectives of usefulness, flexibility, security, and efficiency maximisation by providing a functioning regime that does not overburden wireless communication networks. At this point, we're focused on developing an intelligent service delivery system that can track user behaviour in real time and recognise relevant context. Freight transport procedures need situation knowledge. The architecture of WSNs serves as the foundation for the newly built intelligent service providing system. The identification of the data obtained was applied in the phases of transportation and allowed for efficient freight transport administration.

A element design for a technique works service delivery is the focus of the suggested methodology. Research on the ICT infrastructure for multimodal transportation management conducted in the past is relevant to the present study [6]. This research is expected to help construct autonomous transportation infrastructures with extendable diverse communication, which would improve the safety of these procedures. Because they need a different methodology and are thus beyond the scope of our research, we did not include any sections on cyber security in our study. To strengthen the independence of user–vehicle exchanges, a structured awareness of new and prior transportation advances is required.

Artificial Intelligence (AI) approaches have been used to predict the future. There are a range of new types of WCC and WSNs in the ICT infrastructure. Online identification of moving object locations necessitates the merging of diverse services with systems based on geographic information systems. Sensed data may now be integrated into moving vehicle data monitoring procedures, as well as systems for predicting survey data about the vehicle's circumstances, thanks to smart system architectures. During this study, we focused on limiting unneeded information, prioritising the service delivery process in order to increase driving safety, and formalising the limits of data flows owing to inappropriate data transfers.

The following is the study's organisational structure: Section 2 reviews studies on context-aware process and systems engineering research. Section 3 presents a technique to the construction of an adaptive intelligent software supply system, with an emphasis on the representation of the recommended system's element framework. Section 4 provides examples of probable

disputes in the arranging of consignment transportation and the ways in which they might be resolved. Section 5 of the paper presents the algorithms used to classify and limit context data for motorists, based on the backdrop of AI and mathematical methodologies for decision support. Section 6 provides a quick overview of experimental research opportunities. Section 7 outlines our research's current and upcoming constraints and goals. Section 8 provides an overview of the findings as well as the study's originality in scientific terms.

2. RELATED STUDY

The creation of new kinds of providers for mobility assistance is related to the growth of ITSs and the proliferation in the application of the complex capabilities of ICT [7]. New types of network sensor systems placed at the wayside and in cars should be used to the operation and supervision of transport activities. Nevertheless, an adjustable connection among transport phenomena and the architecture of roadside units (RSUs) needs more study, with special focus dedicated to smart and autonomously acting subsystems.

It is possible to establish VANETs in a lot of formats, several of which are assisted by long-distance effective communication based on mobile protocols [8] [9]. There is also the usage of short-range technologies such as Wi-Fi. Engine, health, and environmental data may all be collected using a variety of sensors that can be installed into the car. Sensors are now able to collect data in a variety of formats, including multi-dimensional. As a means of acquiring context data, detectors may also be used to acquire data relevant to the movement and control of goods [10] [11].

It is possible to include a wide number of sensors into freight transport surveillance systems. The above is where we put our energy:

- The use of real-world sensors to monitor environmental conditions
- Detection devices that check the functioning conditions of automobiles.
- Scanners that monitor the health of people.

Surveillance of transportation and traffic data, danger alerts, recording contacts with other vehicles, e-calls for caution and details, etc., are some of the functions of RSU devices. According to the authors, there are a number of ways in which adaptable service systems might be developed [3] [6].

The Domain of analysis of the context	Aspects of the context in transportation
Surroundings and people factors	Location and identity of surroundings, people and objects and changing objects
Conceptual Definition	Set of entities that interact physically with conceptual states
Application Factors	Application settings
Environmental factors	Time, environment, products and company information

Table 1:Aspects of the context in transportation

The term "context" encompasses a vast range of ideas. We looked into the feasibility of incorporating these context awareness descriptions into our program based on the results of our analysis. To help identify critical data, the intelligent software distribution system provides access to a broad variety of multi-dimensional properties [12] [13].

Providing a V2V service is hampered by a variety of issues, such as assessing qualitative characteristics and overloading wireless channels. Many different communication strategies may be used to acquire, transfer and distribute information in an infrastructure. There are several elements to consider while developing Iot systems, including agility, inventiveness, and versatility. As a result, we focused on a limited number of information protocols. In terms of communication channels, we're primarily concerned with the issue of oversaturation of wireless channels as a result of service supply. This method focuses on evaluating service priorities in terms of aesthetics, transportation safety, necessitate and adaptability [14].

High speed and dynamic topology need high standard handling of relevant data due to the variety of components.

One of the most challenging aspects of doing this is the potential for mistakes and difficulties arising from the use of incomplete data.

3. METHODOLOGY

The goal of this study was to design an expandable architecture for a smart service providing system for freight transport operators. Averting collisions, assisting with emergency situations, and reducing gridlock were all goals.

Table 2 outlines a strategy for creating a flexible, intelligent service delivery system. The freight travel management process necessitates the identification of context-aware information at every tier. Sustainable development calls for process that helps decision makers at various levels of the freight transport management hierarchy make better decisions.

This study does not go into detail on every one of these levels. However, in the next sections, we examine several of the levels in further depth.

The Layers of the Infrastructure for the Development of Context-Aware Services	Description of Components and Functional Units
Software and algorithms for service support and specialized user interfaces	Software development tools for such purposes; Programming languages; Service provision platforms;
Scenarios and orchestration of activities for service provision	Interoperability support tools for integration of required DWs
AI methods for recognition of cargo transportation situations	Special AI methods that are included in service provision systems, such as machine learning methods and packages, neural networks, and image analysis and recognition
Methods for planning and/or re-planning of cargo transportation cycles	Plans to develop software, planning of transportation corridors, provision of related information, re-planning decisions and related activities, software realization tools.
Methods for operative work and management of all participating agents in cargo transportation processes	Operative control methods and implementation of informational and equipment infrastructure for communication between participating sides

Table 2:Infrastructure layers for the context aware services

3.1 Levels of Decision Support for Sustainable Cargo Transportation

The decision analysis mechanisms are AI-enabled. These procedures are connected to the creation of sophisticated services that may aid in the handling of unexpected situations. The phases of construction of smart essential services system are studied by recognising the priority of data conveyed for drivers throughout the mobility cycle.

The work plan is thought to be when shipping objectives are based on historical trends on contracting parties and predicted delivery requirements. The shipping pattern is created in the design stage and sent to the planning stage as goals or specified places. Efficiency factors are provided in the collecting phase to monitor network, operator, and vehicle data.

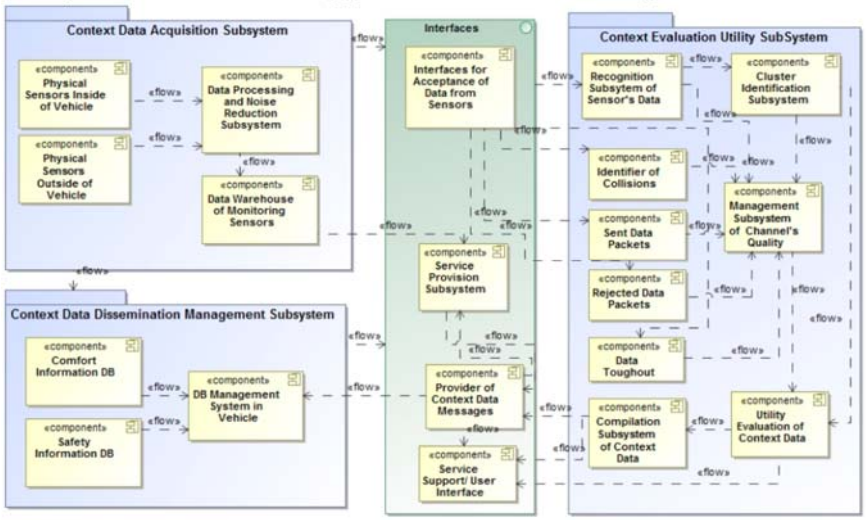

Figure 1: The IASDS architecture for the identification of data from sensors in order to provide service.

3.2 System DevelopmentRequirement

Implementation phase for safe, dependable, inexpensive and pleasant automobiles requires a wide range of technological advancements, including DSRC and IEEE 802.11 standards for Wireless Access in the Vehicle Environment, which must be followed in order to accomplish this (WAVE). Using these protocols, a novel standard of service delivery may be accomplished. For example, DSRC and WAVE may be used to provide services in automobiles in order to meet ITS development objectives and improve road safety, transport planning and the enjoyment of drivers.

Various modes of transportation have been considered in the planning process. For transportation systems in a digital environment, in particular, the development of identification algorithms for the detection of diverse scenarios is required to determine their relevance. It is important to note that these strategies are impacted by the driver service procedure.

Pleasure and entertainment-related activities are regarded less significant, and so are not directly linked to road safety. Drivers may benefit from these kinds of services, which can be supplied in typical driving scenarios. In addition to providing weather and traffic information, comfort areas may also give information on the location and costs of nearby gas stations, motels, and other businesses.

For example, field-level design, process improvement management, and web services during transit all fall within the VANET's classification.

3.3 Architecture of anFlexible Cargo Transportation Service Delivery System

In order to build an IASDS, instantaneous environmental detection and data management methods must be included.

In our prior works, we've developed a more complete conceptual design for the smart service providing system. Mobile network architecture changes and the analytic approaches for limiting superfluous information have recently received a lot of attention. Drivers must deal with an ever-increasing influx of data while on the job.

Types of Sensors That Can Be Equipped in Vehicles (INV)	Types of Virtual Equipment	Types of Communication Network between Vehicles	Types of Roadside Units (RSUs)
Video cameras	Smartphone/Tablet	VANET	RSU for speed recognition
GPS	Calendar	Services provided from ad-hoc nets	Dynamic RSU for traffic regulation
Microphones	Reminder	Reminder	Dynamic info black-boards
Movement dynamics	Information from social networks	V2V communication services	Monitoring and information about conditions of roads

Table 3:Types of sensors that vehicles equipped

Figure 1 depicts the major structural elements of the suggested IASDS's design. We utilised the syntax of the Unified Modelling Language to depict the system's element design.

In order to keep track of data, we designed the Situational data collection module and the Data dissemination subsystem, two separate software packages. Subprograms that provide frame of reference capture and propagation of contextual information are provided by the information from the acquiring sub - system. In order to classify services, prioritise services, and gather context data, functioning processes are used.

Noise reduction is made possible by the Connection quality control subsystem, which permits data throughput and preparation. As accessories for collecting information from numerous diverse sensing devices, interfaces play a significant role. They can aid in the seamless integration into the cognitive structure of the DWs' repository. Unlike the integrated devices out of which message is transferred for the context assessment subsystem, the data for processing is transferred through the elements of the integrations. Clustering methods can be used to establish data - flow prerequisites in the Situation recognition component of these processes.

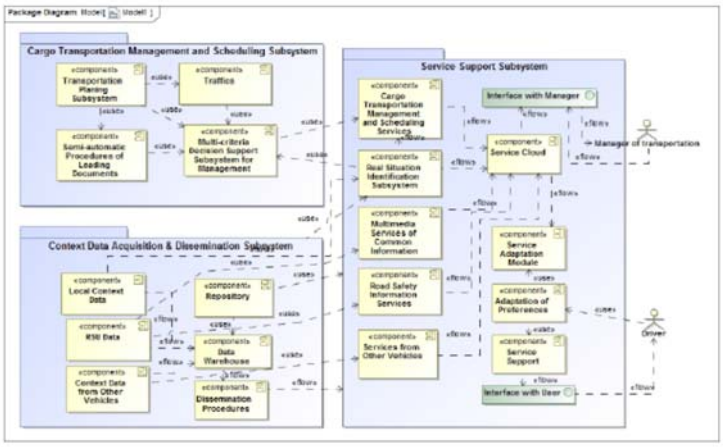

Figure 2:The Architecture of The Proposed IASDS for Recognizing Data from Sensors.

3.4 Conflict Management during the Scheduling Phase

First and foremost, the timetabling process must be examined for potential conflicts of interest. When a completely new occasion occurs, operational incongruence takes place. It is essential to bear in mind that not all dispute are wars at all, but rather multi - functional procedures that can be categorised as such.

It's crucial that the data set's existing dispute are gathered before determining which schemes should be employed to rectify them. To move ahead, the modification step is being used to decide if the contrasting activity has been modified. If one of the operations was carried out, the type of precision will be determined by other modifications for each clashing couple. Both effectiveness can be measured to see if there is a solution if neither one was completed. As a final step, the dispute is removed from the list of conflicts once both activities are completed.

The model's method depends on dispute and choice statistics. The indications of dispute play a significant role in making choices in comparison to social and demographic variables. There is a growth in the number of operations that are removed and a drop in the total of actions that are modified when there are more activities that overlap. However, the amount of time obtainable it seems to have less of an effect on the choice made. There are less chances of altering the original activity and deleting actions that seem to be in opposition with a tiny model.

The selected method for resolving the dispute was anticipated to be heavily influenced by the nature of the dispute events. There was a small chance that the original activities, which were more nimble and adaptable, were going to be supplanted. There is a larger proportion of modifications and a little less of deletions for activities that are more unique. The outcomes, on the other hand, are not as clear-cut as those from activities involving conflict. When it comes to long-term planning, it's been shown that as the time horizon for both innovative and contentious endeavours grows, so does the likelihood of modest alterations.

3.5 Algorithms for Recognizing Contextual Data Provision Objectives in Freight Transport

Freight transport requires the development of services with adaptability qualities. It is possible to create an adaptive smart service delivery system to provide these services autonomously to drivers. It is necessary to develop algorithms that determine the importance of service providing at the appropriate time and location. The technology is aware of the external surroundings

and can assist to determine the present, previous, and expected future conditions during the course of the journey, as well as aid to pick the proper path.
Various sensors enable the highway equipment architecture. Data from a broad range of RSUs may be used to monitor transportation and other contextual information along the route. Knowledge may be gained through sensor information. The data generated throughout the shipping procedure is quite complicated. Structures, measures, and inter - dependencies across sources may all vary greatly in terms of how they are provided and how large their volumes.
It is critical to the IASDS growth process to identify and handle problems by grasping the connections among them and their surrounding environment. There may be issues if this is not done, and the system may not perform effectively or adapt to the user's demands. Difference emerges if transit is categorised by road or may be inherent in the circumstance if the computer is aware of numerous simultaneous circumstances.
Rejecting non-useful data from the system may assist reduce network loads neither compromising quality of the data nor diminishing the multimodal system's performance when it comes to road safety. There has been a call for a more smart and flexible strategy to dealing with these problems, one that takes into account the system status and the assets relating to data packet creation as well as details from other vehicles and can make use of context information from the local environment, including place, time, surroundings, usage rate, driving conditions.
After looking at a list of recognised natural features, a software system was suggested to be used to evaluate each situational message's usefulness. A meta-model is used to prolong the sensors and data storage facility, which is then built for local storage using the mathematical background.
It is possible to describe the utility of each data subject as a Product of two using the matrix ML. There are values that reflect the effectiveness of relevant contextual notifications where the first index j represents the data collected from the sensor (sj).

$$M_L = \begin{pmatrix} d_{L_{11}} & d_{L_{12}} & \dots & d_{L_{1n}} \\ d_{L_{21}} & d_{L_{22}} & \dots & d_{L_{2n}} \\ \dots & \dots & \dots & \dots \\ d_{L_{l1}} & d_{L_{l2}} & \dots & d_{L_{ln}} \end{pmatrix} \quad (1)$$

Weights are assigned to each sensing messages (mi) to determine the prediction effectiveness of the context awareness message (sj). Formula (2) is used to determine the matrix ML's individual element values.

$$d_{L_{ij}} = (Ty_j + H_j + Ex_j) m_i cr_i Pr_i,\ i = 1, \dots, l,\ j = 1, \dots, n \quad (2)$$

Tyj expresses the relevance of situational basic data types in formula (2), which is judged in the range of [1, 3]. They are based on the judgments of specialists in the transportation industry. It was essential to execute polls and use multi-criteria analysis methods to compare the viewpoints of specialists in order to formulate these algorithms. To convey messages in the safe and comfortable zones, a value of 1 has been allocated; messages in the security area, a value of 2 has been assigned. Messages having a weight of 3 appear first in the list.
In the predetermined range [0, 1], the significance of a message may be assigned, with 1 being a security notification and 0 denoting an informational/comfort message.
You may choose from a list of normalised values within the range [1, 3] to use as the function for expressing the message age using Ij, where TM denotes the time change between the present instant and that at which the text was generated. This approach is stated in (3).

$$A = \begin{cases} 1, if\ T_M > 5s \\ 2, if\ 1 < T_M < 5s \\ 3\ if\ T_M < 1s \end{cases} \quad (3)$$

The architecture and methods have been designed to help establish better circumstances for the supply of chosen information in order to decrease the number of data transitions. The situational utility values are stored in a matrix MO.

$$M_0 = \begin{pmatrix} d_{011} & d_{012} & \dots d_{01n} \\ d_{021} & d_{022} & \dots d_{02n} \\ \dots & \dots & \dots \dots \\ d_{01l} & d_{0l1} \dots . & d_{0ln} \end{pmatrix} \quad (4)$$

When determining the predictive ability of a context awareness information, a formula is used to give each msg sent to the automobile vn a numerical value (ml). Formula (5) is used to determine the values of the matrix MO's elements, which may be written as Cartesian product:

$$d_{0ij} = \left(Ty_j + Exc_j + Z_j\right) m_i cr_i Pr_i n_i, \quad i = 1, \dots, l, \quad j = 1, \dots, n \quad (5)$$

To estimate the quality of a data transmission, use Zj, which may be computed using Formula (6):

$$Z_t = \frac{1 + \left(\frac{C_t + D_t}{2}\right)}{T_r} \qquad (6)$$

The collision factor, Ct, is computed using the following equation:

$$C = 1 - \left(\frac{1}{1 + C_{t-1}}\right)$$

Rejection parameters are included in a Dt packet, which may be computed according to a set of rules.

$$D = 1 - \left(\frac{1}{1 + d_{t-1}}\right)$$

The following formula is used to compute the bandwidth factor Tr:

$$Tr = 1 + \left(\frac{tr_{t-1}}{100}\right)$$

Context utility values are included in the data exchanged with a hybrid VANET cloud subsystem. Structured data is represented as a matrix (Mc) with its own unique index (l), which reflects values of message data for the receiver entities (ri).

$$M_C = \begin{pmatrix} d_{C_{11}} & d_{C_{12}} & \dots & d_{C_{1n}} \\ d_{C_{21}} & d_{C_{22}} & \dots & d_{C_{2n}} \\ \dots & \dots & \dots & \dots \\ d_{C_{l1}} & d_{C_{l2}} & \dots & d_{C_{ln}} \end{pmatrix} \qquad (7)$$

The weighting algorithm, which gives values to each signal that will be sent to the receiver, may forecast and describe the utility values of the context awareness messages. The Cartesian product of Formula (8) may be used to compute the values of this structure.

$$d_{C_{ij}} = (Ty_j + Hx_j + Exc_j + Z_j) m_i cr_i Pr_i,\ i = 1, \dots, l,\ j = 1, \dots, n \qquad (8)$$

where $T_{yj}$is the set of reduced parameters.

4. Results and Discussions

In order to avoid composing complex scripts, an easy-to-use user interface was employed. When it comes to supporting a driver's basic behavioural patterns, NCTUns and its subsequent version (Estinet) [15] are a great choice. Furthermore, in NCTUns versions 4 and 5, studies have concentrated on the feature that allows the testing of various ITS automobiles networks, the creation of a simple roadway network design and the simulation of RSUs based on wireless infrastructure mode. Several different types of wireless network applications were tested during the research. This design context can be used to investigate a variety of complex ITS scenarios due to its tight integration. This is necessary for simulating how the car's drivers behavioural changes in response to messages. Node mobility management and ultra-high volume automotive communication networks are among the new features in NCTUns version 5.0, as well as automatic road network construction.

As per the study objective, a variety of simulation experiments were tested out. As an example of how a network model can demonstrate factors that produce a series of texts, one situation simulated a blended VANET cloud service by stashing suitable data in the correct archives of the database system. The integrated server and the DW were linked to the network.

Activity and/or Service Type	Required Amount of Transferring Package(B/s)/ Bandwidth (KB/s)	Possibility of Influence of Packet Loss	Frequency of Transmitted Data	Tolerable Delay (in Microseconds)
Types of actions related to traffic safety in the transportation process				
Changing the lane	~100/1	Average	Event	~100
Information for traffic light control system	~100/1	Average	Periodical	~100
Warnings about hazards	~100/1	High	Event	~100
Multimedia services	~100/1	Average	Periodical	~100

Table 4:Differentiated service delivery in vehicular communication networks

Transport specialists' views were examined to finalize the algorithms used to give priority to the various forms of context and supplied messages. Decision support approaches, such as cumulative waiting and the assessment of correlation coefficients, were utilised in order to provide specific priority values to situational data and access provided by experts.

Simulated transmission of data from automobile to DW server and DW server to vehicle was employed in another simulation scenario for data flow analysis.

Table 5 lists the many kinds of sensors that were used in this investigation.

The data transmission cycles began at 60 s in length. The data transport rate was set at 27 Mb/s, while the packet's size was set at about 1000 MB. Section 5's technique for assigning priority to service providers was used in the experiment. Contextual awareness of the surrounding world was reproduced in the prototype system.

Section 5's algorithms were put to the test in yet another set of tests, this time to see whether they might be put to good use. For a brief period of time, statistical data and gathered data were put to use. Figure 3 shows the collected data, the dynamics of anticipated utility, for illustration reasons only. Comparing these two graphs, we can see how Tyj values have decreased in significance.

Only a small portion of these findings may be relied upon to be reliable. In spite of this, they demonstrate that the collected results throughout the brief trial time may be used to predict the behaviour of modifications in the service supply process. Variations in results are influenced by a variety of factors, including the channel quality characteristics. Additional studies with a large number of lost packets are needed in order to accurately estimate conflicts and the channel capacity requirements.

In each point of the journey, the prediction function may assist identify the present condition by analysing previous occurrences and forecast the future. In our earlier work, we described the algorithms for picking the proper path at probable nodes of multi-modal mobility.

Classification of Sensors by Types of Applicability	Update Rate (High – H, Average – A, Low – L)	Classification of Types of Row Data Sources	Types of Data Exchange
Physical sensors inside of the vehicle			
Speed measurement	H	Data from vehicles	INV
Acceleration measurement	H	Data from vehicles	INV
Temperature measurement inside the vehicle	L	Data from vehicles	INV
Temperature measurement outside the vehicle	In case of needfulness of such conditions	Data from vehicles and RSU	INV
Fuel Level measurement	L	Data from vehicles	INV

Table 5:Classification of WSN sensors used in freight transportation based on their kind of sensor.

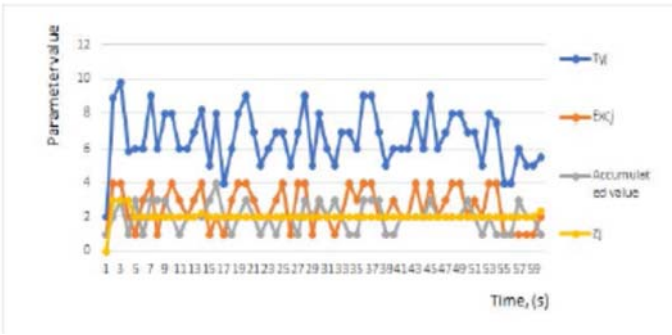

Figure 3: An example of the short-term dynamics and dependence between the new values of the anticipated changes of the cumulative projected utility (Excj), normalised Zj, and Tyj parameters shows the incomplete experimental findings.

5. Conclusion and Future Scope

Expandable architecture and multi-dimensional ways of expert systems are the basis of the suggested strategy. The goal was to create a service delivery system that could identify context-aware information and use it intelligently. The researchers used a broad range of situational data sources, including WSNs and other infrastructure ICT devices, in the design process. These context-aware procedures are examined in the research study, along with the creation of systems to achieve crucial context-aware identification goals and their impact on a larger comprehension of relevant data.

Smart service delivery systems' suggested architectural integrity is one-of-a-kind, thanks to algorithms developed to identify situations by comprehending their environment. This technique also laid the groundwork for the creation of adaptive software solutions, which are essential to the mechanization of certain circumstances. The suggested intelligent adaptive strategy allows again for utilisation of ambient relevant information, including the kinematics of the automobile, and data exchange from other cars to overcome the issues of smart service supply. Data transfer restrictions were implemented based on wireless network circumstances and assessments of wireless communication channels' performance. With these solutions, the service limiting process may be made more efficient by taking into account the wireless transmission channels' capacity.

Prototypes of the IASDS internet infrastructure were developed in this prototype. Network filtration and consolidation methods in the IASDS may assist limit the volume of useless collected data that must be communicated through automobile communications infrastructure without compromising the quality of the contextual data.. The categorization of sensors by kind was used to identify particular scenarios, as supplied by the researchers.. Techniques for collecting data that were used in this study were found acceptable.

In the future, we want to investigate more sophisticated crash event detection and unexpected circumstance forecasting situations. There will be fewer accidents and risky circumstances because implications for the way will be classified according to various kinds of wireless technology and data will be sent based on context for certain smart service models.

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A Study on Segmentation Technology of Ultrasound Deep Network Segmentation Techniqueof Thyroid Nodules

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Abstract.
Thyroid nodules are common all across the globe, with a frequency varying around 19 to 68 percent in different parts of the world. The difficulty with nodules is determining if they really are cancerous or harmless. With the goal of alleviating the moment procedure of current thyroid nodule detection and also the difficulties in image retrieval, the U-Net-based thyroid nodule detection is suggested for use in computational assisted diagnosis. Using mark-guided ultrasonography deep network recognition, this research presents a model for thyroid nodule classification. It is discovered that the approach presented in this study has relative benefits over VGG, Inception, DenseNet, segmentation accuracy, segmentation edge, and distributed system time when compared to these algorithms. Thyroid nodules were fragmented using the UNet network-based ultrasound technique, as well as the nodule region coincident with the physically illustrated nodule area was close to 100 percent; the categorization prediction accuracy has been as significant as 0.9785, as well as the UNet categorization outcome was more similar to the individually illustrated nodule area. The efficiency of U-Net categorization of the thyroid is about 3% greater than that of the efficiency of those three systems combined. The UNetbased classification of thyroid nodules described in this study greatly increases the discriminative power of thyroid glands even with a limited training examples, and it offers a complete guideline in diagnosis and therapy of thyroid nodules in patients.
Keywords. Thyroid;glands; Ultrasonic Image categorization;UNetMachine learning

1. INTRODUCTION

Located at the bottom next to the neck, the thyroid gland is a butterfly-shaped part of the endocrine system that produces thyroid hormones [1]. [2] The thyroid is an endocrine gland that generates thyroid hormones that are eventually removed into the circulation and aid in the maintenance of the individual body's metabolic rate. Thyroid cancer is growing in prevalence over the globe, but the mortality rate stays stable [3]. Thyroid nodules are quite frequent in the overall population, with a frequency of 19–68 percent in the overall population [3] [4] [18]. They are generally detected by chance during a standard neck visualization scan within the first year of life. Thyroid nodules may be very dangerous to one's wellbeing and therefore can leads to death. The early discovery of thyroid nodules, as well as accurate categorization, diagnosis, and medication, will all contribute to a reduction in the risk of thyroid carcinoma. It is critical to evaluate diagnostic value in people who have been diagnosed with unresolved or suspected hematological malignancies in order to rule out thyroid cancer as a cause of their symptoms. Pulmonary nodule evaluation is normally accomplished by fine needle aspiration, with surgical intervention to determine the source of the nodules being used as a last resort if necessary. That, meanwhile, will need a significant investment of both human and financial resources. As an option, radiologists may evaluate a variety of characteristics that are visible in the nodule region on thyroid ultrasound pictures. Figure 1 depicts typical ultrasonography results for various risk groups of thyroid cancer based on the results of an ultrasound scan.

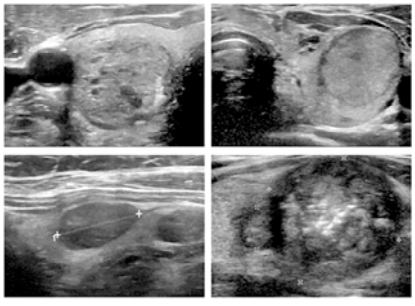

Figure 1: Ultrasound features that are typical for various risk groups of thyroid cancer

In the past 10 years, there were a slew of activities to lower the incidence of thyroid cancer [5]. Because of its non-invasive nature and cost efficiency, echocardiography is the most extensively used technology in thyroid radiology for thyroid nodule evaluation [6] [19]. The most important criterion in determining whether or not a thyroid nodule should be removed is proper thyroid diagnosis. Apart from traditional techniques of clinical diagnosis, computer-aided diagnosis (CAD) technologies are becoming more popular [7] [17]. The goal of digitalizing illness detection is to improve the accuracy of the diagnostic process while also reducing the cost and time spent by patients. For the evolution of the thyroid ultrasound CAD system, many Machine Learning (ML) methodologies have been used, including deep learning. When it comes to healthcare imaging analysis including computer vision, Deep Learning (DL) [21], a sub domain of Machine Learning (ML), has quickly gained in popularity, and it is widely viewed as a potential alternative to traditional methods of analyzing ultrasound pictures [8] [20].

Machine learning, that are mostly used for image classification, has shown tremendous progress in the field of image recognition, as demonstrated by the results of a recent research study. A unique idea for classification of thyroid nodules has been developed as a consequence of the research's infiltration of the healthcare world. The classification of pituitary computed tomography using algorithms and computer vision removes the need for a long review period and completely eliminates the dependence on the moral judgments of doctors over the course of the procedure. Neuronal networks as well as machine learning are being used in current research to differentiate between benign and malignant thyroid nodules.

The following sections provide an overview of the remaining parts. Section 2 provides an explanation of the approach used in the prior research studies. It is discussed in Section 3 how the current research was carried out methodologically. Following that, in Section 4, the findings of the suggested method's quantitative analysis, as well as a comparison with previous research, are provided. Section 5 finishes the article by providing a look forward to the future of the subject matter.

2. RELATED STUDY

A number of different ways to detecting nodules in ultrasound pictures have been reported by earlier authors. A CAD system developed by the researchers of [9] used a proposed technique and a segmentation-based nonlinear pattern research methodology to measure the way characteristics in ultrasound pictures in order to identify thyroid nodules was shown. A support vector machine (SVM) and a random forest classifier were used to obtain information from thyroid nodules in order to discriminate among normal and cancerous thyroid nodules. In addition, the study implemented segmentation methods to enhance the categorization of nodules in order to make better accurate assessment. Nougroho and colleagues [10] created a computer-aided diagnosis system (CAD) to detect thyroid cancer. The major goal of this project was to make it easier for radiologists to analyze significant properties of ultrasound pictures by using a digital image processing technique. One‘s suggested technique consisted of four phases: image restoration, categorization, edge detection, classification of each attribute utilizing multilayer perception (MLP) and SVM, as well as defining if the tumor was benign or malignant. They also included a step for defining if the tumor was benign or malignant. The InceptionV3-based technique for the detection of thyroid nodules was first described by Song et al. in [11]. The major goal of their study was to provide specialist doctors with information that would aid them in detecting benign nodules and preventing needless Fine Needle Aspiration (FNA). They used a deep clipped nodule collection that was developed with the assistance of a physician to train their system. The findings of their trial demonstrated that their model may be useful in assisting radiologists in diagnosing cancerous nodules, which is a hopeful development.

Using a convolutional neural network (CNN) architecture for thyroid cancer aggressiveness identification, the authors Ko, S.Y. et al. [12] reported their findings that matched the simulation results with radiologists' diagnostic accuracy. There have been two pre-trained algorithms employed in this study. A radiologist retrieved the area of interest (ROI) from every ultrasound picture so that the CNN could be trained using the local information from the images. The results revealed that both CNN and experienced radiologists' photos fared equally when it came to distinguishing thyroid malignancy. Using task-specific information, the authors of [13] offer a new computer-aided design (CAD) method for classifying and recognizing thyroid ultrasound pictures. Essentially, the strategy they provided is separated into two sections. As a first step, we developed a multistate region-based detection network that learned pyramidal properties to distinguish nodules at various sizes. Next, we built an inter categorization network with characteristics that were directed toward diagnosis and many views of the network. Every network branch made advancements in an unique set of capabilities which radiologists often use in their job. In their assertion, the authors said that their suggested CAD system surpassed professional radiologists' conclusions by an impressive 8 percent.

The researchers at Vasile, M.C. et al. [14] conducted yet another investigation on the diagnosis and classification of four distinct types of thyroid nodules. This was accomplished via the use of an approximate solution that integrated two deep learning models. The suggested composite CNN–VGG approach beat both the 5-CNN and the VGG-19 models, obtaining an average precision of 97.35 percent, according to the research findings. Yang, W. et al. [15] introduced a multiplex cascading deep learning model (MCDLM) for the automated identification of thyroid nodules, which combined radiologists' different domain knowledge (DK) and used multidimensional ultrasonography imagery to achieve this. When generating high-quality pictures for racist and bigoted reasons, the researchers utilized the U-Net model in conjunction for the dual semi-supervised conditionally generative adversarial network (DScGAN) model to get exact classification performance and to create high-quality pictures. Following that, DScGAN produced pictures that were trained for identification of thyroid nodules using a supervised support vector machine (S3VM). The results indicated that MCDLM has a generalization ability of 90.01 percent.

Other researcher, Abdolali, F. et al. [16], suggested a method for identifying a range of thyroid nodules that was successful in their research. Using regularization and a transfer functions, the suggested multitasking model, Mask R-CNN, prioritized recognition over categorization while also using regularization. The findings of their recommended model exceeded those of Faster R-CNNs and the standard Mask R-CNNs. Automated accurate identification of thyroid nodules is a critical but hard step due to a variety of factors, including hazy look, an unclear edge, uneven form, and difficulties discriminating among normal tissue and the nodule area. The results of this study demonstrated an automated approach for recognizing and sectioning thyroid nodules utilizing ultrasonic imaging data. The proposed technique employs a DL structure with just a convolutionary neural network as well as a VGG-16 backbone to increase detection performance, and by applying a modified VGG-16 model, it is possible to achieve excellent diagnostic accuracy with a model that is comparable to the original.

3. METHODOLOGY

Ultrasonography is a very adaptable, affordable, rapid, and established screening tool that has been around for a long time. Healthcare physicians utilize ultrasonography to get related ultrasound pictures in order to accomplish a variety of diagnostics and treatments that are not possible in most clinics or hospitals. Patient assistance is provided during a variety of procedures, including preventative measures, medication, and even rehabilitation. Furthermore, because of its digitalization, data, and other qualities, ultrasonic pictures obtained using ultrasound technology are quickly being one of the most popular study topics, intersecting with image analysis, machine learning, as well as other areas.

Ultrasonography examination is a term that refers to using acoustic pressure to investigate the inside cells and tissues of a human being. With the use of Doppler ultrasound, it is possible to accomplish associated medical exams in a quasi way, making it appropriate for tests on a variety of special events. Using models that rely to produce electromagnetic pulses of a specific wavelength, ultrasound technology gathers the reflected light produced while high frequency flow passes though the target organs mostly in human body, and then exhibits people as similar pictures or contours and offers a wide range with obey data, among other things.

To conduct various ultrasonic examinations, ultrasonic technologies is used in conjunction with certain distinct physical properties of ultrasonography to carry out various ultrasonic safety checks. It is feasible to perform ultrasonic exams on biological cells or organs from a variety of angles by using these various qualities, which makes it easier for physicians to undertake future medical aid diagnostic as a result.

Ultrasonic, computed tomography (CT), and magnetic resonance imaging (MRI) have emerged as the preferred and commonly utilized picture imaging methods in the context of healthcare imaging equipment. Doctors may swiftly evaluate a health diagnosis and prescribe interaction occurs measures and procedures, as well as offer fast and efficient assistance in the therapy of the medical illness, by utilizing these picture imaging modalities. For example, in contrast to CT and MRI, ultrasonic imaging technique is straightforward, the scanning rate is quick, the data latency is minimal, the immersion is excellent, and true scanning is possible. Furthermore, when compared to CT and MRI, the tools required for imaging techniques are less expensive, the radiation dose emitted by the equipment is lower, the cost of each ultrasound scan is lower, it is easier for physician to continue their operations, even though it is easier to advertise in health facilities at all levels of government.

Using diagnostic imaging information as the foundation for diagnosis and therapy has been more common since the advent of technology in the 1970s. However, as technology has progressed, the ability to appropriately segment medical pictures has emerged as a significant bottleneck in the production of a range of technology. It is even possible to assert that quality control division of pictures has evolved into the most fundamental and most significant challenge in the area of medical imaging, and that it must be resolved as soon as possible.

The conventional semantic segmentation area may be classified into two groups, according to its application. Picture segmentation may be completed by searching for includes innovation features in the image directly, which is one approach. When using the first kind of technique, morphology is utilized to segment images; when using the second type, the initial border is defined and the technique is used to repeatedly approach the initially set boundary to the actual picture border in order to conduct image classification. An energetic functional technique is the term used to describe this sort of procedure.

Machine learning techniques have unquestionably risen to the top of the list of popular future studies at the present. Deep learning, as just an expansion of computer vision, has far outperformed the capabilities of computer vision in terms of effectiveness and depth of analysis. The convolutional networks including fully convolutional neural networks are the primary neural networks used in the development and evolution of the deep learning-based segmentation method (FCN). Using the initial network as a foundation, they are adjusted to fulfill the requirements of various purposes. As a consequence of the rapid rise of FCN, medical image segmentation has become simpler and more precise, resulting in segmentation approaches based on deep neural networks being the dominant research route at the time. As of right now, classification technique is far higher even than previous segmentation algorithms.

Among the most widely used models in image process techniques, CNN is amongst the most well-known, and many system architectures generated from it were useful in a wide range of applications. The CNN algorithm was first suggested in the 1980s, and it is still in use today. In spite of the fact that the technique has been vigorously advocated for and developed, it has not yet been widely adopted due to limitations imposed by the stage of system requirements available at the time, and the system is mostly used to address minor problems including such identifying number and composition.

In contrast to the FCN method, UNet is an updated full reaching this point (FCN) that is built on the FCN architecture. Figure 2 depicts the overall structure. Feature extraction and up-sampling are the two main components of the algorithm. The feature extraction section consists of four iterations of Fourier and Max Pooling processes that are performed four times. During each iteration of the convolution operation, a new scale level is introduced to the image. This results in a maximum of 5 degrees, with the first scale being the initial picture. This is accomplished by the continuous convolution process of the up-sampling section, which reduces the number of feature channels to half. As a result, each moment the network does an up-sampling, it splices all together generated feature map with the down-sampling portion of the very same size feature space. The probabilistic heat map is created in the final layer using the 1 inversion and the nonlinear activation function, which is applied to the data. As a result, the network has four pooling layers and four up-sampling layers.

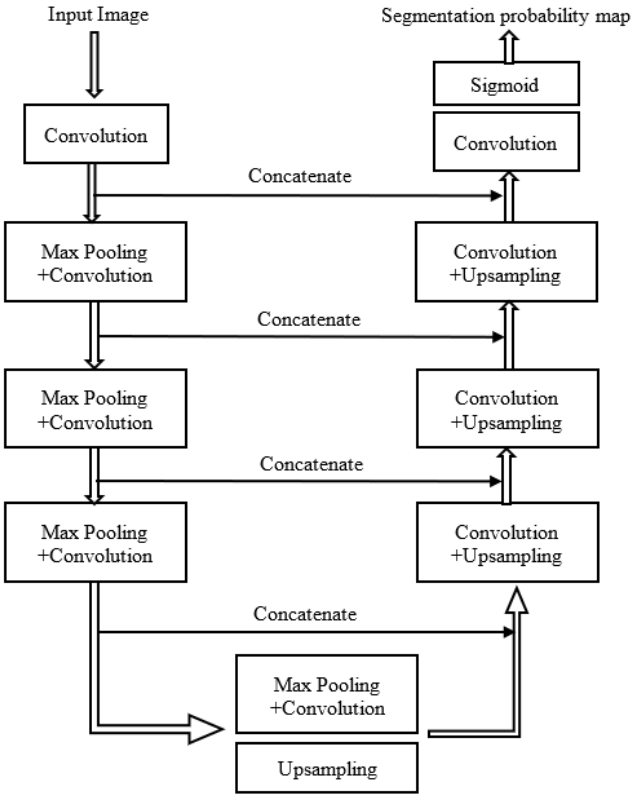

Figure 2. The network structure of the U-Net.

The enhancement of U-Net comes from the combining of inter features: the up-sampling step combines the convolution layer evidence received during the feature extraction process with the evidence gleaned during the background subtraction section. Since of this, and because past experience has shown that it can achieve higher efficiency even on tiny large datasets, the U-Net system is used as the core network architecture for the categorization experiment in this research.

The VGG system replaces the bigger convolution operation in the neural network with a series of three-way convolution kernels that are consecutively three-way. Its use of layered tiny convolution kernels for a particular responsive field results in some more quasi layers for a particular perception, which may boost the benefits of neural networks in difficult training. It has the potential to raise the depth of the network while simultaneously reducing variables under another sensory field circumstances, as well as to increase the precision of neural network categorization to a certain level.

A architecturally innovative feature of Google Original conception Net is the use of a worldwide mean convolution layers to substitute the fully - connected, as well as the reduction of the number of variables and the introduction of batch normalization to speed up the integration of the classical machine learning process. The Inception V3 architecture is a 47-layer artificial neural model that, in an industry first, divides the two-dimensional convolution operation into two one-dimensional convolutional layers, allowing for a decrease in adaptive algorithm and over fitting while maintaining accuracy.

DenseNet may be thought of as a subset of the remnant neural network ResNet, which is itself a particular instance. A short-circuit link on both the front and backend layers is established in the CNNs architecture of Res Net as during training phase, allowing the gradients to be back transmitted and therefore avoid the problems of vertical vanishing and slope explosion [35]. Developed using the DenseNet 161 architecture, a dense connecting method that links all layers to one another is created. The DenseNet 161 version for the N-layer system includes a total of links, making it richer than that of the deep residual network of connectivity. In addition, every level of the DenseNet 161 architecture relates specifically the characteristic variables of all preceding levels, allowing for information recycling and greater network performance to be achieved.

3.1 Evaluation Criteria

This section offers the use of picture segmentation signals described in [52] in order to evaluate the performance of every one of the segmented techniques discussed previously. Both are fairly basic and broad assessment criteria, and the particular formulas are as follows. Both are reasonably classic and general assessment methods.

$$Overlap = \frac{TP}{TP + FN + FP} \quad (1)$$

$$Dice = \frac{2 \times TP}{2 \times TP + FN + FP} \quad (2)$$

$$ACC = \frac{TP + TN}{TP + FP + TN + FN} \quad (3)$$

$$TPF = \frac{TP}{TP + FN} \quad (4)$$

False Negative (FN) is a kind of negative result that is mistakenly interpreted as a blank sample when in reality it is a good test. True Negative (TN) is a sample that is deemed to be null; in reality, it is a collection that is also bad. False Positive (FP) samples are samples that are assessed to be affirmative when they are really blank. True Positive (TP) is a test that has been assessed to be good; in reality, it is indeed a favorable test. The favorable and unfavorable sample of the study indicate the images in the nodule region as well as the images in the non-nodule region, respectively, is for information provided in this research. As shown in the description, Common ground and Slices represent the number of crossover in between fragmented nodule area and the Support Vectors, Accuracy (ACC) indicates the likelihood that almost all images inside the a whole ultrasonic thyroid picture are correctly predicted, and TPF symbolizes fragmentation of the right part of something like the nodules that corresponds to a percentage of Ground Truth. This research, which is concerned with the precision of the divided nodule region, makes Overlap's number the most useful comparison. Whenever the overlap gap isn't quite so wide, some other three signs are given more weight than the first.

4. RESULTS AND DISCUSSIONS

4.1. Data Set

It is reported in this study that the actual ultrasonography thyroid instances received from our institution were employed in the research training algorithm described in this research. Every instance has an ultrasonography thyroid picture as well as a Xml document with different details about the picture and its location. The data contains a sequence of reference coordinates for every nodule border that has been carefully characterized by the doctor, as well as designations for different illnesses as well as the grade of a nodule in question. Outcomes of the malignant diagnosis, and so forth. Thyroid nodules of various shapes and sizes were included in the overall data set, which included 2,246 genuine thyroid nodules.

2. Data Preprocessing

A neural continuing to learn thyroid ultrasonic image classification approach is proposed in this research after combining several ultrasonic computer vision techniques. After conducting many trials, the author developed the method. Figure 3 depicts the total process, which primarily consists of data gathering, information extraction, and networking five modules, which include model development, providing complete and parameters modification, information verification and validation, as well as information implementation and evaluation. The procedure may be separated into two steps, broadly speaking.

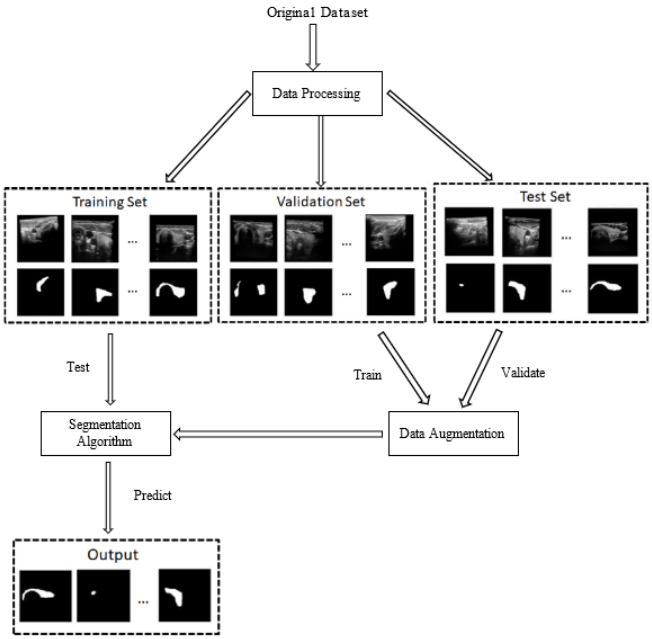

Figure 3.The general process of segmenting ultrasound pictures.

The very first step is the investigation of data transformation techniques for ultrasound pictures, which includes three phases: data preparation, data analysis, and data improvement. The second stage is the investigation of data methodologies for computed tomography. As seen in Fig. 4, data preprocessing requires the management of factors as needed, as well as the gathering of evidence and the creation of labeling underneath the supervision of specialists. Perform the data treatment next, including data filtering, trimming, pattern classification, noise removal, and testing dataset split, among other things. The last step is data enrichment. The initial data set is statistically improved, and the picture is twisted, resized, magnified, transformed, and color contrasting as a result of a mix of downloads augmentation and web improvement.

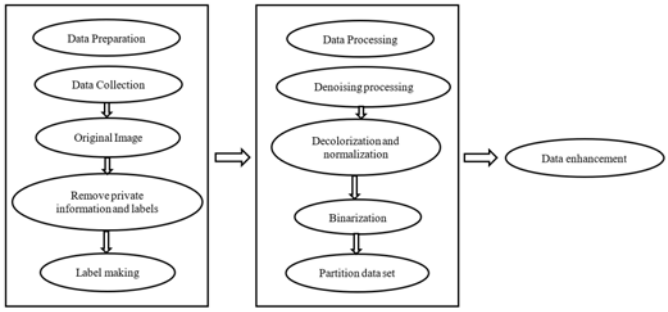

Figure 4. The flow of a technique for preparing ultrasound images.

During the second phase, researchers will investigate the segmentation technique for computed tomography, which will include the improved performance of the U-Net Baseline core network, the assimilation of an inter structure, closely packed pit convolution layers networks, focus mechanisms, the pyramid model, limited sample augmentation, a fresh transfer functions, as well as other techniques. It allows for showcase reuse, the restoration of lost contextual information, the suppression of the reaction of unimportant regions, the improvement of the success of small and medium ROIs, and the resolution of ultrasonic confidence issues such as a lack of samples, a lack of pixel resolution, distinctions, and significant variation. Furthermore, investigations demonstrate that the whole set of approaches described in this study outperforms the competition after being subjected to scientific examination and compared with several current given detailed.

4.3. Image Segmentation

The UNet architecture is a fundamental communication system for segmented. We present a novel dynamic segmentation technique for the identification of thyroid nodules that is based on flag data that was directly established by the physician as during health assessment, such as the 4 terminal locations of an entire length and the two ends of the main beam of the nodule, and that is based on the flag data. In addition, the four marking locations are utilized to lead the division of nodules, leading to the term "marker-guided U-Net segmentation model" being used to refer to this approach (MGU-Net). The first step is to determine the return on investment (ROI) of ultrasonography benign cysts focusing on 4 parameters that should include some previous information about the tumors. The findings of the analysis and testing are shown in Figure 5.

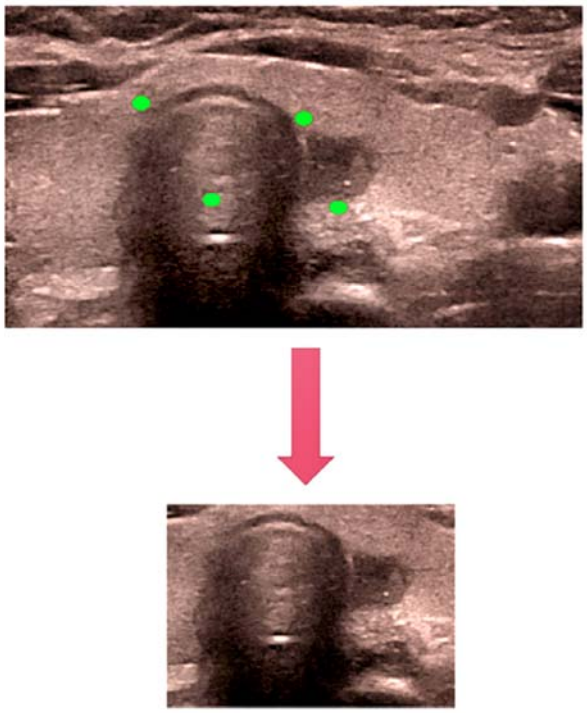

Figure 5. The ROI of the nodule was determined based on the four markers.

4.4. Performance Comparison

When all four morphological operations are tested on the very same testing set, as shown in Table 1, it is possible to simply evaluate the results of each segmentation approach. Compared to the other three models, the segmented ability of U-Net on ultrasound pictures has indeed been vastly enhanced in the situation of extremely limited learning visual information. In addition, the connection speeds of Inception V3 and DenseNet 161 is much greater than those of VGG19.

Model	Overlap	Dice	Accuracy	TPF
MGU-Net	0.9146	0.9576	0.9758	0.9534

VGG19	0.8334	0.9012	0.9486	0.8847
Inception V3	0.8467	0.9153	0.9465	0.9274
DenseNet 161	0.8541	0.9174	0.9529	0.9285

Table 1: The classification performance measures of four communication networks were compared.

In Fig. 6, you can see the segmented data achieved by using the three different approaches just on testing ROI. In the graphic, there seem to be four columns: the top column has the Ground Truth, while the final three columns provide the classification performance of the MGU-Net architecture, the Inception V3 model, as well as the DenseNet 161 prototype, respectively. By comparing the two images, it can be observed that the first contour created by Inception V3 using four designated points essentially encompasses every one of the nodules as well as a tiny proportion of the background image. Because the locations here on line segment will move simultaneously throughout the integral equation phase, the system will likely being in a state of equilibrium. The preliminary curve develops extra seamlessly, as well as it is far more hard to obtain apparent curved surface or distended corners; DenseNet 161 exhibited a major advancement in categorization performance in comparison to Inception V3, and this can extra honesty the basic shape of nodules; and when especially in comparison to DenseNet 161, the categorization outcome of MGU-Net is nearer to Ground Truth, particularly the surface as well as bulging portion of a nodule periphery.

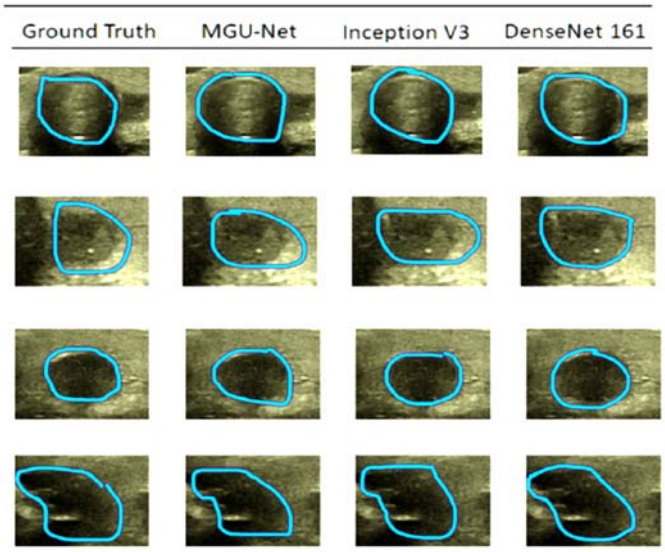

Figure 6.Ground Truth and segmented outcomes from three distinct ways of nodules are shown in the following examples.

4.5. Calculation speed comparison

Because the modeling must be delivered to scanning apparatus in instantaneously, the computation speed of a modeling framework is a significant measure of the model's effectiveness when evaluating its effectiveness. The test is carried out on 50 computed tomography of thyroid nodules that have been handpicked from either the information source like a variety of experimental groups, with the CPU and GPU carrying out the test on each of the sets. The sampling frequency with in table represents the sum of overall treatment time refers to the average treatment time, as well as the training process is the sum of overall operational hours divided by 150 learning sessions. In Table 2, you can see how the outcomes turned out. Furthermore, as shown in Table 2, the computation time of MGU-Net is significantly lower than those of other systems, and as a result, the thyroid nodule described in this article makes use of MGU-Net.

Computing Practice	Equipment	MGU-Net	VGG 19	Inception V3	DenseNet 161
Average test time /s	CPU	25.13/1.484	42.74/3.286	30.47/2.413	31.21/1.996
	GPU	2.28/0.164	4.28/0.452	3.24/0.257	3.56/0.374
Average training time /s	GPU	5	8	7	7

Table 2.The four models were compared in terms of computation time.

The use of deep learning techniques in thyroid Sonography graphics diagnosis is becoming highly advanced, as well as the field keeps going to reach the next level in its development. According to the existing machine learning connectivity new framework implementation, the majority of smart screening and diagnostic techniques for thyroid computed tomography are predicated on CNN image block coaching, which including further classification and prediction outcomes in both recognition and classification. There has also been significant advancement in compared to the original activation functions and unmonitored training techniques. Even so, there are still a number of issues that need to be addressed in the implementation of CNN with in profession of thyroid computed tomography.

One disadvantage of using an artificial image set is that the training is performed on it may not have been similar to single pictures that are lower in comparison and have complicated contoured backgrounds. It is also hard to find sufficient labeled specimens for extracting features in certain malignant tumors with a reduced prevalence, that also helps make things more complicated in these cases. In order to simulate temporal dependencies, some researchers have changed their attention towards

recurring neural networks, in which the activation of neurons may immediately act on itself at the very next commonly denoted, but on this premise, long short-term memory (LSTM) systems have been developed.

Cross-mode as well as multifaceted ensemble learning may however be a viable long term orientation for thyroid ultrasonic computer vision, and researchers have been using reduced feature point features of the image to incorporate data on approximately in recurrent neural network (RNN) methods for object recognition. Because of the progress of helps determine as well as the betterment of computation framework, the machine learning connectivity inside the ground of thyroid Sonography graphics prognosis would then create with in case of an increase precision, greater flexibility, and greater have for, thereby serving as a thorough regard for medical diagnostic and therapeutic.

Even though the tag fully convolutional tools for determining for ultrasonography thyroid nodules suggested in this study doesn't really add to the load of both the doctor's procedure, it still necessitates the physical marking of the four spots that define the nodule edge. It is envisaged that the nodule will be reached in the coming while still maintaining the precision of the classification. Fully automated segment decreases the chance of human mistake and saves physicians time by eliminating the need to do a process flow.

5. Conclusion and Future Scope

This article presents the results of extensive study into based projects used in the treatment of thyroid disorders detected by ultrasonography. Some technological advancements have already been achieved as a result of machine learning, which has been integrated with expertise in the area of machine vision as well as empirical assessments provided by medical specialists to achieve some results. It is suggested in this study to use a dot ultrasonic fully convolutional classification algorithm to separate thyroid nodules. For cases where the extracted features of ultrasonic thyroid nodules obtained by previous techniques are not optimal, this study integrates the doctor's labeling evidence received during the evaluation of a patient with the classification of the nodules obtained through the use of the comprehensive fully convolutional U-Net. The training set is matched to the test data set. The reliability of thyroid nodule classification is greatly increased in cases when there are fewer nodules.

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A Review on Performance of Concrete Using Metakaolin as A Binder and Granite Waste as A Coarse and Fine Aggregate

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Abstract

Granite fine is a product made in granite factories, while cutting large granite rocks. In concrete, granite fine is used as a filler material, which converts the ideal amount to help fill the holes in the concrete and it will increase the strength of the concrete. A large amount of material is used to test the strength of concrete by using granite fine as a composite. Concrete is made with granite fines as an alternative to fine concrete and various tests are explored and these values are compared with conventional concrete without granite fines. So while granite is a good alternative to locally available concrete, it improves the compression, tensile and flexibility properties of concrete, while also significantly offsetting the overall cost of concrete.

Keywords : Concrete, Coarse Aggregate, Fine Aggregate, Granite

I. INTRODUCTION

Concrete is the mixture that consists of three basic components: water, cement and aggregates. The mixture of these materials and their interactions determine its properties and characteristics. Thus the two phases created in concrete, from cement and water on the one hand, and from aggregates on the other, bring together many research efforts to improve the properties of concrete. The role of cement in concrete is certainly dominant as it is its main component. The technological requirements of modern constructions have brought about significant changes in the composition of cement. Many specialty composite cements have been produced, using other main components besides clinker, with the aim of improving its properties and producing high-strength concrete. Also important weight has been given to the role of aggregates and the way they "work" with cement. In fact, the interface between aggregates and hydrated cement, which "describes" the cooperation of the two materials, has been described by many researchers as the critical point of concrete. But also the chemical reaction of the aggregates with the cement components, when it happens, most of the time has a negative effect on the properties of the concrete. Many materials are used to improve the morphology of the aggregate and hydrated paste interface as well as the other interfaces created in the concrete during hydration. These materials have the ability to react with Ca(OH)2, and to produce products that pay for the pores of the concrete. They are used as additives by weight of cement and are the 4th component of concrete. The technological goal of all these efforts is to create "high performance concrete". The materials used are characterized as "high value-added materials" because they significantly improve the behavior and durability of concrete (durability), usually positively affecting other key properties. Of course, because some of the materials used have some cost, which mainly comes from their production and processing processes, the cost of construction is borne. However, the fact that the percentage of cement from the use of additives is significantly reduced - it can reach up to percentages of up to 35% depending on the material - obviously works positively in the overall cost estimate. Also the improvement of the quality of the construction and its life time are elements that in the long run amortize the construction cost. Finally, in any case, the indirect environmental relief is particularly important, considering that for every ton of cement produced, the atmosphere is charged with almost one ton of CO2.

Fine aggregate (FA) is an important component of concrete. The most commonly used is natural river sand. The Government of Tamil Nadu has recently imposed restrictions on the removal of sand from river beds due to undesirable impacts on the environment. On the other hand, the industry has accumulated granite waste over the years. Only a significant amount is used and the rest is dumped dishonestly as it is not polluted. The enormous increase in the amount of waste to be disposed of, the severe shortage of bins, the sharp increase in transport, and the cost of dumping garbage necessitate the need to use this waste effectively. The shipped work is aimed at making concrete using granite scrap and industrial waste. In doing so, it serves the purpose of reducing construction costs, and also helps to address the region's environmental issues, including its disposal issue.

Industry-generated granite waste has been accumulating over the years and is being dumped dishonestly due to environmental issues. We, therefore, use granite waste as a cement substitute in different percentages.

2. LITERATURE REVIEW

After firing kaolin at two different temperatures, 800°C and 900°C, the authors [1] prepared geopolymers from metakaolin. Its kaolin geopolymers treated at 900°C had better compression and bending strengths

than 800°C heat treated kaolin. The lower frying temperature of kaolin results in lower thermal conductivity of the geopolymers [2-3]. In another study [4] the setting time of geopolymer polymers decreases when the firing temperature of kaolin is between 500°C and 700°C, while above 700°C, it increases. A further increase in the firing temperature of the kaolin leads to a decrease in compressive strength (CS). According to [5], metacoline is said to have some effect on the CS of geo polymers before and after exposure to high temperatures (650°C –850°C). Metakaolin which is suitable for use as a building material for geo polymer products is got during firing of kaolin at a temperature of 500 to 750 C for 2 to 6 hours [6, 7].

The performance of SBR is tested in tropical climatic conditions as a concrete repair material. Since its cement mortar has shown excellent reduction in water penetration resistance [8].The use of polymers in mortar and concrete mixtures has improved properties than concrete. The study shows that 8% polymer content is added to the compression and flexural strength of cement mortar. At 3, 7, and 28 days the CS increased by 13.5%, 8.35%, and 9.12%, respectively, with a maximum flexibility (F) of 8% at 8% polymer content compared to conventional motors [9].SBR was used for the bonding layer between the old and new concrete. At days 7, 28, and 60, there was an increase in the CS of the modified samples with the bond (SBR) compared with the old concrete without using the polymer bond [10].The effect of SPR is to increase the working capacity of concrete, and the CS of modified mortar is 5% to 5% slightly higher than that of ordinary cement mortar. Polymer film formation at a ratio of 5% P/C seems to be shown in a small number of locations across small bridges. The CS of the concrete decreases compared to that of ordinary concrete [11-15].

Recently, [16] has provided extensive research on the development of stable binders using partial alternatives to cements such as slag, metakaolin, fly ash, etc., SCMs play an important role in mortar and concrete properties when incorporated at a certain ratio in the cement system. Based on the results of the reviewed research, some modifications of the SCMs improve the mortar and concrete properties through the pore structure and the pozzolanic reaction. In [17] the effects of four composite systems are examined. Compared to conventional Portland cement, quartz composite has been shown to produce more thermally stable hydration products. Recently, [18] examined the properties of slag, silica fume and metakaolin in 25, 30 and 35% of Portland cement alternatives. The development of the microstructure of the 365-day cure and its impact on mechanical strength were examined. The effect of partial change of metakaolin is explained on the performance of concrete mixes at 5, 10, 15, 20, 25, and 30%.

The effect of superplasticizer on performance can be clearly seen, despite the increase in metakaolin levels [19]. With a W/C ratio of 0.55, the hydrolysis rate of partial change was found at 0, 10, 15, 20 and 25% of metakaolin. The amount of hydration of the metakaolin pastes was specified based on the total calcium of the hydration process [20]. The sulfate resistance of modified mortars is examined by partially replacing the cement with methacrylate. Samples of the compounds were mixed with 1: 3 cement/ sand at a w/c ratio of 0.50. With regard to the behaviors of the modified motor compared to the conventional motor, it was found to prevent sulfate attack. The optimal metakaolin replacement appeared to be associated with a 10 to 15% reduction in workload, with 15% metakaolin substitution having 19.9% better mechanical performance compared to control concrete [21]. According to [22], there is a correlation between absorption, limitation of elasticity and distribution of strength.

In the study, the increase in partial cement conversion using metakaolin led to a significant increase in the amount of water required for hydration. The results show a 19.5% improvement in CS with a partial change of 10% metakaolin in 28 days. The use of 20% by weight and 10% by weight respectively as a substitute for metakaolin sand or cement improves the corrosion resistance of motor models [23].However, [24, 25] studied the effect of the use of metakaolin as a by-product of the cementitious properties of concrete.

In addition, according to [26], the life properties of metakaolin -modified concrete had improved durability. Portland cement had better frost resistance compared to it.

In another study, [27, 28] they examined the effect of converting cement by metakaolin using different W/C in 90 days. The use of metakaolin in concrete increases the rate of initial aging strength of the concrete paste. Compression strength increases with increasing metakaolin levels.

Furthermore, [29] examined the impact of metakaolin change on strength properties and the rapid chloride penetration of concrete. Models were prepared wih partially modified the cement by metakaolin. Significant improvements in CSs were observed for the cement conversion by metakaolin. In [30] research on the partial replacement of cement with metakaolin on concrete is provided. The results showed that the metakaolin mixture improved the properties by 15% and then decreased by further increase of methacholine.

In [31-34] the state of metakaolin and the properties of concrete were discussed. It was emphasized that the addition of metakaolin to concrete led to 25% strength and improved durability and lower water

permeability and agility. In [35], a test study on the modified cement mortar properties by epoxy mortar compared to acrylic modified mortar is conducted. In [36], a test study on incorporating PVA emulsion into lightweight concrete, the result shows a 20% increase in CS with 180 days of healing. The F of the modified lightweight concrete was 10% higher than that of the unaltered concrete in 28 days.

To determine the bonding effects of polymer composites to improve the strength of a wide range of concrete, [37] evaluated the properties of a wide range of concrete through testing.The positive effect of polymer are reviewed and showed three types of polymers in concrete. Polymers improve the properties of concrete, including increased CS, F and tensile strength (TS) and better improvement in chemical resistance and corrosion reduction and penetration of concrete [38].

Furthermore, [39] studied the influence of the chemical properties of polyvinyl alcohol on the initial hydration of cement. Meanwhile, [40] evaluated the use of polymers to change the functional and mechanical properties of a wide range of concrete composites. Four polymers with different chemical properties were incorporated into the mix and several tests were carried out on cementitious mortars firstly and secondly on a wide range of concrete mixtures. Results show that some polymers in general are beneficial in increasing the life of the material. In particular, polymer modified compounds have the ability to increase density by low CS to obtain a certain void level.

Polymer/cement mass ratios were studied. The work provided an impact of integrated SBR latex on the microstructure, and chloride bonding behavior of Portland cement mortar [41].In [42- 43] SPR examined SBR-modified reinforced concrete beams and it showed significant improvement in the flexural strengths of modified concrete. In [44], as noted in previous research, the bending strength of concrete with 5% SBR significantly increases with CS, and replacing cement with SF improves the F up to 7.5%. The effect of applying SBR polymer is studied on concrete in conjunction with fly ash and SF [45].

Most recently, [46-47], explored that replacing 15% cement with 5% optimal polymer and metakaolin creates an optimal concrete mix for durability and strength.The effects of polyacrylic esters and silica fumes are tested in varying amounts on cement mortar [48].

Portland cement mortar was tested with 100% Portland cement mortar at 7 and 28 days with 30% metakaolin 15% lime and improved mechanical properties [49]. The influence of cement type and plasticizer additives on concrete is explored. Research shows that the type and amount of plasticizer plays a significant role in cement in concrete [50].

According to [51-55], the impact of aggregate types on the strength of concrete is most significant in high-performance concretes. For high-strength concretes, higher flexible strengths are obtained with basalt and lime aggregates compared to normal gravel aggregates. Concrete made of limestone may have relatively high strength due to the intermediate chemical reaction between the cement and the coarse aggregates.Their study showed that the compression strength increased by 22%, replacing 35% of the aggregates with granite fines. By increasing the granite fine to 50% the CS will be only 4%. The split tension strength is equal to 0%, 25% and 35%. The 5% shift has a strength of 2.4% and the 15% shift reduces the TS. However, by changing the 35% granite fines, it can be concluded that the test results did not show a decrease in strength compared to the sand mixtures [56].

They founded with the addition of metakaolin cement compared to conventional concrete. The ideal percentage for conversion by metakaolin is 10% to 15%. The mechanical properties of concrete are improved by partially changing the metacoline and granite dust. The CS of concrete is 15% MK and 20% GP in concrete [57].

Studies showed that the CS of concrete is increased by increasing the granite powder content. At 7 and 28 days the strength decreased from 0 to 7.5% and from 7.5% to 10%. The TS of composite concrete is found to be 0 to 7.5 % by replacing cement with granite powder. However, the STS of concrete increases with the granite powder content and can be seen to reach an optimal value of 7.5%, then decreasing to 10% at 7 and 28 days [58].The following observations and conclusions are drawn from this study they conducted based on experiments performed on six beam models. G.P. A load of failure was high, which was the controlled beam when the test was increased to 28 days. As a result of this investigation, 25% GPS can be used as an alternative to better concrete self-compact high-performance reinforced concrete beams [59].

Their study shows that, in terms of their F, in the early stages of curing, even after natural sand has been replaced by granite powder. The next phase of curing allows 28 and 56 days to increase the new strength with a GB% increase, but not to the conventional concrete level. Performance is just as good as regular concrete. Granite masses can therefore be considered as a substitute to FAs [60].Their findings from experimental studies demonstrate that the mechanical properties of granite powder strength can be considered as a partial alternative to sand. . Adding 30% with granite fines proves that the concrete mix is better compared to other ratios. CS, especially with reference compound (GF0) for all ages, increased during the healing days. The CS with 30% granite fines gave a higher value compared to other values [61].

In this study they established the STS for compounds containing 5% granite waste. Control compound. Increasing the conversion rate of cement by 10% led to a value for the equivalent STS measured for the control mixture. However, TS is measured when this ratio is high. Converting granite waste in the concrete mix at a 25% conversion rate led to higher values of TS separation than obtained from the control mix [62].In this study, they established the a test study of high-performance concrete made from granite powder, which contains 7.5% silica smoke, 10% fly ash, and 10% sludge instead of cement [63- 67].

In this study they established the CS of concrete increments by converting granite powder waste to 7.5% and this is comparable to normal concrete. The work efficiency is very good for different percentage of cement replacement [68].The study show that the concrete mixture replaces the cement with 15% granite dust powder from the abstract test results they have established. 7 days and 28 days curing tip greater CS than concrete mix. When analyzing the test task, the most important factor to consider is cost analysis [69, 70].In this study they concluded that replacing 10% sand with granite waste gave higher CS to all ages compared to the control mix. Replacing 5% cement with granite waste resulted in a slight decrease in CS (approximately 5-9%) [71].

3. CONCLUSIONS

Based on the test of CS, STS, and workability of concrete, strengths such as compression, STS, flexibility and workability have been shown to be increased by partially replacement of granite powder.

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Predicting the irradiation effect on solar power plants and optimum performance evaluation model using Machine learning

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Abstract.
Power harvesting using solar power is the recent trend and innovations happening in deploying many types of equipment working with solar power. This is harmless and greatly reduces pollution and is eco-friendly. The government also provides more concessions for establishing these solar power harvesting methods. There are two subsystems in solar power generation like sensor management systems. The subsystems have to be managed by predicting the power generation and identifying the right time for panel cleaning, and maintenance. In solar power generation systems, it is necessary to identify the faulty equipment and replace it for robust power generation. In the proposed article we are predicting the effect of ambient temperature, and module temperature on irradiation of the solar power generation system using the Weka machine learning tool using algorithms like SMOreg,Linear regression, KNN, and Multilayer Perceptron. The prediction model predicts the solar power irradiation with Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) of 0.0294 and 0.0558 of the Ambient and module temperature respectively. The prediction of irradiation in the solar power plantwill be helpful in grid maintenance, efficient use of accessories, identifying and servicing the sub-optimally performing unit to increase the daily yield, and reducing the operational cost.

Keywords. Solar power plant, Sensors, Ambient temperature, Power generation, Weka, ML, SMOreg, Machine Learning(ML), Renewable Energy,Regression, Power Generation.

1. INTRODUCTION

The advancement of human civilization has resulted in fast industrialization, which has been accompanied by urbanization and globalization, resulting in increased global energy demand. Conventional energy sources, which face rapid depletion, appear to be unable to meet soaring energy demand on their own. Solar, as a ubiquitous and environmentally beneficial source of renewable energy, has become one of the most widely used power production technologies in a variety of applications. To get the most out of a solar photovoltaic (SPV) system, it needs on be set to maximum power generation. The existence of life with sustainable energy is almost very difficult and the harvest of energy with an alternative source is very important in the context of developing countries, the conventional method is predicted to be extinct concerning time and globalization.The socio-Economic of a country greatly depends on the consumption of energy andalso has a direct impact on the economic growth of a country. Energy harvested has different forms la like thermal power plants, nuclear power plants, windmills, and so on. One of the trending methodologies of harvesting power is solar power plants. A country like India is best suited for establishing a solar power plant. Sun energy is available in abundance and can be transformed from solar energy to electrical energy. Since energy can neither be created nor destroyed. Methane, biogas is one of the most commonly used power from fossil fuels to generate energy which is very costly for establishing, comprehensive, unreplenishable, and decreases day by day. As a part of sustainable resources,India has stepped into solar power harvesting which is one of the renewable energy resources replacing fossil fuels and other types of power generation to meet the thirst for energy. This solar photovoltaicmethod of energy is relatively very cost-effective, and eco-friendly compared to other chemical or oil-based electricity generation. Hence in our near future, Solar power plant is believed to be the most effective, efficient, and sustainable type of energy generation and null effect on environmental degradation. Solar electricity, in general, is becoming more economical every year. Solar panels have cheap operational expenses compared to other power generation technologies since they can create a huge amount of electricitycompared to other power generation technologies since they can create a huge amount of electricity without compared to other power generation technologies since they can create a huge amount of electricity without the use of fuel. Another benefit of solar energy is that it is scalable, meaning it can be used to power a single residence or an entire factory. Overall, the sun emits undeniably more energy than we require; yet, the ability to convert it to electrical energy cost-effectively and in a cost-effective manner and to store electricity for nighttime and rainy days is a limitation. Solar power is a CO2-free, renewable energy source that has a substantially lower environmental impact than other power generation technologies. The key elements that affect the environment are the unique materials necessary for solar panel production, location, and the water required for solar panel cleaning[3-4]. The efficient use of solar panels, inverters, and grids in large-scale solar plants will reduce the cost and space necessary to generate the required power, reducing the environmental impact. Machine Learning (ML) methods will be increasingly beneficial in evaluating and generating models from solar plant data tomaximize hardware use.

Our context of studies in this paper goes along the following steps: Firstly, the data collection from Kaggle is taken as such as plant sensor data of power plant 1. Next, the data is preprocessed to nine different features as mean,maximum,minimum,Variance, Standard deviation, kurtosis, Skewness, RMS, and Trimean is evaluated over a wide range ofdata, and the best possible acceptable performance within the set threshold is sought for getting the final optimal model. Secondly, the data set acquired is preprocessed using the Weka tool usingthe election module []. Training is performed by building a model and training the model with 66% of data with 10 cross-validationprocesses. The third step is the classification

of the data set using some of the pre-selectedclassifiers and the result is being tabulated for its performance accuracy and mean square error in classifying the output class with the remaining44% of the data. Finally, the performance evaluation criteria for checking for better performance and attainment of an optimum model. Moreover, this model has the capability of giving irradiation level that affects the solar power generationat different irradiation level as predicted by the dataset information.

2. RELATEDWORKS

Singh, Sarabpreet, et al.(2012)applied the ambient air temperature that will degrade the entire efficiency of the power plant. In this article, it is finalized with the result that 5 – 40 degree rise in ambient temperature caused an 11% decrease in mass flow rate, net output flow by 24%, Plant efficiency by 11and %, and an 18% decline in net output power. Finally the reduction in plant capacity by 8MW in summer due to an average rise of 40 degrees rise in ambient temperature [1]. GünnurŞenet al. (2018) proposed seasonal temperature variations havea great influence on GT,ST, and CCB. The range of 8-23 degrees causes 15.4 MW energy loss, on enhancing the CCPP to give maximum power output by the conventional controllers the output power decreased with rising in temperature by 30.4MW for a raise in temperature to 23 ° from 15° [2]. Najjar, et al.(2020) proposed the performance is evaluated using statistical analysis, The Thermal power plant's four parameters like availability, reliability, capacity factor, and thermal efficiency are considered using mathematical modeling compared with the international best practices and the target values [3]. M. Ferri et al. (2010) applied energy harvesting using light energy by using integrated micro solar cells and the energy is stored in an external capacitor. The capacitor relates to the load for a predefined period slot. This proposed systsystem'serimentalreresulthows that this is best suited for discrete-time regime applications.[4]. S. Ghosh et al. (2014) proposed the solar energy harvesting technique is employed to generate high voltages from integrated photodiodes. This paper presents two switch transistors and solar energy harvesting using ICs. Switched inductor DC to DC [5]. Pathak et al. (2020) proposed in this articlethe efficacy of a solar photovoltaic system using the MPPT algorithm, this is also an automated control systemusing the solar intensity and temperature. The experiment involved uniform solar sunstroke concerning time and Global MPPT[6]. MO Lukyanov et al.(2021),applythe legislative rules and regulations for harvesting renewable energy and introduce the penalties and imbalances faced by the producers. This article focuses on the forecast and implementation latest technology and energy storage systems. Using MATLAB Simulink, the theoretical relations with input dataand a model predict tests its operability[7]. Md. Bengir Ahmed Shuvho et al.(2019) proposed Life with sustainable energy is becoming unimaginable and we must switch over to an alternative source of energy such as the solar power plant and the performance evaluation using Fuzzy logic controller for solar irradiation, ANN for the grid-connected to 80KWp investigations and sun simulator test [8], many literatures discussed on solar power plant using Machine learning algorithms [13-16].

3. MATERIALS AND DATA DESCRIPTION

The proposed article is working on the Kaggle data set [9] which contains two sets of information one give the power generation data and the second one gives the sensor panel data from a solar power plant. The data is collected from the inverter wherein it is connected to an array of solar panels, the sensor data is collected from the optimally placed sensor at the plant every 15 minutes both the power generation and the sensor data or tabulated and given in this public data set like Kaggle.[9]

Variant Modes Features Extraction: In this study, for each mode, we have extracted the statistical features of variability quantifying the variables. The Table shows the statistical significance of the mode. For each mode, the computational statistical feature results in 9 different features with the resulting data set are 425 by 19

Feature number	Descriptive Statistics	Description
1	Mean Value MEDIAN(Array)	The central value of the distribution
2	Maximum value MAX(Array)	The maximum value in the data selected range
3	Minimum Value MIN(Array)	The minimum value in the data selected range
4	Variance VAR.S(Array)	Variance quantifies the deviation of data from the mean value in the data selected range
5	Standard deviation STDEV.S(Array)	Quantifies the amount of distribution each value in data has from the mean.
6	Kurtosis KURT(Array)	Quantifies the peakedness in the data[15]
7	Skewness SKEW.P(Array)	the symmetry in the dataset is quantified[16]
8	Root mean square SQRTPI((SUMSQ(Array)/COUNTA(Array)))	Quantifies the strength of variations in the data.
9	Trimean TRIMMEAN(Array,Percentage)	The mean of data excluding the highest and lowest 50% of the data points

Table 1: Variant mode feature extraction on weather sensor data

The power generation and the sensor data are collected for some time and date. To obtain a relationship between the sensor and the power generation of the Solar Power Plant at a particular time with varying intensity of light from the sun which has a direct relationship with the power generation. The table shows the distribution of Power Plant data for 34 days and every 15 minutes.

Variants	Ambient Temp ºC	Module Temp in ºC	Irradiation
Mean	28.0549	32.5802	0.2328
Variance	0.9887	12.0260	

Standard Deviation	0.8117	2.5227	
Kurtosis[15]	-0.5834	-0.4273	
Skewness[16]	0.044	0.1782	
Trimean	28.0568	32.588	
Maximum	29.2704	36.7395	
Minimum	26.8854	29.2872	

Table 2: Data validation in variant mode using Weather sensor data

3.1 Data Preprocessing

The data pre-processing is done using the weka tool by choosing the preprocessing we can discard all the irrelevant, outliers, and incomplete data transformation. The data is stored in comma-separated value file format (CSV) which is the explorable format in weka. The description of the data present in the data set of power generation is as follows:

i) Date and time of the reading recorded, Plant ID for the plant, Source key of the plant, Temperature at the plant, Solar Panel Module temperature, Solar panel Ambient temperature Irradiation for every 15 minutes duration,

ii) The data is normalized using the pre-processingin weka tool which Normalizes all numeric values in the given dataset (apart from the class attribute, if set) before analyzing and classification of the built model using machine learning algorithms.

iii) The Variant mode features are extracted for the available data set and analyzed in the weka tool for building a model and predicting the correlation coefficient and error evaluations.

4. EXPERIMENTAL ANALYSIS AND PREDICTION MODEL:

The main experimental setupcomes from the Kaggle dataset, which contains a system of 2 solar power plant datasets in a comma-delimited format, and the output class chosen is irradiation soambient temperature and module temperature are the two categories that affect the irradiation in solar power plants.

4.1 Experimental setup

The collected data is pre-processed in the weka tool for the implementation of the machine learning algorithm with the Normalized weather sensor dataset. Data is classified using selected classifiers such as Linear Regression, SMOreg,IBk, and Random Forest. The next step in the advancement is to check for a better correlation coefficient, very less Mean square error, root mean squared error, relative absolute error, and Root relative squared error. We go to the preprocessing step called attribute evaluator, Kernel selection, and Neighbour selection for increasing the performance and decreasing the error percentage are performed with the same base classifiers and the level of precision is checked. If the threshold is reached, the model attained is an optimal model.

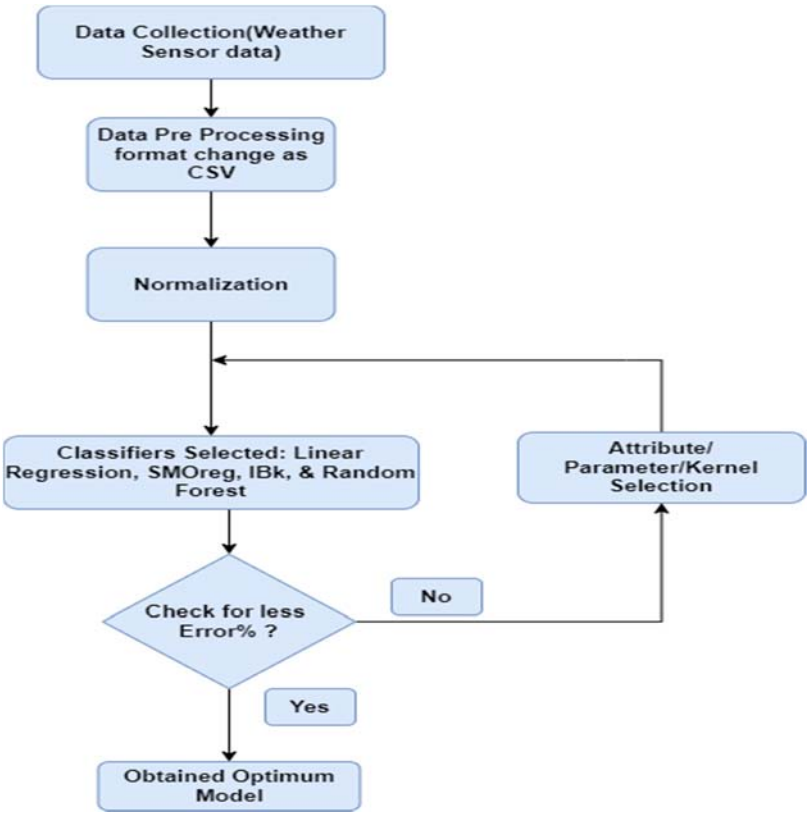

Figure 1. Experiment flow diagram

Figure 1 illustrates an experimental flow diagram starting from the data collection, format changing for exploring in the Weka tool with nearly 425 instances 19 attributes. First, the data is normalized in preprocessing step in the wekatool and the classification begins by building a model for the selected base classifiers. The next process is decision making by adjusting the attribute selection in linear regression as the M5 method and Greedy method for getting less percentage of error and enhanced

correlation coefficient. In SMOreg the kernel like Polykernel and PUK kernel is selected out of these two PUK worked out to be best, IBk is instance base classifier the

Weka 3.8.5 (Waikato Environment for knowledge analysis) is one of the popular machine learning software written in Java that was developed by the University of Waikato, New Zealand, open-sourcesoftware available under the general public license.[12] Weka is a graphical user interface way for learning machine learning. It is a collection of machine learning algorithms for performing datasets directly or it can be called from Java code. It also contains tools for data preprocessing, classification, regression, associated rules, clustering, and visualization.[12]

Figure 2. Normalized data distribution in weka3.8.5

Figure 2 shows the visual distribution of Normalized data which is 19 attributes and 425 instances [12].The proposed experimental setup is for the structure of building a model to estimate or predict the irradiation level.The selected classified are linear regression model function category, SMOreg model from function category IBk in the lazy category, and random forest from Tree category using weka tool.

4.2 Designated Base Machine Learning Algorithms

Selected two classifiers are from the set of supervised learning algorithms to fit our modeling procedure and their knowledge and modest implementation foremost to easier clarifications.

4.2.1 Linear Regression:

Linear regression is one of the popular machine learning algorithms usually used for the statistical method of predictive analysis decision-making predictions for continuous data sets, real or numeric variables such as salaries, age, product values, and sensor's timely varying values and so on. The linear regression algorithm follows a linear relationship between the dependent variable and independent variables and is hence called linear regression.

$$Y = a_0 + a_1 \times \qquad (1)$$

The formula for calculating the mean square error is as follows:

$$MSE = 1\frac{1}{N} + \sum_{i=1}^{n}\left(Y_i - (a_0 + a_1 \times i)\right)\text{^}2 \qquad (2)$$

Where N is the total number of observations Yi is the actual value and (a1xi+a0)=the Predicted value.

4.2.2 SMOreg:

SVM (Support Vector Machine) to carry out the estimate of one-variable persistent and restricted genuine capacities characterized in the scope of reals through PUK portion (Pearson VII capacity based Universal Kernel); the goal is to show the way that exemplary AI relapse can accomplish intriguing degrees of exactness with incredibly short learning times.

4.2.3 4.2.3IBk Instance base classifier:

One of the conventional calculations in the AI idea is the closest neighborhood calculation, where the information is dispersed in the hyperdimensional space, and the calculation occurring relying upon the "k" closest neighbors by basically duplicating the names of the load with next to no particular impacts on calculation for the forecast. Even though it is computationally concentrated, it is exceptionally simple for execution.

4.2.4 4.2.4 Random Forest:

This is additionally a prestigious sort of tree classification AI calculation. The group AI calculation in weka. make numerous choice trees and union them to get a more precise and stable forecast. These choice tree-based indicators are most popular for their computational power and adaptability. Nonetheless, on account of profoundly uneven preparation information, as is many times found in information from clinical examinations with enormous benchmark groups, the preparation calculation or

inspecting strategy ought to be changed to further develop the forecast quality for the classes. minority. In this work, a balanced random forest approach is proposed for Weka 3.8.5.

5. RESULTS AND DISCUSSIONS

5.1 Evaluating the Performance Criteria

The performance metrics are obtained from the prediction patterns generated by the applied classifiers, which are reflected in the available inputs in the confusion matrices. Evaluating the performance by building a model using machine learning algorithms

Selected Classifiers	Time to build the model	Correlation coefficient	MAE	RMSE	RRSE	Root relative squared error	No of Instances
Linear Regression Model	0.03	0.9881	0.0329	0.0468	12.62%	15.35%	425
SMOreg(PUK)	0.32	0.9903	0.0241	0.0424	9.23%	13.89%	425
Ibk @k=3	0	0.9831	0.0306	0.0561	11.72%	18.39%	425
Random Forest	0.26	0.9874	0.0274	0.0483	10.50%	15.82%	425

Table 3:Experimental results of the built model

Table 3 is the consolidated results of all classifiers with changes in attribute and kernel changes for obtaining minimum error.

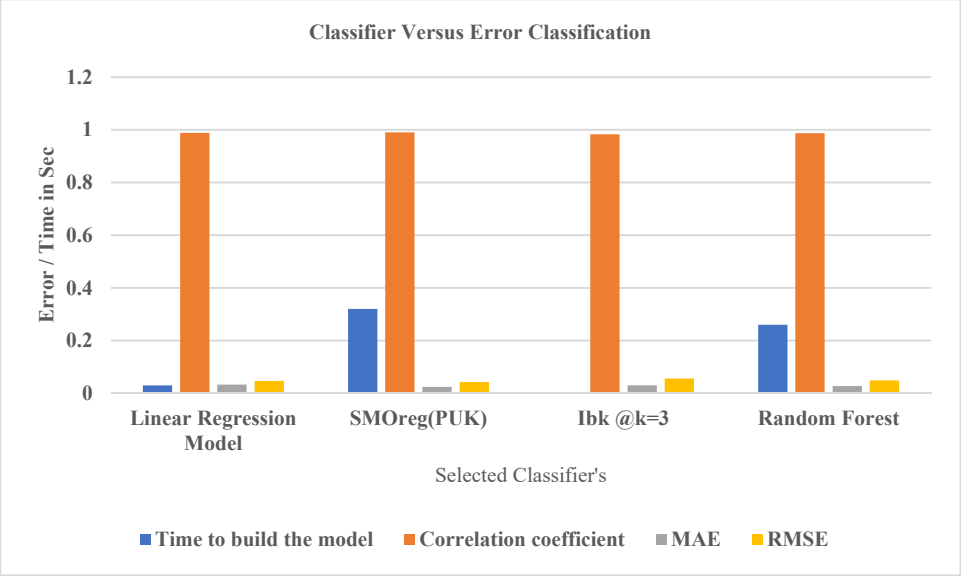

Figure 3. selected classifiersfor the error and time to build the model

Figure 3 illustratesa similar correlation coefficient obtained for all the four different ML algorithms that are in the range of 0.9831 to 0.9903 for Instance-based classifier and SMOreg respectively. The Instance-based classifier has taken negligible time to build the model, SMOreg ML algorithm has taken more time of 0.36 seconds compared to all other classifiers. The mean absolute error is 0.0241 to 0.0329 for the function-based classifier's SMOreg and Linear regression ML algorithms. The root mean square error value is also in the range of 0.0424 to 0.0561 for SMOreg and Instance base Classifier.

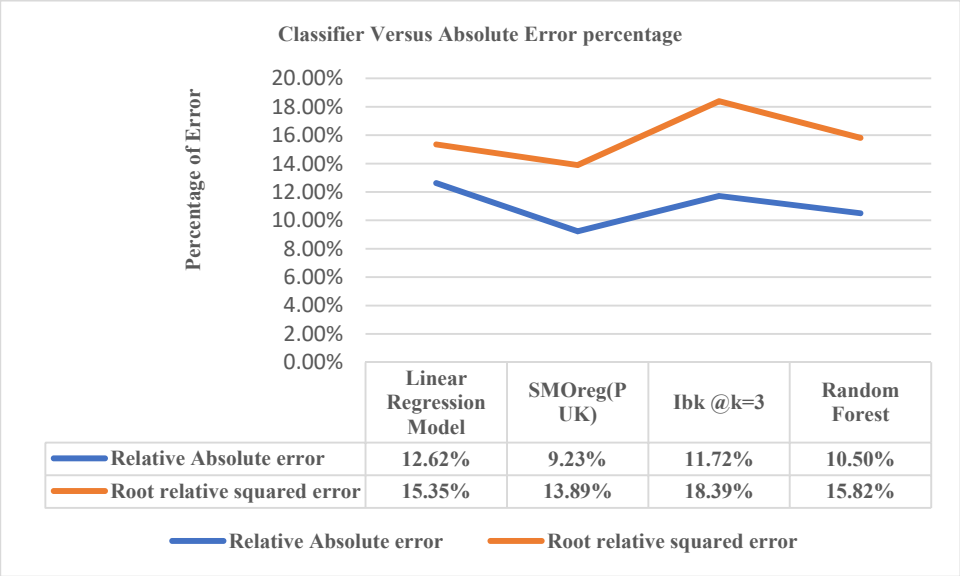

Figure4. Classifierconcerning the percentage of error characteristics

Figure 4 illustrates the Selected ML algorithms versus the relative absolute errorpercentage(RAE) and the Root relative squared error percentage (RRSE). The range of RAE is 9.23% to 12.62% for SMOreg and Linear Regression ML algorithm. The Root relative squared error lies in the range of 13.39% to 18.39% for SMOreg and the Instance-based classifier IBk ML algorithm. Overall the optimum model that is considered with minimum error is the function-based ML algorithm SMOreg.

6. CONCLUSION:

Solar Energy harvesting is one of the favorable alternate energy resources in the declination of ecological energy resources. This prediction of irradiation in photovoltaic energy resources using machine learning algorithms gives a model that predicts the irradiation with very less error and a good correlation coefficient of 0.9903 and RMSE of 0.0424. Future research examinations can be conducted on mapping solar potential in the fuzzy logic ANN (Artificial Neural network) model or go into deep learning techniques.

7. FUTURE RECOMMENDATIONS:

Stability analysis of the fuzzy logic and ANN models will be carried out in the future for verifying the meeting stability criteria of these results. Fuzzy logic and ANN models can be utilized to break down a mixture of sustainable power for future energy emergency alleviation. Notwithstanding that these techniques can be used to plan the executive arrangement of an Earth-wide temperature boost and environmental change difficulties.

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Anaerobic Treatment of Food Waste for Energy Recovery – A Floating Drum Anaerobic Digester

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Abstract.
The main objective of this study was to develop the anaerobic process for the treatment of canteen waste from the food waste. It is carried out in a one cubic meter floating drum anaerobic digester. The process includes inoculum of cow manure and start-up of the digester under mesophilic condition. This continues anaerobic digester is studied at different NaOH addition, agitation time, loading rate. The floating drum anaerobic digester is of 1 cubic meter capacity and it is observed continuously for 6 weeks (42 days). At steady state, the efficiency of the floating drum digester is produce biogas yield of 0.628m3 for loading rate of 15kg. The results showed that the biogas yield contained a maximum methane (CH4) content of 64.99% in mesophilic anaerobic digestion with temperature of 36°C.

Keywords. Anaerobic Digester, Biogas, Canteen waste, Food waste, NaOH

1. Introduction
Biogas is one of the renewable energy resources that are commonly obtained by the fermentation of rice straws, vegetable wastes, cotton waste, garbage waste, human waste, animal waste, food waste, dairy waste, industrial organic waste, used to produce bioenergy [1].The biogas price is very low and otherwise technical requirement is not very high. [2]Therefore biogas generation is very economical one and high value of market potential. Generally we know that renewable energy is says the important of wind, biomass, solar and tidal energy so this kind of energies developed and it is planned to enhance the energy generation on a priority needed. The biogas production mainly concentrate on of 50–60% of methane yield is obtained from the free oxygen - bio105 chosen of biomass like animal dung, plant residue, food waste, etc. Anaerobic digestion process is suggested that wide spread and well proved technology to create organic materials at waste technology. [3]AD (Anaerobic Digestion) method only controlled on some important parameters like as pH range slurry, temperature of digester, organic loading, some other ways to improve the digestion using some pretreatment types. Currently, the nanotechnology is developed in AD has shown excellent results and increased production rate in microbes in recent years.[4] In the many survey, it is suggested that the inclusion of nanoparticles (NPs) developed number of methane generation(CH4) from 21.5% to greater than 150%. Anaerobic bio digestion of organic matter (OM) has always important one due to the time-consuming in bio114 disintegration process. NPs have been proved as biodegradation enhanced due to their unique properties of physicochemical. [5] Therefore, Urea capped Fe3O4 nanoparticles (U–Fe3O4 NPs) are attractive materials to enhance Methane gas production. The various types of temperature used for biogas production in the anaerobic conditions example psychrophilic period above 30˚C maintained at digestion days,[6] mesophilic period above 30 to 45˚C and thermophilic period temperature around 46 to 60˚C but anaerobic bacteria's present in the thermophilic as well as mesophilic periods of digestion periods. Agitation is one of the main period for contact the bacteria as well as substrates with help the exit in liquid. Main role of the stirring is eliminate the scum generation its causes of capacity of the bio digester.

2. Experimental Setup and Materials
The anaerobic digestion process a floating dome bio reactor at gas holder type is carried out the research work. The bio reactor makes from fiber material, size of 1m3and the cumulative volume of the bioreactor is 1000 Littreat overall all gas store is 700 liters. The bioreactor inner and outer slurry temperature is monitored

withheld by thermocouple probe type device. Waste slurry is stirred used agitator for the daily basis using the electric timer with compressor pneumatic type. Figure 1. shows the Floating dome anaerobic digester and In this experiments conducted using the catenae food waste 5 to 15 kg randomly and similarly added the NaOH solution of waste inlet slurry 2 to 8 %, the agitator device is used to stirrer slurry for every 5 to 20 mines it is used to enhanced the biogas and methane production.

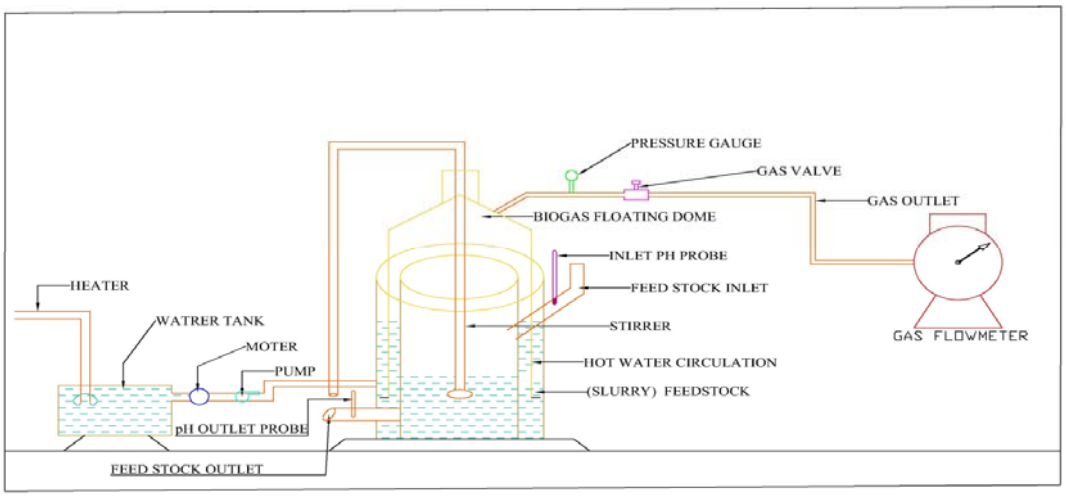

Figure 1. Line diagram of Floating dome anaerobic digester

The bioreactor temperature is monitored from inner also outer at time of digestion using the different thermocouples, it's measured digitally. The research work is initiated and then after methane are measured weekly bases by the help of Wet Type Bio Gas Flow Meter at duration of six weeks of bio digestion. Similarly another way of other method the gas production is monitor at 42 days. The pneumatic agitation unit is mainly used to stir the digested slurry day bases and digested slurry is obtained from the digester may be used as an organic bio fertilizer.

3. RESULT AND DISCUSSION

The Figure 2. result is indicated that the maximum biogas is achieved at the 5th week of digestion 0.63m3 at 6 % NaOH solution is added in the digester inlet slurry. The synergistic development is very important for biogas production higher balanced with nutrients also enhanced buffering capacity of co fermentation process. In this research alkalinity level is gradually declined because of NaOH solution added during the incubation periods.

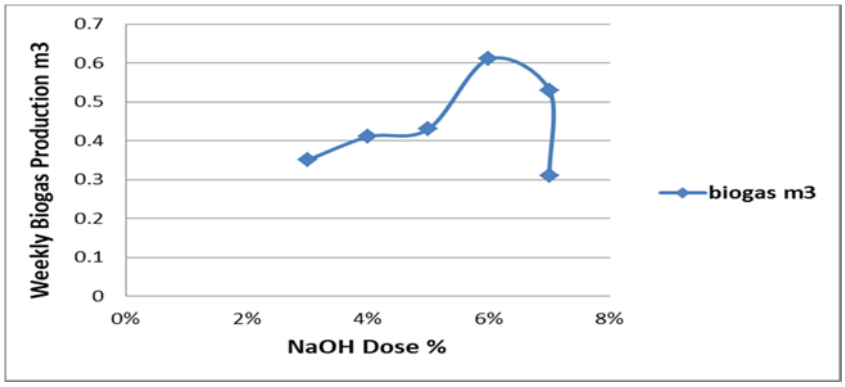

Figure 2. NaOH addition with Biogas production

Similarly Figure 3. Shows the quantity of methane content for the sample is maximum at 6% of NaOH addition; in this case the methane content is achieved at 42 % at last week of digestion. The [7] C/N ratio is one of the most important stages of methanogens production in this case the carbon as energy growth of microorganisms and nitrogen is one of the energy source for structural growth of microorganisms from the digestion.

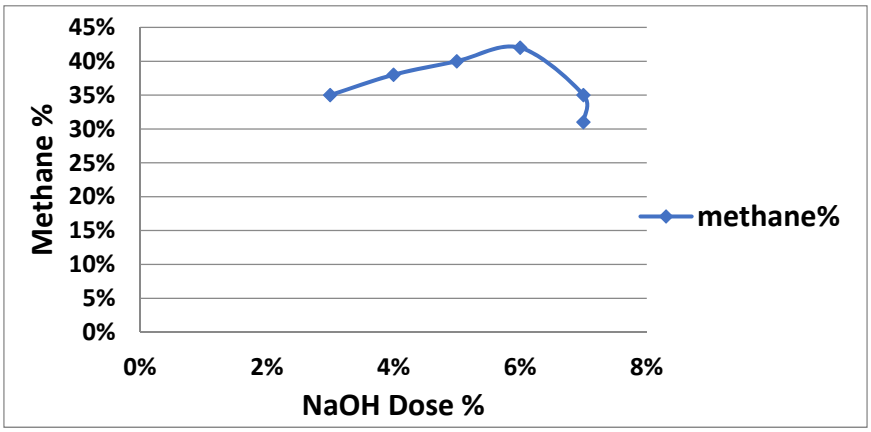

Figure 3. NaOH addition with Biogas production

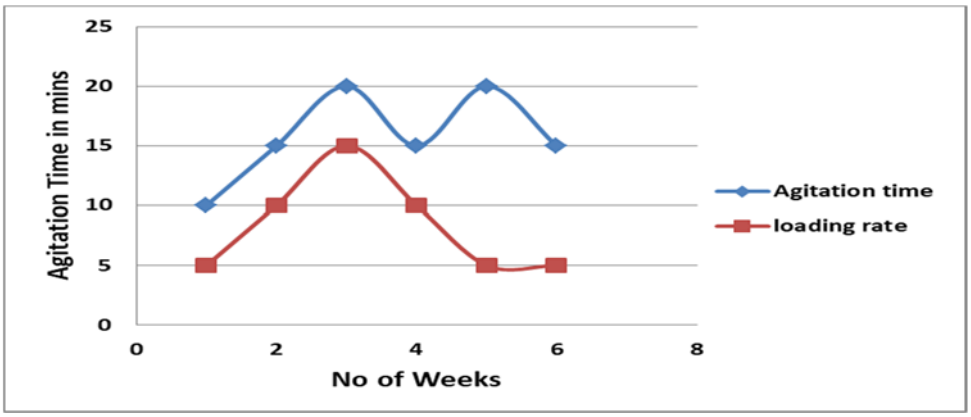

Figure 4. Agitation time with Different loading rate

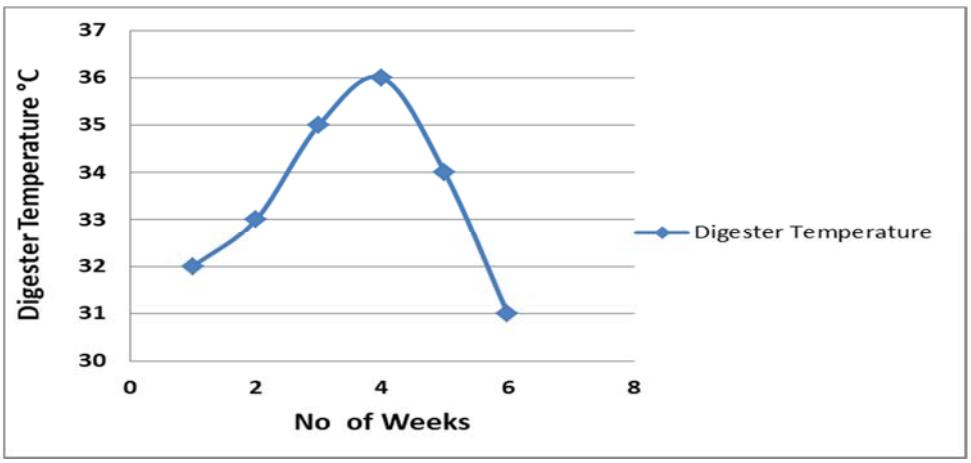

Figure 5. Digester temperature with respect to weeks

From graph figure 4 and 5 shows the Agitation time with different loading rate and digester inlet temperature of slurry. In the graph represented that the 20 minutes with 15 kg is received the maximum biogas and methane yield. Agitation is most developed stage in anaerobic digestion to enhance the adequate contact with bacteria also substrates and it is one of the cause of out of the gases from digester. A further increase the loading rate then plant achieves a maximum gas production. [8-10] The importance of biogas cleaning and upgrading methods is including product purity as well as impurities, biogas recovery and loss, development efficiency and the investment with operating cost.

4. CONCLUSION

The research studies conclude that the canteen waste might be one of the best way of produce the efficient biogas with NaOH chemical pretreatment under anaerobic bio digestion process. The digester working in mesophilic condition is concluded with high amount of biogas yield and quicker reaction rate at the NaOH addition with agitation. In this research conclude that the food waste is used to bio methane production is create pollution less also eco-friendly environment in the region. Present day's biogas production provides more environmental with social benefits, but still adopted at minor rate when transferred to rural households at developing countries.

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Performance Analysis on Smart Solar Grass Cutter with Lawn Coverage

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Abstract.
The intelligent grass cutter system is a proposed method for the future of lawn care. The robotic vehicle's engine is coupled to a grass cutter blade, enabling the equipment to spin at very high speeds. These systems are designed with a clever functioning technique that enables them to cover a complete lawn by finding the edges using an ultrasonic sensor and then traversing the grass in a zigzag pattern. This capability is made possible with the aid of a Micro-controller based circuit, and the powering of these systems is provided by two AA batteries. The DC motors that propel the vehicle and the lawn cutter are both powered by separate batteries. Similarly, the system relies on solar panels for both development and battery charge. The Micro-controller is responsible for coordinating the dc motors that propel the vehicle and the grass cutter, as well as for keeping an eye on the ultrasonic rangefinder. In response to ultrasonic inputs, the micro-controller intelligently manipulates the dc motors, therefore assisting the motor driver IC in reaching the required position. To ensure that the whole lawn is watered, these systems include a gyro sensor that allows a maximum turn radius of 180 degrees. That means it runs on fossil fuels like gasoline and diesel. We employ solar energy, a sustainable source of energy that also helps to save on power costs and requires less work from the human side of things.
Keyword. Ultrasonic sensor, DC motor, Gyroscope sensor and Micro-controller.

1. INTRODUCTION
1.1 General Grass Cutting Techniques
Edwin Budding of England is credited with inventing the first practical lawn mower in the 1830s. Budding's mower, a better alternative to the scythe, was patented in Britain on August 31st, 1830. It was designed to cut grass of various types on large lawns and gardens.

The original machine for planting seeds is 480 millimetres wide and has a wrought iron frame. Mowers need to be pushed from behind to operate. Transmission of power from the back roller to the cutting cylinder occurred through Cast-iron gear wheels, with a 16:1 ratio enabling the rear roller to drive the cutting cylinder's blades. Cutting height was adjusted by inserting a second roller between the cutting cylinder and the main or land roller. Grass cuttings were launched forward into a tray-like container. It was quickly understood that the machine would be easier to pull if there was another handle up front. Amazingly comparable to today's mowers, these devices were really astonishing [1, 2]. Because it is the impetus for the present way of preparing fields, sports ovals, grass courts, and so on. As a result, numerous sports, including football, cricket, tennis, baseball, and others, adopted current sets of rules [3].

Figure 1. Lawn mover

1.2 Smart Solar Grass Cutter With Lawn Coverage:

Generally Grass cutters have become very popular for now a day. Many of the times, grass cutting machines are used for soft grass furnishing. The technology is merging along with environmental awareness. Then consumers are looking for the view to contribute to the relief of their own carbon footprints. One of the cause is population is man-made and can be seen in our own daily lives, more specifically in our own house. Here, we initiate the model which is Automatic Grass Cutting Machine generated through solar energy, (nonrenewable energy).These models eliminate both the environment as well as noise pollution.

The operation of solar grass cutter has a panel arrangement in a way that can receive solar radiation with high intensity directly observed from the sun. The solar panel changes to solar energy into electrical energy. This electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panel while batteries are charging. This motor is connected to batteries through connecting wires between these mechanical circuit breaker switch is provided. The main breaker switch is used to start and stop the working of the motor. From the motor, power transmits to the mechanism and this makes the blade to rotate the shaft and cuts the grass.

The designed solar power lawn mower comprises of direct current (d.c motor), a rechargeable battery, solar panel, a stainless-steel blade and control switch. Rotation is achieved by the electrical motor which provides the required torque needed to drive the stainless steel blade which is coupled to the shaft and gears to the motor. Gears are used to increase the rpm and to reduce the power consumption. The solar power lawn mower is a operated by the switch on the board which closes the circuit and allows the flow of current to the motor which in turn drive the blade used for mowing. The battery recharges through the solar charging controller and performance evaluation of the developed machine was carried out with different types of grasses.

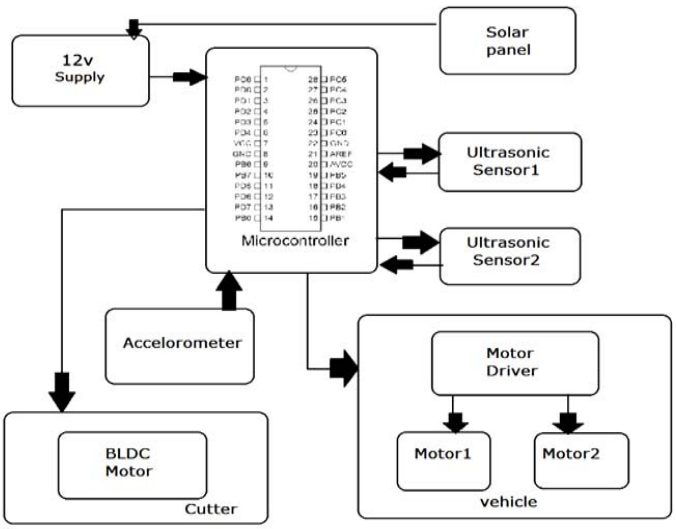

Figure 2.Block diagram

2. EXPERIMENT AND METHODS.

2.1. Hardware Components:

In the same vein as the UNO, the Ardino Nano is a small, compact board. The Ardino Nano accepts power through a mini-B USB connector, and it may be supplied by an unregulated external power source between 6 and 20 volts, or by a regulated supply between 3.3 and 5 volts. When a power outage occurs, the greatest voltage available will be used. The boot loader takes up 2 KB of the 32 KB of RAM available on the ATmega328P microcontroller. The ATmega328P has 1KB of EEPROM and 2KB of RAM. There are 14 digital I/O pins on the Nano for various purposes. The voltage requirement for them is just 5 volts. Each pin has a 20-50 k ohm internal pull-up resistor and may provide or receive up to 40 mA. Functions such as Serial, External Interrupts, PWM, SPI, LED, I2C, and AREF are included. To facilitate interaction with other devices like a computer, another Arduino, or other micro-controllers, the Arduino Nano is equipped with N communication ports. Digital pin 0 (RX) and 1 (TX) on the ATmega328P may be used for UART TTL serial communication (TX). The Arduino IDE has a built-in serial monitor for exchanging basic textual information with the board itself. When data is being communicated from the computer to the board through the FTDI chip and the USB cable, the LEDs located next to digital pins 0 (RX) and 1 (TX) will flash.

According to the micro-controller on your board, the Arduino Nano can be programmed using the Arduino software (Arduino Duemilanove or Nano with ATmega328P from the tools board menu). The ATmega328P on the Arduino Nano has a boot loader pre-burned into it, thus no extra hardware programmer is required to install fresh code. The system is compatible with the original STK500 protocol for communication. The ICSP (In-Circuit Serial Programming) header allows the microcontroller to be programmed without first loading the boot loader, using an Arduino ISP or a compatible device. The Arduino Nano is built in a manner that enables it to be reset through software running on a linked computer, eliminating the need to physically push the reset button. Through a 100 nF capacitor, one of the FT232RL's hardware flow control lines (DTR) is linked to the reset line of the ATmega328P. By taking this line low (assertion), the reset line is temporarily disconnected, which resets the chip. This feature is used by the Arduino software to make code uploads to the Arduino Nano board as simple as clicking a button. Two kinds of sensors are employed to turn the physical parameter into an electrical signal for measurement. Sensors that use both sound waves and rotational motion are referred to as "ultrasonic" and "gyroscope"[4, 5].

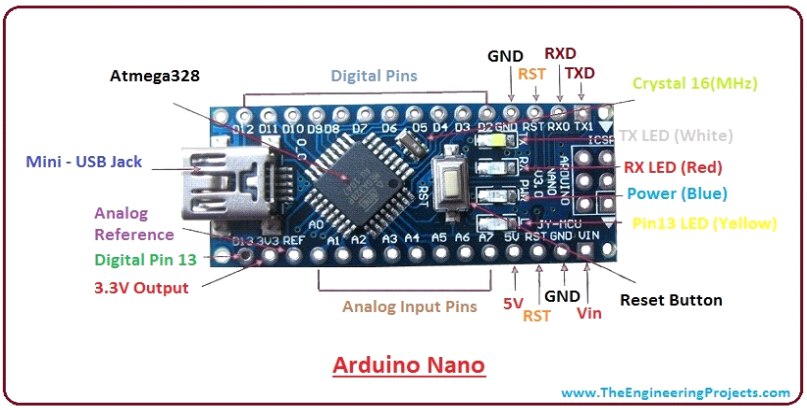

Figure 3. Arduino Nano

2.2. Power Supply:

Some power supplies need the user to manually set the input voltage, while others can sense and adjust to the standard wall outlet voltage. Solar panels are used to convert sunlight into electricity, whereas photovoltaic cells may be utilised directly as a power source[6]. Charles Fritts built the first solar cell in the 1880s[7]. One of the first to realise the significance of this finding was German entrepreneur Ernst Werner von Siemens[8]. The efficiency of solar cells is between 5% and 6% [9]. Concentrated solar power systems concentrate sunlight from a wide area into a narrow beam using lenses or mirrors and tracking devices. The photo-voltaic effect is used by photovoltaic cells to turn sunlight into electricity [10]. Additionally, lead acid batteries are used. It's one of the first types of rechargeable battery. Although the cell has a poor energy density and a small energy density compared to its volume, its high power-to-weight ratio allows it to generate a huge surge current. The modified version of the standard cell may be utilised to enhance storage and minimise maintenance needs in applications where large-format lead–acid designs are already in widespread use, such as backup power supplies in mobile phone towers, etc. VRLA (valve-regulated lead–acid) batteries, which include gel-cells and absorbed glass-mat batteries, are often used in these applications [11]. Actuators are machines used to move and operate a

mechanism or system. There are several uses for DC motors, and this one features a variable speed motor with a 12V DC motor. Because of its high torque, it may be used in a variety of traction applications. Hoists, cranes, trolley cars, elevators, air compressors, and so on are all examples of industrial applications.

3. DESIGN AND MATERIAL

3.1. Design:

The solar panel is mounted on the top of the chassis, where it receives direct sunlight, and the rest of the smart solar grass cutter is designed using solid-works software 2017 according to the specified criteria. To ensure that the chassis remains stable, the battery is positioned in the centre. The ultrasonic sensor is mounted in front of the chasse and is used to identify and avoid obstructions. Since the height at which the blade is set to cut the grass is fixed, the four wheels are connected to the chasse at that height. If you want a clean cut of grass, the mower blade shouldn't contact the ground. The design is finalised after considering these factors. As of 2013, the publisher claimed that more than two million engineers and designers at more than 165,000 firms were using SolidWorks. [12]

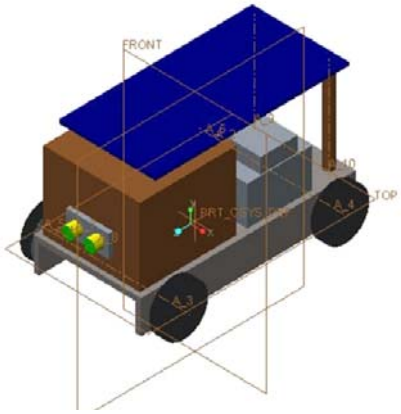

Figure 4.CAD model

3.2. Material

The chassis of the grass cutter is an interior frame that holds components such as the circuit board and other electrical devices[13]. Gear, wheels, gearbox, blade, and occasionally the driver seat are all part of the chassis[14]. Due to the larger weights and more frequent usage required of commercial vehicles, the design of a pleasure car chassis will vary from that of a commercial vehicle [15–18]. Turning the wheel on its horizontal axle while it is placed vertically beneath a load-bearing platform allows for the transportation of big loads. One may steer a ship or car by sitting atop a column attached to a rudder or a chassis on wheels. The wheel may generate or transfer power when coupled with a crank. Iron cylinder cutting gears were included on the initial blades of the earliest known lawn mower. It was put to work cutting grass on large gardens and athletic fields. Several different types of cutting blade mechanisms, including as cylinder blades, deck blades, and lifting blades, have emerged as mowers have altered form and function throughout time. When propelled by a motor, the strip-like element rotates such that its cutting edge is horizontal and its trailing edge is inclined, creating a vortex effect inside the housing that forces the grass to stand up straight so that it may be cut. If the strip's cutting edge collides with an obstruction, rather of forcing the obstruction forward as it could if the blade were rigid, it will be redirected into a recess in the housing. When the cutting edge wears down, the operator replaces it by pulling a fresh strip from the disc and cutting it to size. When a disc has to be changed, the old one is taken out, and then the new one, which has a winding strip on it, is installed on the bottom of the machine.

4. CODE ILLUSTRATION

4.1 Smart Grass Cutter Code

```
#define trigPin 4 //Sensor Echo pin connected to Arduino pin 13
#define echoPin 5 //Sensor Trip pin connected to Arduino pin 12
void setup()
{
Serial.begin(9600); // BAUD RARE is set to 9600(Serial communication from pc to Arduino Nano)
pinMode(trigPin, OUTPUT);// Ultrasonic sensor sending sound signal
pinMode(echoPin, INPUT); // ultrasonic sensor Receiving the echo sound signal
pinMode(8, OUTPUT);   // Wheel 1 motor config
pinMode(9, OUTPUT);   // Wheel 2 motor config
pinMode(10, OUTPUT);  //Wheel 3 motor config
pinMode(11, OUTPUT);  //Wheel 4 motor config
digitalWrite(8, HIGH);   // turn the LED on (HIGH is the voltage level)
digitalWrite(9, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(10, HIGH);   // turn the LED on (HIGH is the voltage level)
digitalWrite(11, LOW);   // turn the LED on (HIGH is the voltage level)
  }
void loop() {
long duration, distance; // defining two variables of datatype long
digitalWrite(trigPin, LOW); // ULTRASONIC sensor not sending sound signal
delayMicroseconds(2); // wait for 2 microseconds
digitalWrite(trigPin, HIGH); // Ultrasonic sensor sending sound signal
delayMicroseconds(10); //wait for 2 microseconds
digitalWrite(trigPin, LOW); //
duration = pulseIn(echoPin, HIGH); // time of flight for sound signal is taken
distance = (duration/2) / 29.1; // time is converted in to distance
Serial.println(distance); // printing the distance in serial monitor of Arduino IDE
if(distance<60)
  {
digitalWrite(8, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(9, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(10, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(11, LOW);   // turn the LED on (HIGH is the voltage level)
Serial.println("stop");
delay(100);
digitalWrite(8, HIGH);   // turn the LED on (HIGH is the voltage level)
digitalWrite(9, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(10, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(11, HIGH);   // turn the LED on (HIGH is the voltage level)
delay(1000);
digitalWrite(8, HIGH);   // turn the LED on (HIGH is the voltage level)
digitalWrite(9, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(10, HIGH);   // turn the LED on (HIGH is the voltage level)
digitalWrite(11, LOW);   // turn the LED on (HIGH is the voltage level)
   }
else
if(distance>60)
  {
digitalWrite(8, HIGH);   // turn the LED on (HIGH is the voltage level)
digitalWrite(9, LOW);   // turn the LED on (HIGH is the voltage level)
digitalWrite(10, HIGH);   // turn the LED on (HIGH is the voltage level)
digitalWrite(11, LOW);   // turn the LED on (HIGH is the voltage level)
Serial.println("front");
  }
delay(250); //pause to let things settle
  }
```

4.2 Grass Cutter Working Flowchart:

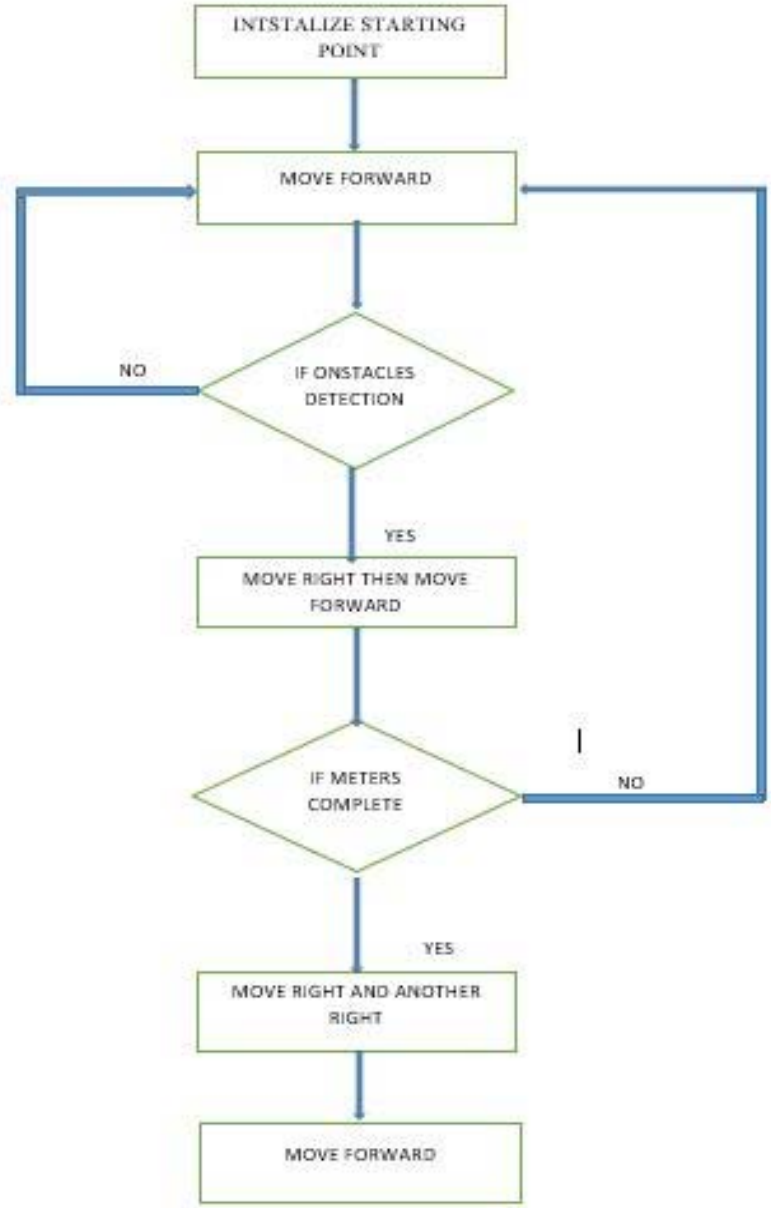

Figure 5. Flow Chart

4.3 Algorithm:

1. Start the system.
2. Move the system forward by changing the direction of transmitter circuit to down.
3. If obstacle occurs then move the grass cutter according to our convenience that is to left, right, reverse and if there is no obstacle then move forward.
4. When meters complete then move machine to left and another left or right and another right.
5. And move the machine forward.

5. RESULT

Completed with good results, the "Smart Solar Grass cutter with Lawn Coverage" project has been published. The batteries may be charged throughout the day so it can be used at night. As there are fewer moving parts and less of an initial investment is required, this project is more suited to the average person. While the grass cutter is moving, the battery will be charged, reducing the amount of work required of the workers. Below, you'll find a performance statistic that may be used differently depending on context.

Condition	Direction
1000	Forward
0100	Reverse
0010	Right
0001	Left

6. CONCLUSION

The overall energy obtained from the sun thus far surpasses our energy consumption, leading us to believe that it uses non-renewable forms of energy such as petrol, diesel fuel, etc. Our usage of solar energy, a sustainable source of energy, has eliminated the need for polluting fossil fuels and cut down on the time and work required to maintain our lawn. This machine requires little in the way of training even for a non-expert user. With the help of buttons and code, of course! In the face of an obstruction, it immediately adjusts course or ceases operations, making it both fast and precise. As a result, it is important to safeguard machinery in a way that both preserves its functionality and minimises the potential for harm to users.

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SMART TRACKING SECURITY DEVICE FOR WOMEN SAFETY USING RASPBERRY PIE HARDWARE

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Abstract.

Nowadays, women and youths' prosperity is an incredible issue of our overall population. The check of the loss is extending bit by bit. In this endeavor, a proposing system will help with ensuring the prosperity of women and children wherever around the world. These used different sensors like the Accelerometer sensor, Sound sensor, far off furor switch close by the camera, these sensors constantly development the customer. We have similarly used GPS which will help with perceiving region and following the contraption. Wi-Fi used in the structure is used to send prepared notification close by the got scene of the event to guards, relatives, and police central command. potential gains of different GPS kind used in device.

Keywords. Camera, GPS, Heart Beat Sensor, Panic Button, Raspberry pi 3 models, women safety device etc.

1. INTRODUCTION

In recent years, women's are continuously facing various threats such as abusing and brutal problems and being treated as victims. We are in need to ensure the safety of women. The ideal system was a portable device. This project is concentrating on the security system of the women's by means of providing a secured environment to them. The objective of this project is to create a portable safety device for women's. We are mainly creating a ideal model for the device that can be easy to carry anywhere. Safety of women in world has become a major issue in the world. Nowadays women's are undergoing various immoral activities. The devices which is used for the safety of the women's will be enhanced as mobile apps for their convenience. Our project gives solution to one such issue. Alerts family and friends by sending emergency message and captures the images of the Scene attack to maintain proof for legal actions. It consists of wireless Pushbutton, accelerometer sensor, sound sensor when any of the sensor is triggered, the device will get activated automatically within a fraction of seconds. Immediately the location of the injured person and images of scene will be sent to an emergency contact

2. LITERATURE REVIEW

In this paper [1] such gadget is planned which is a compact one that can be actuated according to the necessity of the person will find casualty utilizing GPS and with the assistance of crisis messages be shipped off individual areas according to the plan. The device gives a caution framework, call for help, and electric stun to dispose of the aggressor.

This paper [2] proposes another perspective to use advancement to get women. The structure contains an ordinary which when gets, tracks the space of the setback using and sends emergency messages assist to the three emergency contacts and the police of the control room.

This paper [3] portrays a vehicle following and delegate security system that gives the blend of GPS contraptions and specific programming to follow the space of the similarly as outfit messages and alerts with an emergency button. The information of vehicle position given by the device can be seen on the google maps application.

This paper [4] In this paper, the author discussed how the gadget is designed to make certain ladies safety. This system is used to locate ladies based totally on GPS technology. In this way, the signals that have been created are despatched to the board, manipulate the signals and offer SMS services, so emergency calls can be shared with the region of the coordinates to keep ladies from harassment.

This paper [5] Today in this global the women are being molested, kidnapped, and harassed with the aid of bodily strong people. So to make sure the safety and protection of ladies the concept of a clever device is constructed that is comfortable and really clean as compared to every other cumbersome system that already exists [6-10]. This paper proposes the dangerous problems faced via girls and it's going to help in finding the culprit without difficulty with help of high technology. And it is going to be easy to enforce in exclusive areas for security and surveillance of women [11-14]. MEMS sensor used for phase shifter applications [15-17].

3. PROPOSED SYSTEM

In the previous devices the main problem is difficulty in initiation so that the person cannot react for the situation in time. The devices are very big in size and very weighted to carry & more expensive to buy it. It is observed that these techniques addressed only some problems such as tracking the location of victim, alerting the police, alerting the local people for immediate help by using the buzzer. The previous safety devices address only a few problems. They are used for only some works like sending location, asking for help, or sending photos etc. So, our devices are used in which many of the problems are addressed using this device.

4. HARDWARE IMPLEMENTATION

4.1 RASPBERRY PI Hardware layout:

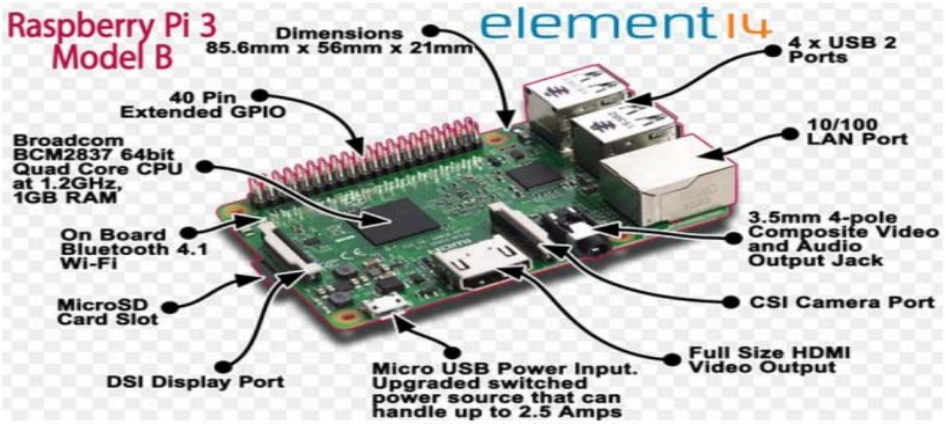


Figure 1. Hardware layout

5. METHODOLOGY

In present day scenario we encounter numerous kidnapping or eve teasing cases. And it is a major issue that needs a special solution. So, focusing on this issue the main objective of our project is to design a gadget which provide a safety and security in any time at anywhere.

5.1 System Design

In this we introduced the block diagram the project TRACKING SECURITY DEVICE FOR WOMEN SAFETY. Here we also gave brief description about the operation and components used in the system.

5.2 Block Diagram

The Functional square of the lady's wellbeing gadget task SMART TRACKING SECURITY FOR SAFETY. In this the mems sensor, camera, sound recorder, RF transmitter, and a GPS, gsm is interfaced with raspberry pi.

5.3 Diagram of the safety device

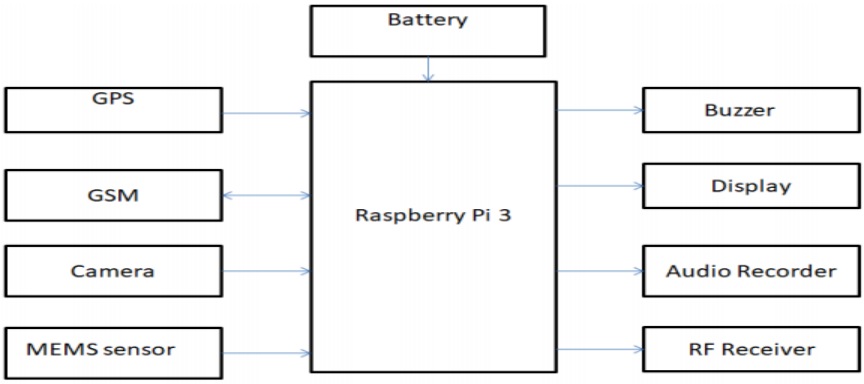


Figure 2. A concise depiction of the parts on the Pi.

Processor/SoC (System on Chip): SoC came as a Supervised Learning because we training to the machine by using algorithm. We can use this algorithm as a classification Problem.Where the whole data in a training Random Forest Classifier get only 2/3 data that enter into one Decision tree and again get the different another 2/3 data that enter into another Decison tree. If 10 Decision Tree mentioned in a algorithm, Random Forest classifier get Different 2/3 data. Here out of 10 decision tree some decision tree only predict as a wrong that is a variance so that variance in the minority voting but we take only majority voting. Majority voting is not a variance. Finally Random Forest Classifier remove this variance by using this simple methode and after removing the minority of variance and getting the majority that is a correct output.

Power sources: It is a device that consumes 700mA or 3W or powers. It is GPIO header. Any extraordinary mobile phone charger will achieve created by filling the Pi.

GPIO: GPIO – In GPIO using the 1st row to calculate the eculidean distance for all other rows so we got distance values for all rows then knn take the top three minimum values. And determine which target came as a majarity with respect to values that is output. If first row target output and eculidean distance output both are same the acuuracy increase. This is one row process. Similarly knn do every row by same process. If every row is predicted as same methode, our accuracy is increasing step by step in a training process. If all predict good we got a full accuracy in a training. Finally, we got a good model and check the test. If both are came as good accuracy we can use this our model as a future. Supervised Learning because we training to the machine by using algorithm. We can use this algorithm as a have one root node and two leaf node. It is help to split the data sheet based on the conditions. Let's consider output as a Two target. Based on condition, If Decision Tree splited with classify one target in one leaf side and second target in second leaf side perfectly for one feature. Our feature column is good this is known as Minimum Gini index. In a column feature, If Decision Tree split with classify atleast one target come as one leaf node that is also a good Feature this is also know as minimum Gini Index. Suppose, Two target come as both leaf node that is a worst feature. Finally, Which feature column enter as minimum Gini index, Decision Tree Take a only that feature for training model.

Preprocessing the data steps is very important. Our accuracy is increases based on preprocessing steps. Preprocessing data means removing unwanted datas like Empty rows, duplicates rows, Extreme value. If we donot preprocessing this, our prediction go to wrong so this only reason the preprocessing steps is very important. This steps is very important because this steps will decide to Train the our datas or not. Here, we use the statistics methode to check our input and ouput are any relationship are not. x-axis is house square feet and y-axis is Price of house square feet. If square feet of the house is increase the price also increase this is called the relation ship of input and output so we must detect this relationship by using correlation, t-test, anova test, chi-square test then only we move to next steps.

Suppose one column contains both integer and float. We must change one Datatype. Same rows exist on another row place. If we donot remove this dulpicate rows our machine mugup. This mugup is called overfitting. If our machine mugup the training data, It predict well in training but It doesnot predict correctly in test datas so must remove this duplicate records. We also remove this empty record. If we donot remove this Empty record our machine assume this Empty record is also one data. If i want to Remove this empty record i go to remove that row very less and if we remove this empty records my accuracy of prediction is gone to decrease so that time we use to fill the mean or median in empty records. Take the mean or median in a column and fill it in empty records in a column. Similarly we can do this same process by every column.

Outlier is a extreme value that means it is not a particular range. This datas 100 is a extreme value and 1-10 is a particular range. So we must remove this 100. If we donot remove this, our prediction goes to wrong. When column feature is a categorical variable. We must convert categorical to binary digits numerical because

machine learn only 0 & 1. Voting Algorithm is one of the technique of Ensemble Learning and it is Supervised Learning. We can use this as regression and classification also. Our data is enter into many machine learing models like decisiontree, Knearestneighbors, RandomForestClassifier, Finally Voting algorithm is check Which models are predict a majority of same target that is a output, If that repetative output and dataset output same the accuracy is increase.

Bagging Algorithm is one of the technique of Ensemble Learning and is is a Supervised Learning. Bagging is a same method for Random forest Classifier Algorithm. Here random forest we use only base learner is a Decision Tree But Bagging we can use any algorithm as a base learner such as KNearestneighbors, Logistic Regression, Support vector machine.

5.4 Block Diagram of the variable switch

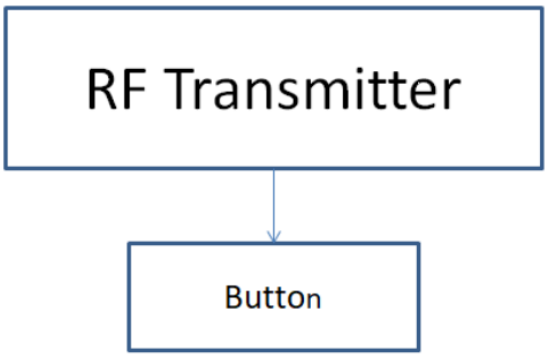
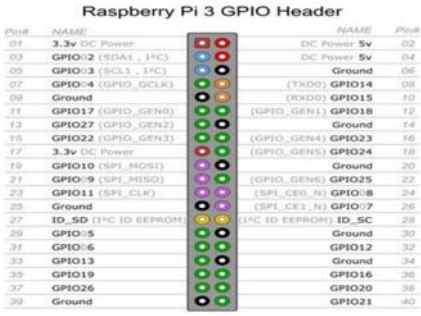


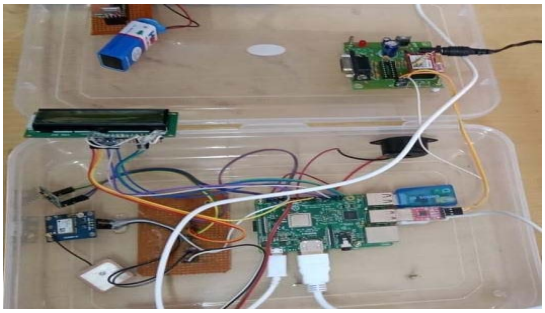
Figure 3. Block diagram of the variable switch

Practical square of the variable catch venture . In this Rf transmitter is associated with the gadget, Rf collector is associated with button, are interfaced with Raspberry pi.

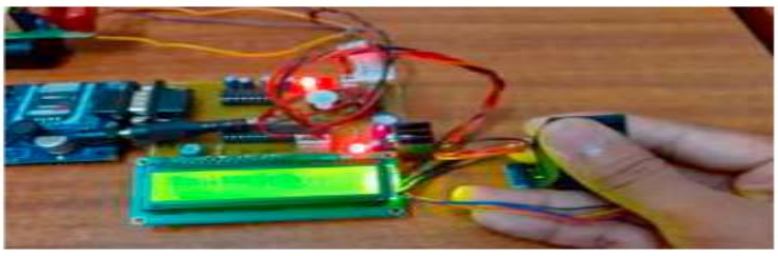
5.5 Ouptut:



(a) Raspberry Pi Header



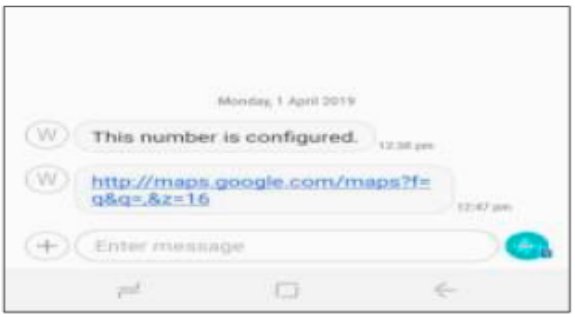
(b) Hardware Implementation



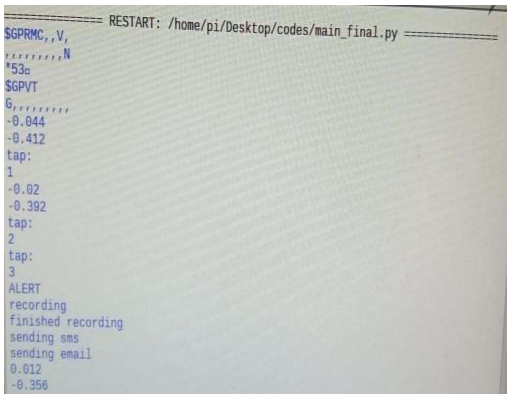
(c) Output Display

Figure 4. Output of proposed work

6. RESULTS



9. Message Received by Family members/Police



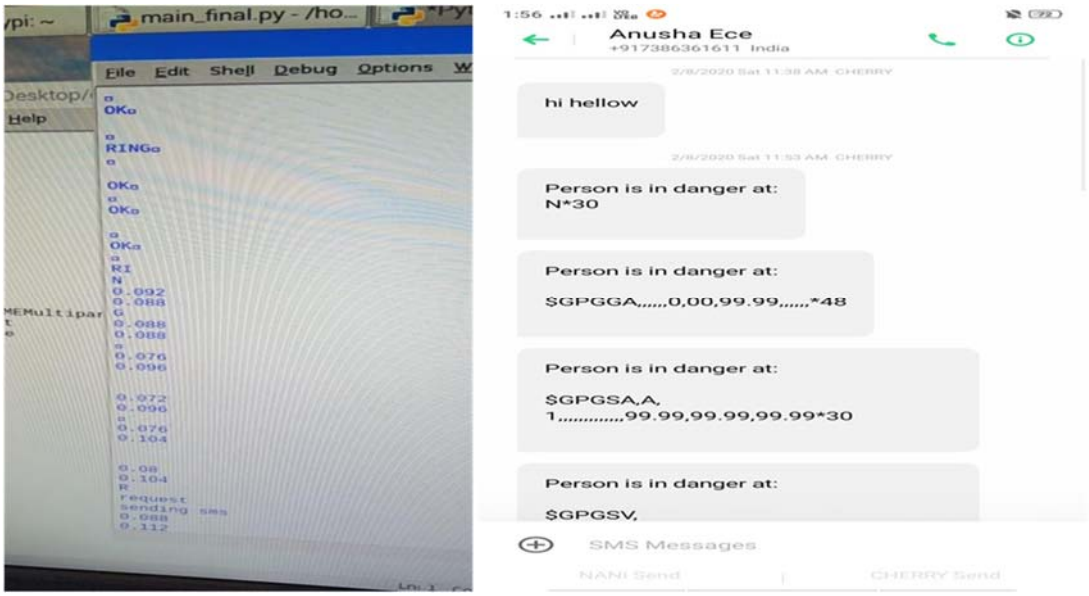


Figure 5. Results of Message received from parents or police using Raspberry Pi

7. CONCLUSION

By seeing those numerous advantages and another factor we reached the resolution that it is the best substitute to lessen the number of episodes that are occurring against ladies. This being an exceptionally imaginative thought ought to be grown further for enhancements. In this way, the objective of the Smart following security gadget project is to fundamentally build wellbeing for women.

In this project we have added a MEMS sensor to increase the chance of easily initiating the device and also included gps and gsm module for communication purpose when any harm occurred to the women. In this project we also provided a switch which is also used as another type of initiation of the device.

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Bi-dimensional Empirical Mode Decomposition based Dimensionality Reduction of image using Interpolation and Smoothness Techniques

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Abstract.

Bidimentional Empirical Mode Decomposition (BEMD, or), is a new decomposition approach based on oscillatory mode signal gathering. A non-linear and non-stationary signal can be analysed using BEMD. Intrinsic Mode Functions (IMFs) are adaptively divided into oscillatory components. High computation times and other artefacts are linked with dimensional empirical mode decomposition (BEMD) approaches because of the usage of two-dimensional (2D) dispersed data interpolation methods. Computer vision problems like texture extraction and picture filtering are well-known to be demanding and complex. Using empirical mode decomposition (EMD), we were able to extract features at several spatial frequencies and at different sizes. Texture extraction and picture filtering are well-known computer vision problems that are notoriously difficult and time-consuming to solve with the EMD. After collecting the extreme points, we may use smoothness and interpolation to produce the maximum and minimum surface envelops. BEMD has tested and used a few interpolation algorithms, but many more are still under development. To help in envelope estimate in BEMD, this research compares the performance of a number of commonly used surface interpolation approaches. Different radial basis functions and Delaunay triangulations based interpolators are studied in this paper. First, a synthetic texture picture is used, and then two separate actual texture images are used for the analysis. Only interpolation methods are simulated, with little or no control over the other parameters and components in the BEMD process. A bilinear interpolation with a directionally adaptable low-pass filter is the basis for a real-time, continuous-scale picture interpolation technique. It is designed to be implemented on hardware. The standard bi-linear interpolation approach suffers from artefacts. Techniques described by the authors use directionally adaptable low-pass filtering to address this issue. Selecting low pass filter coefficients can help alleviate the problem of extreme blurring. A high-quality picture scaler for a variety of imaging systems may be realised using interpolation techniques.

Keywords: Dimensionality reduction, Bidimentional Empirical Mode Decomposition, BEMD, Interpolation, Smoothness, Image decomposition, Image processing, Feature Extraction,

1. INTRODUCTION

Dimensionality reduction of real-world data is necessary for effective data management. Dimensionality reduction is the process of reducing high-dimensional data into a more understandable form with a lower dimensionality. Ideally, the reduced representation should have the same dimensionality as the original data. The smallest number of factors required to explain the observable qualities of data is known as the inherent dimensionality of data. Many fields benefit from dimensionality reduction because it lessens the negative effects of excessive dimensionality. Because of this, dimensionality reduction may be used for a variety of purposes including data categorization, visualization, and compression. PCA and Discriminant Analysis have traditionally been used for dimensionality reduction (DA).

Empirical mode decomposition in two dimensions involves estimate of discrete data for interpolation in the method. Surface interpolation is used in the empirical mode decomposition technique. A BIMF that is more useful is the goal of the bi-dimensional empirical mode decomposition (BIMED) method. This decomposition can help guarantee that

the screening process is more efficient in typical situations; The decomposition is usually used to determine the upper and lower envelopes after extracting the extreme points. The interpolation problem is complex because surface interpolation is required to complete the interpolation procedure in bi-dimensional space. As a result of this interpolation, image processing in the bi-dimensional empirical mode decomposition technique is based on it [3].

EMD's adaptiveness is a key feature that sets it apart from more classic approaches like Fourier and Wavelets. The priori basis function is not necessary for the decomposition. As a data-driven approach, the EMD employs no predetermined filtering or wavelet processing steps[4]. Extrema detection, rules for halting iterations for each individual IMF, and interpolation algorithms dictate BEMD decomposition, which results in the 2D IMFs[4]. The interpolation method may be regarded the most critical aspect in a successful decomposition. Creating 2D surfaces from dispersed data often necessitates a number of iterative steps. There may be no interpolation centres in the boundary area of the maxima or minima map in the case of BEMD, which might be more problematic for the latter modes of decomposition. As a result, effective decomposition may necessitate boundary processing that introduces extra interpolation centres at the border. The upper bounds and lower bounds of the data/image are formed by interpolating the local maxima points and the local minima points, respectively [7]. The mean or average bounds is calculated by taking the mean of the image's upper and lower bounds. By utilizing the mean envelope to create 2D IMFs with zero local means, the BEMD decomposition also helps with orthogonal decomposition. As a result, it is crucial to find a 2D dispersed data interpolation method for BEMD that is accurate in terms of both form and smoothness of the envelopes [14]. There's nothing more fundamental to interpolation than the idea that a continuous function may be represented in terms of a set of weighted and shifted basis functions. Choosing the right foundation functions is critical. Many academics have spent a lot of time and effort optimising them for the interpolation property, which is the standard perspective [19-25].

2. OVERVIEW OF BEMD:

Nonlinear and non-stationary data may now be analysed using a brand-new approach. In this approach, the 'Empirical Mode Decomposition' is the most important aspect. These 'intrinsic mode functions,' which permit well-behaved Hilbert transformations, may be used to deconstruct any complex data collection or signal [4]. The adaptive nature of this decomposition approach makes it incredibly efficient. Nonlinear and non-stationary processes can be decomposed using the internal features time scale of the data. There are exactly the same number of extrema and zero crossings in each IMF. Once EMD has been applied, a new set of low-frequency IMFs may be retrieved from the signal. It is always the first IMF that has a high frequency component and the final IMF that has a monoatomic function. Following are the conditions that each of these oscillatory modes has to meet [8]:

(1) The total count of extrema and zero crossings must be equal in order for them to be similar or different by one.

(2) Envelopes with local peaks and minima must have zero mean values. For the signal X (t) to be decomposed into IMF, the first step is to detect all local extrema, then use cubic spline to determine the maximums in the upper and lower portions of the envelope. Following the decomposition, the following formulae can be used to reconstruct the signal.

$$X(t) = \sum_{j=1}^{n} Cj + rn$$

2.1.Bi-Dimensional Empirical Mode Decomposition:

In the event of a multidimensional signal, a multidimensional approach to EMD is necessary. EMD in 2D known as Bidimensional EMD (BEMD) [2] Sifting is used to calculate IMFs in both BEMD and EMD. Input signals are analysed to identify multiscale inherent vibrations. However, rather than a single set of intrinsic mode functions, we got two-dimensional signals using the approach of Huang [4].

A two-dimensional matrix signal f can be seen as an image (x, y). The following are the specifics of the BEMD decomposition method.

1. Using the cubic spline approach, locate all f(x,y) local maxima and minima.
2. Emax(x, y) and Emin(x, y) are the maximum and minimum envelope surfaces that may be interpolated using the extrema from step 1. (x, y).

A two-dimensional matrix signal f can be seen as an image (x, y). BEMD is a decomposition method that follows these steps.
1. using the cubic spline approach, locate all f(x, y) local maxima and minima.
2. Use the extrema from step 1 to perform surface interpolation to get a bounded surface Emax(x, y) and a bounded surface Emin(x, y) (x, y).

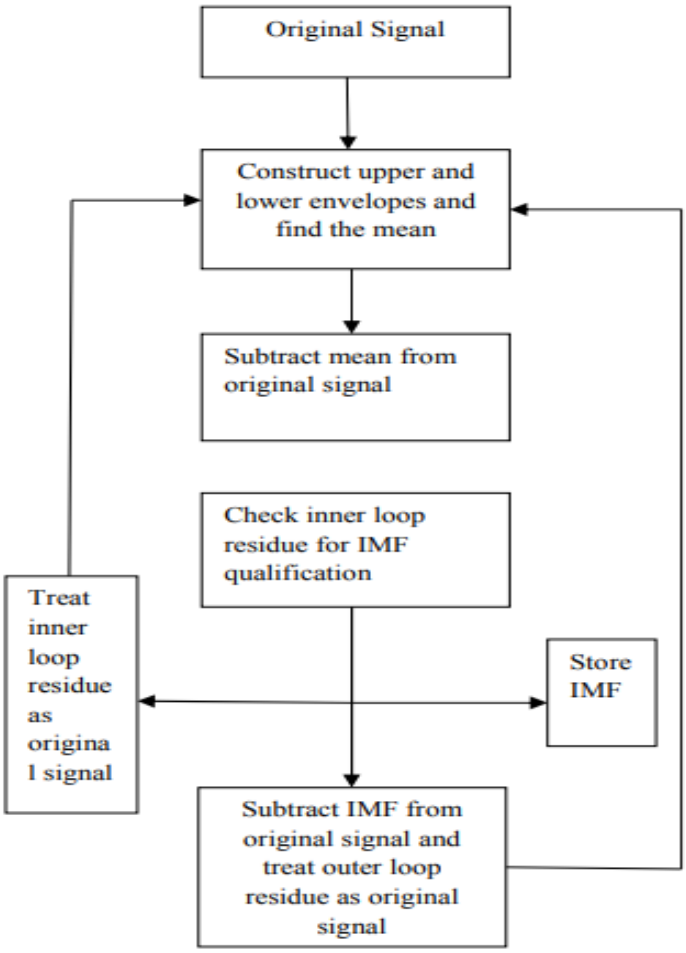

Figure 1. Graphical representation of BEMD

A 2D matrix signal f can be seen as an image (x, y). BEMD is a decomposition method that follows these steps.

1. Using the cubic spline approach, locate all f(x, y) local maxima and minima.
2. using the extrema from step one, perform surface interpolation to generate a maximum and a minimum bounded surface Emax(x, y).
3. The average envelope surface Avg(x, y) will be calculated on the basis of the maximum and minimum envelope surfaces.
4. When the mean bounded surface is subtracted from the original signal, the jth iteration of the ith sifting process is called Hij.
5. If the stop criteria are met, go to the next step. If this is the case, then repeat steps 1 through with Hij as f(x, y). A single repetition is all that is required to complete this task. IMFi can be obtained by meeting the stop criteria [7].

2.2 Stoppage criteria

The conditions for a stoppage in many circumstances,
BEMD's IMFs do not meet the criteria of an IMF. When the convergence criteria is modest, further iterative decomposition cannot yield any more information. The approach can also be used with an empirical stop criterion as

an alternative. Use Equation to determine the SD criteria in accordance with Huang's (1998) approach where r is a constant that is set by the end-user (between 0.2 and 0.3) and is used in this article as the stop criterion[4].

$$SD = \sum_{i=0}^{x} \sum_{j=0}^{y} \frac{|H_{i(j-1)}(x,y) - \mathrm{H_{i,j}(x,y)}|^2}{H^2{}_{i(j-1)}(x,y)} < r$$

3. Image Interpolation and Smoothness

In general, there are two phases involved in image interpolation:

The initila step is to create a new pixel location, and the later step is to give a pixel value to it.

Interpolation algorithms are summarised in this section. Interpolation using convolutions. The zero-order hold technique is another name for the closest neighbour interpolation. The interpolation is accomplished via convolution of a M x N input picture with a suitable kernel, represented by H [17]. For example, the kernel for two-fold interpolation may be stated as follows:

$$H = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}.$$

The first-order approach, which uses a bi-linear interpolation to estimate intensity from an image, is also known as the first-order method.

$$H = \begin{bmatrix} \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & 1 & \frac{1}{2} \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \end{bmatrix}.$$

For horizontal and vertical convolution, the bi-linear interpolation is identical to convolution with the kernel twice. A basic construction makes the closest neighbour and bi-linear interpolations popular choices for low-cost, compact imaging systems. Since functions are the best kernel for interpolation because they were established by Shannon in the 1940s. However, because of its infinite impulse response (IIR), it cannot be used in implementations with finite impulse responses (FIR) [20].

3.1 Edge Detection

To determine the representative direction of the current pixel, the method utilises an LR Image as its input. The spatial gradient or directional frequency analysis can be used to choose the representative direction. The precision of the frequency-domain analysis approach is sacrificed for computing efficiency [16]. The spatial-domain technique, on the other hand, is capable of detecting a wide range of orientations with a significant computing burden. A bi-lateral or epsilon filter, for example, as well as other directional low-pass filters, demand a significant amount of processing and memory. As a result, five Gaussian filters are employed in the suggested technique [19].

3.2 Interpolation and Low-pass Filtering

As a result of the interpolation ratio, both interpolation and directionally adaptive filtering were used to detect edges. The interpolated picture must be remembered before filtering if the two operations are separated. There's a difficulty with hardware implementation due of the extra memory. Interpolation with a ratio of 5/3 is seen in Fig. 4. Low-resolution images can be represented by dotted lines, while full circles depict the areas that need to be filtered. [18].There are two interpolation scale factors known as SX and SY, and they are specified as

$$SX=\frac{(ori\_width-1)}{(inter\_width-1)}$$
$$SY=\frac{(ori\_height-1)}{(inter\_height-1)},$$

where ori_width, inter_width, ori_height and inter_height respectively represent the widths and heights of the lowresolution and high-resolution in Both SX and SY are equal to ½ [10].

3.3 Texture smoothing:

When it comes to texture smoothing, we rely on smoothing spline interpolation. As previously stated, only areas that were classified as texture regions are subjected to smoothing spline interpolation. Because it interpolates between all points in a table, and controls overfitting, smoothing spline interpolation is an excellent choice for data interpolation in this situation. Spline interpolation is simple and stable, and they are the key advantages. spline f smoothing reduces [11]:

$$p\sum_{j=1}^{n} w(j)|y(j)-f(x(j))|^2+(1-p)\int \lambda(t)|D^2f(t)|^2dt$$

There are n data points, and the integral occurs across the shortest interval including all entries of x. Here, |y(j) = f(x(j))|2 represents the total of all data points' square errors. The default value for data points is 1, and as the number of data points increases, so do the error estimations. As a tuning parameter, the smoothing parameter is commonly referred to as the smoothing parameter[14] [16]. Smoothing reduces for 0 while increasing for smoothness. The piecewise constant weight function comes with a default value ω is one. Also known as the second derivative, D2f indicates the function f's second derivative. Between 0 and 1, the smoothing parameter p is set. Data points are fitted with a straight line using least squares if p = 0. If p is set to 1, the interpolation will be a cubic spline, which is the best match to the data, thus we've set p to 0.5 for our interpolation .As part of the CSAPS MATLAB function that conducts the smoothing interpolation and allows the choice to set the value of the smoothing parameter p, we employ it to accomplish smoothing for an input picture [17].

4. Experimental Results

A performance evaluation and comparison of the suggested interpolation method is presented in this section. The suggested technique employs both sharp and smooth filters in this experiment. Subsampling alone, without the use of low pass filtering, produced the lowscale image.

Interpolation Method	Interpolation Ratio	Red channel [db]	Green channel [db]	Blue channel [db]
Bi linear	3.0	29.162	26.543	27.342
Cubic Sharp	3.0	29.372	27.041	27.312
Cubic Smooth	3.0	29.564	27.102	27.571
New Sharp	3.0	29.016	26.301	27.463
New Smooth	3.0	28.872	26.315	27.561

Table 1: PSNR values of five interpolation methods with Interpolation ratio 2.0.

5. Challenges of BEMD

Creating BEMCs from a pixel-by-pixel picture is not a new idea, however. For each BIMF, the number of BEMCs and their properties are determined by the method used to detect extrema, the interpolation method used, and the stopping conditions [12]. As a result, each image has an endless number of BEMC sets. For interpolating the extrema points, scattered data interpolation has been used to form the upper and lower bounds. For each BIMF, the SD threshold criterion is most commonly used [15].

6. Conclusion and Future Enhancements:

The cubic natural spline approach has been used to create BEMD, which is both simple and adaptable. Non-stationary and non-linear signals are no problem for BEMD. Wavelet, Fourier, and other classic decomposition methods pale in comparison to this one. The IMF's calculations are critical to the BEMD's implementation. The term "IMF" refers to an oscillation that is distinct from the accompanying signal. An iterative and filtering method are used to compute the IMF. When the stoppage criterion equation is met, the iteration and filtering process is halted. The correlation coefficient is used to assess the extraction on a variety of pictures under assault. The suggested approach has been proven to be more resistant to JPEG compression, filtering, and noise addition after simulation. Using the BEMD, you may extract the brain MRI's spatial frequency components as well. There are 1025 distinct spatial scales, ranging from the finest to the coarsest, described by J.C. Nunes and colleagues in Image and Vision Computing (1019–1026). Non-linear and non-stationary data may be analysed using this approach, which is generated from picture data and completely unsupervised. Both natural and synthetic textures have yielded promising outcomes in our experiments. We can focus on simply one or a few modes (individual or multiple spatial frequency components) rather than the complete image when we have access to these representations of sceneries or objects. 2D EMD clearly presents a novel and promising method of decomposing and extracting texture characteristics without the need of any parameters. 2. The BEMD may now be used for routine image processing tasks. Developing a blind method in this area might be a fascinating project in the future.

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A Systematic Study of Deep Learning Algorithms in Oral Squamous Cell Carcinoma: Current State, Clinical Issues, and Potential Scenarios

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Abstract.

Cancer is an aggressive illness with a limited median lifetime. Recurrence and mortality rates are high during the recovery phase, which can cause the process to be lengthy and costly. Preventing cancer detection in its early stages and improving patient prognosis predictions are important for improving patient survival. As a result of advances in mathematics and data engineering, the precision of quantitative techniques used to determine disease prognosis has increased significantly, and numerous scientists have been motivated to employ these techniques over the years. Cancer prediction accuracy has also improved because of advances in AI especially Machine Learning (ML) and Deep Learning (DL) algorithms. This article discusses the advantages of AI in cancer detection and prognosis after reviewing the literature. A subtype of oral epithelial cancer is known as OSCC. Despite their high mortality rates, even basic screening methods for OSCC are frequently insufficiently specific, and as a result, the disease is usually discovered after it has already spread widely. The percentage of OSCCs that are diagnosed early and have a precise treatment strategy is significantly higher than the percentage of OSCCs that are not diagnosed until later in the course of the disease and do not have a precise treatment strategy. In vivo cell structure analysis can be done using the confocal laser Endomicroscopy (CLE). Studies that used in-situ ultrastructural imaging of OSCC show a bright future for that technology. The objective of this review is to research and discuss existing data on oral cancer detection early in patients.

Keywords. Oral Squamous Cell Carcinoma, Deep learning, Image Classification, Regularization technique.

1. INTRODUCTION

A tumour that starts in the squamous cells or mucous membranes of the skin, called squamous cell carcinoma is one of the type of cancer. There are about 1.3 million new cancer cases in every year in the head and neck as a result of the malignant transformation of these cells. Tissue from an oral cavity tumour will be examined to assign a score. Oral Submucous Fibrosis (OSF) diagnosis using machine learning algorithms is feasible, but no study has been proposed to date testing multi-class grading of oral squamous cell carcinoma (OSCC). Instead of identifying biopsy images for OSCC that show multi-class characteristics, in particular, would assist in reliable prognosis and multi-modal treatment protocols for patients with oral cancer, thus lowering pathologists' clinical workload. Based on this understanding, this survey is planning to use Broder's histological classification scheme to rate OSCC. A promising technology for medical image processing has appeared in the area of artificial intelligence, known as deep learning, which is built using layered neural networks. It has been demonstrated to be comparable to seasoned diagnosticians in terms of diagnostic accuracy. The ACS, CDC, and NAACR work each year to keep their constituents aware of cancer prevalence. This year's thesis discusses both the truth of human papillomavirus cancer and the importance of HPV vaccination. The CDC and the NCI provided data on cancer incidence and death, while the NCI provided data on cancer mortality. a long-term perspective (from 1975/1992 to 2009) and a medium- and short-term perspective (from 2000 to 2009) on the age-adjusted prevalence and death rates for all cancers combined According to national statistics, the Papanicola test coverage rate was greater than 50% in 2008 and 40% in 2010. Between 2000 and 2009, mortality rates for all cancers decreased by 1.5 per cent a year for men and women alike. Incidence rose for men but not for women. The prevalence of two HPV-related tumours, as well as many others, doubled (eg, liver, kidney, thyroid). [1-3]

1.1 HIGHLIGHTS

- Biopsy pictures of the more common oral squamous cell carcinoma were studied(OSCC) using several existing articles.
- A novel CNN based deep learning methodology is suggested for OSCC multi- class cell type classification.
- A transfer learning strategy is also used,with four potential pre-trained models.
- The classification accuracy will be more when we choose a DL based algorithm for the earlier

diagnosis of OSCCcancer.

2. LITERATURE SURVEY

Deep learning is another machine learning subtype that is prone to hierarchical concept formation that needs unique layers of representation to allow more complex concepts to be built on top of. Labelled data is a prerequisite for machine learning algorithms since complex queries that need a lot of processing power to resolve are not feasible. Larger size than one might expect, where it is really needed, is in various real-world scenarios. This review provides a brief review of deep learning algorithms that are the most commonly used today.

Hu, L, et.al, [4] Authors discussed the acetic acid visual inspection of the cervix, but this method cannot be replicated or checked. The aim of this study was to develop a machine learning algorithm that could detect cervical pre-cancer and cancer by "blindly" looking at images. Multiple approaches to test for cervical cancer, as well as a finding of pre- cancerous lesions, were used to monitor a group of 9406 women aged 18 to 94 in the Guanacaste region of Costa Rica for seven years (1993–2000). To find the origins of these tumours, which had been present for 18 years, a tumour registry linkage was performed. Using Faster R-CNN, a deep learning-based approach uses two models based on Automated Visual Evaluation Algorithm and cervix locator, the training and validation were conducted on digitised cervical images of screening photographs captured with a fixed-focus camera ("cervicography"). The prediction score (0-1) generated can be assigned a sensitivity (how good the prediction is) and a precision (how accurate the prediction is).

Kourou, K,et al, [5], the authors presented a summary of recent machine learning methods used in cancer progression modelling. The predictive models presented here are built on Supervised Machine Learning (SML) Models also the more number of diiferent input features and data samples. With the rising pattern of using machine learning approaches in cancer science, we've compiled a list of the most recent papers that use these strategies to model cancer risk or patient outcomes. M. Aubreville et al. [6] explore how, using CLE recordings, authors have implemented and validated. Patch probability fusion is used in a unique automated technique for OSCC diagnosis. Textural feature-based machine learning techniques, such as LBP, GLCM, or LHS, are compared to the current state of the art in terms of the current state of the art in textural feature-based machine learning approaches. For this study, CLE image sequences (7894 images) from the four different places in the oral cavity, as well as the OSCC lesion, were collected from patients diagnosed with OSCC. The new approach outperforms the state of the art in CLE image detection, with a region under the curve (AUC) of 0.96 and a mean accuracy of 88.3per cent (sensitivity 86.6 %, specificity 90 %). N. Das et al. [7] designed a test that utilised the Alexnet, VGG-16, VGG, and ResNet pre-trained deep CNN models to determine the optimal model for our classification problem. Although the Resnet-50 model achieved the highest accuracy of 92.15 per cent, the findings demonstrate that the proposed CNN system outperformed other models and achieved a
97.5 per cent accuracy. This investigation established that the proposed multi-class grading scheme should be used to diagnose OSCC. Huang, S.et.al, [8], authors look at how AI can help with cancer detection and prognosis, focusing on its unparalleled precision, which is much better than that of general predictive oncology applications. We also see how these approaches are helping to advance the sector. Finally, the advantages and disadvantages of using AI in clinical settings are addressed. As a result, this essay offers a fresh outlook on how AI will aid in cancer detection and prognosis, as well as seek to improve human health in the future.

Bur, A. M, et.al [9], authors suggested that when opposed to approaches based on DOI, machine learning increases estimation of pathologic nodal metastasis in patients with clinical T1-2N0 OCSCC. An improved predictive algorithm such as the decision Forest algorithm is required to make sure that that the patients having occult nodal disease get proper treatment while excluding the expense and morbidity of neck dissection in the affected patients who do not have pathologic nodal disease. Yan, H., et.al, [10] Being able to identify squamous cell carcinoma is crucial for surgical care based on fibre Raman spectroscopy and deep learning, this thesis proposed a TSCC-classifying system of convolutional neural networks (CNN). -The first step was to obtain 24 Raman spectra from 12 TSCCs from 12 patients' Results reveal large differences between TSCC non-tumorous tissue to have a range of 700– 1800 cm. A CNN algorithm was applied to spectra to retrieve the nonlinear features. As a final point, the derived features are used to classify TSCC with a. The findings revealed the sensitivity and specificity of 99.07% and 95.37% for CNN's model. As well, testing with TSCC shows our system outperformed current methods. Thus, Raman spectroscopy offers a valuable method for intraoperative assessment of the margins of resection of oral tongue squamous cell carcinoma.

Woolgar, J. A, et.al [11], this paper covers the potential prognostic significance of histopathological characteristics specific to the primary tumour and the lymph nodes. It is also covered briefly in addition Information on the histopathology is supplied with mention of the probable pitfalls. Special emphasis is often placed on the importance of the relationship between the pathologist and the methodologist, histopathology

examination phases, and correct recording of results. Santisudha Panigrahi, et.al, [12], authors have proposed an automated computer-aided network called capsule network for oral cancer classification. The dynamic routing strategy used in the capsule network achieved high valiant for the affine changes of the augmented oral dataset using rotation. The capsule network's capability to transform the dataset such as pose, view, orientation changes achieved more appropriate for the histopathological analysis of the oral cancer dataset which makes it robust for the early prediction of oral cancer. The model thus generated is evaluated using the accuracy, sensitivity, precision, F-score and specificity. The generated produces a cross- validation result of the accuracy of 97.35 and specificity and sensitivity of 96.92% and 97.78%.

As per the authors' statement, Chan, et.al [13], proposed a modern deep convolutional neural network (DCNN) with the integrated feature of a texture map for the detection of ROI in an automated integrated model for the detection of cancerous regions. Using a texture map augmented with multiple patches and fed into the DCNN model as an input, the proposed model has two integrated systems: one for detecting oral cancer using feature extraction based on standard deviation values and another for pinpointing the ROI (Region of Interest) for cancer tumours. Standard deviation values are calculated using a sliding window technique. With wavelet transform, we were able to achieve detection sensitivity and specificity on the order of 0.9687 and 0.7129 on average. Gabor filter can achieve detection sensitivity and specificity as high as 0.9314 and 0.9475 on average. DongWook Kim,et.al, [14], the authors compared the Traditional Hazard based model called COX Proportional Hazard (CPH) model with the Random Survival Forest(RSF) and DeepSurv model (the model based on Deep Learning Algorithm) for the survival prediction to examine the patients with OSCC and their survival rate post operation. DeepSurv produced best result among the three models by measuring Harrell's c-index, in both the test and training for measuring the concordance of predicted and actual survival rate, DeepSurv produces highest prediction accuracy when compared with the other two models with 0.810 and 0.781, followed by RSF (0.770/0.764), and the CPH model (0.756/0.694)

Kouznetsova, V. L, et.al [15], Machine learning models have been developed to analyse the metabolic pathways associated with oral cancer and periodontitis, according to the authors' research. For detecting periodontitis in saliva, separate 10-fold cross-validations confirmed. For detecting periodontitis in saliva, separate 10-fold cross-validations confirmed Gravi metabolomic pathways data mining, AI and deep learning approaches such as logistic regression and stochastic gradient descent Oral and periodontitis classifications were shown to be substantially more accurate using neural networks, logistic regression, and stochastic gradient cross-separation. The deep Neural Network (DNN) with the Tensor Flow software had the best results. The accuracy for the prediction of the model was 0.978 % while the methods that didn't include Deep Learning (DL) achieved similar results, albeit much less accurate results.

Paderno, A.,et. al, [16], Completely convoluted neural networks (FCN) are useful in the field of head and neck oncology, since the endoscopic inspection is a necessary aspect of treatment, and in monitoring the effects of cancer on the upper-digest tract. . Semantic segmentation of oral cavity and oropharynx squamous cell carcinomas was tested using FCNN-based algorithms in this study (OP).Two videos were pulled from the institution's tertiary endoscopic video repository that features the combination of NBI and OP interventions. The dataset referred to in the OC had 110 images, while the OP had 116 images. three different types of FCNs (U- a-U-Net, U-Net 3, and ResNet) For the gold-standard assessment, FCNs' success was assessed across all tested networks and compared to the manual annotation. Kim, Y., et.al,[17], In The Cancer Genome Atlas, ORCA data that is publicly available has been filtered using CIBERSORT profiles of ORCA data to create binary risk groups that cluster based on measurement scores and survival patterns for those groups (TCGA). In 16 of the 22 TIL fractions, clinically significant variations were seen in the different classes. TIL fraction patterns are used to train a DNN classifier. Additionally, this internally validated classifier was used on an ORCA dataset from the International Cancer Genome Consortium's data portal to forecast patient survival patterns. Seven genes were found to exhibit significantly different expression within the two risk classes. TILs also played a critical role in the tumour microenvironment; thus, it has piqued the interest of researchers to use a novel deep-learning tool to assist in cancer prognosis.

Yuan, Y, et.al [18] to study multiple machine learning algorithms for prediction of oral tongue metastasis of squamous cell texture on preoperative imaging. 116 individuals with OTSNC and Elective Neck Dissection were surgically removed (END). From T2WI and contrast-enhanced T1 images, the scientists identified 86 texture structures for each patient. The process of shortening included 3 rounds of analysis: reproducibility, collinearity, and knowledge gain advanced algorithm (NN-adv), k-NN, boosting computer (BM), decision

tree (DT), perceptron (PT), boosting perceptron (PO), and k-adv SVM (NN). 10-fold cross-validation. Alabi, R. O, et.al [19], After February 2020, authors looked in Ovidline, Scopus, and the IEEE databases for the purpose of diagnostic or predictive uses of OSCC. Only those which applied machine learning models for prognostic and/diagnostic purposes were examined and two experts (O.Y & A.R) used predefined search query parameters to recover papers. The authors followed the Chosen Reporting Substances for Systematic Review and Meta-Analysis (PRIS/meta-Meta). The authors used the Prediction of Bias in Study Assessor for estimating the probability of bias (PROBAST) as well.

Song, B. et.al [20], Auto fluorescence and white light photos were used to train a deep learning-driven image identification algorithm in this work. The data from the auto fluorescence and white light images is retrieved, quantified, and combined to feed the deep learning neural networks. For oral cancer categorization, we examined and compared the efficiency of various CNN, transfer learning, and multiple regularization techniques. The findings of our experiments show that deep learning approaches are useful in categorizing the images of dual modal for oral cancer findings. Here the MatConNet, an open-source CNN toolbox is used in the application, here Data Augmentation improves the classification performance and Regularization technique such as weight decay helps in handling the overfitting problem with an average accuracy of 86.7 percent, the 4-fold cross-validation resulted in an 85.0 percent specificity rate with 86.7 percent accuracy, and an overall accuracy rate of 86.7 percent. Folmsbee, J et.al [21], the Authors investigated several strategies for efficiently training convolutional neural networks (CNNs) for tissue organisation using Active Learning than the more traditional Random Learning (RL) in this study (RL). 143 digitized images of hematoxylin and eosin- stained entire oral cavity cancer parts make up our dataset. In the role of using a CNN to classify seven tissue groups such as stroma, tumor, mucosa, keratin pearls, lymphocytes, semen, and history/adipose. Authors equate AL and RL preparation. For a given training data set size, the AL strategy outperforms the RL strategy by an average of 3.26 per cent.

Hinton, G.et.al [22], For several decades, people have been anticipating that the application of artificial intelligence in health care would arrive. At certain points, AI was built on a foundation of rationality: they concluded that wisdom was something you found through the use of patterns and laws of logic. To encourage programmes and visual models to execute the logic of experts, this approach was implemented. The emergence of deep learning recently (as of early 2018) has enabled technology like speech recognition, image processing, and language translation to be applied to nearly a billion different digital activities. This Viewpoint intends to help medical professionals understand the fundamentals of deep learning. Kann, B. H,et.al [23], They show that a convolutional neural network (Dual Net) can teach itself to recognise nodal metastases and ENE, surpassing human doctors in this area. 3D convolutional neural network trained on 2,875 CT-segmentated lymph node samples and evaluated on 131 blinded research samples were used for validation and fine-tuning. The unblinded test set was used to estimate an AOC of 0.91 (95 percent confidence interval: 0.85–0.97). Patients with head and neck cancer may benefit from this treatment method, which is described as an improvement above the existing standard of care.

Lydiatt, W. M, et. al [24] , In this paper, various modifications that took place in the region are examined in order to help the reader get a greater understanding of how the location has changed. This most recent update included some additions, one of which was the implementation of a separate staging algorithm for HPV-related oropharyngeal cancer, which is distinguished from other types of oropharyngeal cancer. Some other changes to the which includes the division of various types of throat cancer into three separate chapters; the removal of skin and Merkel cell carcinomas from a general chapter that covers the entire body; and the distinction of different types of cancerous tumours (T) for skin, oral cavity, and nasal passage. To compile the staging system, the Head and Neck Task Force participants worked in collaboration with colleagues around the world and created a staging approach that is in compliance with the TNM staging paradigm; the system is easy to use and accommodates the discovery of newer staging guidance. Hartenstein, A.et. al [25], deep learning already functions well, and with better data, especially larger blood sample data sets, and greater access to more qualitative information such as DNA/RNA sequence data, the algorithms would be much better.In a contrast-enhanced CT image, CNNs may characterize lymphatic infiltration by PCa on their own. The performance of CNNs is strongly correlated with their physiological backgrounds, and this is something that must be considered when designing imaging-based biomarkers. Mohammed ,T.et.al[26], proposed a model for the selection of best classification model based on the principle of the Hardy-Weinberg principle where the optimization is carried out using the relevant values of barnacles for the production of best offspring for the better optimization process. The best values are adopted to find the classification of complex problem in a minimal complexity [27-32].

The below table shows the combined data taken from the existing survey papers, which shows that the deep learning method gives a more accurate value when compared to other methods.

Author	Method for Predictor Measurement	Exclusion of poor quality Images	Exclusion criteria	Deep LearningTechniques	Transfer Learning Applied	Accuracy /Sensitivity/ Specificity
Hu, L(2019)	cervicography	NR	NR	Faster R-CNN (automated visual evaluation Algorithm)	yes	95
N. Das(2020)	computer-aided diagnosis for oral sub-mucous fibrosis	yes	A history of maxillary sinus surgery, a fracture, or certain tumours	Transfer Learning (Alexnet, VGG- 16, VGG-19 and Resnet-50)	yes	97.5
Song, B(2018)	Dual-modal mobile imaging device	yes	Very Poor image quality or Clear consensus	MatConNet	yes	89
Bur, A. M(2019)	Tumor depth of Invasion(DOI)	Yes	Inconsistent histopathological findings; instances with less than 10 examples in the training set; cases with missing or inadequate images of mucosa	Decision Forest algorithm	no	95.5
Yuan, H(2021)	MRI Texture analysis	yes	Co-occurrence of two anomalies rather than just one is also acceptable.	convolutional neural networks (CNN)	yes	95.37
Yan, H(2018)	Raman spectroscopy	yes	NR	convolutional neural networks (CNN)	yes	96
Kouznetsova, V. L(2021)	saliva metabolites	NR	NR	The independent 10-fold cross-validations of logistic regression and stochastic gradient descent validated their validity.	no	94.2
Kann, B. H(2018)	CT(lymph node extranodal extension (ENE)	yes	Contrast-enhanced CT	DLNN(Five-fold cross validation for the DualNet model)	yes	97
Hartenstein, A.(2020)	(2) a 68Ga-PSMA PET scan with contrast enhancement	yes	PET/CT scan in lobectomy patients with dissection of lymph nodes in the hilar and mediastinum	Visual Geometry Group (VGGNet), random forests	yes	96
Aubreville, M(2017)	Laser endo microscopy images of the oral cavity	yes	Blurred imaged or images with incomplete exposure	patch probability fusion method	no	90

Table i. Classification methods with its accuracy level

3. CONCLUSION

With conventional machine learning, only a few pieces of information are relevant; with advanced machine learning, any function must be studied and interpreted by an expert before a method can be applied. Due to the increase in available hardware like GPU, deep learning is also given a higher precision for classification for most machine learning methods without having to use hand-feed the algorithm. Very few researchers have applied deep learning and machine learning techniques in the field of the question of diagnosing and predicting oral cancer survival rates have been done this year in literature.

The image processing methods used in this study paper are for identifying oral cancer as well as other oral strategies for growth modelling and assessment are seen to be important for using deep learning for early detection of disease imaging and pathological imaging. The researchers note the importance of human

diagnosticians' diagnostic capacity, along with moderate agreement This sophisticated ML-based methodology provides many benefits over the existing measures, including reproducibility, objectivity, immediate monitoring (>10 times quicker than clinicians), and adaptability to clinical demands. It was proven that the DL algorithm is accurate for patients with HNSCC.

Based on the observed the hybrid model consisting of various training model using optimization algorithm such as Barnacle Mating Optimization algorithm is used to achieve best accurate results for the classification of various oral lesion to identify the oral cancer at the earlier stage. The performance of the developed model can be calibrated by various metrics such as F1 score, Precision, specificity.

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DIAGNOSIS OF CHRONIC KIDNEY DISEASE USING DEEP LEARNING

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Abstract:

Disease prediction is one of the most important procedures in saving a person's life. Machine learning and deep learning plays a key role in disease prediction, and research is ongoing to improve accuracy. Kidney illness is one of the primary diseases that poses a threat to our health. Ignoring a kidney problem can lead to chronic renal disease and death. Chronic Kidney Disease and its indications are sometimes gentle and progressive, going undiagnosed for years before being discovered. Unfortunately, there has yet to be found a technological cure for the disease. Bade General Hospital provided us with a dataset of 400 patients with ten characteristics. DNN is now being used in medical image processing to diagnose diseases like cancer and diabetes. The model has a 98 percent accuracy rate. We also selected and underlined the relevance of Factors to produce a rating of the features utilized in CKD prediction. The results showed that 2 factors, Creatinine and Urea, have the most impact onCKD prognosis.

Keywords: *Chronic Kidney Disease (CKD),Deep Learning (DL), disease prediction, symptoms and accuracy.*

I.INTRODUCTION

The kidneys are two bean-shaped organs that are around the size of fists [1]. One on either side of the spine, they are positioned immediately below the rib cage. The kidneys filter 120 to 150 quarts of blood every day to generate 1 to 2 quarts of urine. The kidneys' primary role is to eliminate waste materials and overflow fluid from the body through urine. Urine is made up of a series of very complicated excretion and restoration stages. This mechanism is required to keep the body's chemical equilibrium steady. The kidneys regulate the body's salt, potassium, and acid levels, as well as producing hormones that impact the operation of additional organs. A hormone generated by the kidneys, for example, drives red blood cell synthesis, controls blood pressure, and regulates calcium metabolism, among other things.

Early detection of renal disease may aid with rectification, which is not always achievable. To avert major harm, we must first have a better awareness of a few renal disease signs. Deep learning classifiers are used to predict the class, target, labels, and categories of a data item. Classification is a type of supervised learning in which the objectives are given input data [2]. A few of the uses include medical diagnosis, spam detection, and targeted marketing. They achieve this by converting discrete input variables (X) into discrete output variables using a mapping function (f) (Y).

There are two main diseases of CKD:

1. Diabetes and
2. High blood pressure

As a result, preventing CKD requires managing these two disorders. CKD usually does not manifest itself until the kidneys have been severely damaged. According to research, hospitalisation cases are increasing at a rate of 6.23 percent per year, yet the worldwide fatality rate stays constant.

There are few diagnostic tests to check the condition of CKD:

1. estimated glomerular filtration rate(eGFR)
2. urine test
3. Blood pressure

Determine which groups may benefit from more systematic CKD screening and offer an overview of screening and diagnostic procedures.

Outline therapy options for CKD patients to slow the course of renal impairment and reduce morbidity and death.

Emphasize the significance of proactive therapy of prevalent co-morbid disorders such as cardiovascular disease and diabetes to potentially reduce morbidity and mortality among patients with CKD.

2. RELATED WORK

Nikhila (2021) explains how four basic calculations are used to evaluate whether a patient has Chronic Kidney Disease in its initial stages. Accuracy, sensitivity, specificity,and F1-Score, are among the six execution metrics used to assessDL models. The Mathew Correlation Coefficient and Area Under the Bend scores for AdaBoost and Random Forest were both 100 percent. By allowing clinical doctors to examine the condition at an early stage, the DL model suggested on this work will provide an effective ways for preventing Disease [3].

G Nandhini; J Aravinth (2021), depicts CKD is an infirmity which will in general harm the kidney and influence their viable working of discharging waste and adjusting body liquids. A portion of the confusions included are hypertension, iron deficiency (low blood count), mineral bone issue, poor dietary wellbeing, corrosive base irregularities, and neurological complexities. Early and blunder free recognition of CKD can be useful in deflecting further crumbling of patient's wellbeing [4]. These persistent illnesses are visualized utilizing different sorts of information mining grouping approaches and (DL) calculations.

Md. MohsinSarkerRaihanet.al (2021), talks about an earlier guess of CKD can feed the personal satisfaction to a higher reach in such conditions and can upgrade the quality of life to a bigger territory. Sara Alshakraniet.al (2021), states one of the significant medical conditions is persistent kidney illness (CKD). It is expanding consistently because of unfortunate dietary patterns, deficient water utilization, and absence of wellbeing mindfulness. Innovative progressions, for example, Deep Learning (DL), affect the wellbeing area by giving more precise recognition and fruitful therapy of numerous persistent illnesses. This examination paper investigates an assortment of DL strategies to foresee kidney infection [6].

Pronab Ghosh et.al (2021), talks about he in general review has been carried out in view of four dependable methodologies, for example, Support Vector Machine (from this time forward SVM), AdaBoost (hence AB), Linear Discriminant Analysis (consequently LDA), and Gradient Boosting (hence GB) to obtain exceptionally precise aftereffects of expectation. These calculations are executed on an online dataset of UCI AI store .Afterward, unique execution assessment measurements have additionally been shown to show fitting results [7].

3. PROPOSED METHODOLOGY

The suggested approach may estimate the risk of CKD for public health using generally available health data. When we evaluate actual data, the suggested model will fail to categorise, and the classification result will be unacceptable. In order to predict CKD, they recommended comparing Decision Tree and Support Vector Machine (SVM) techniques. During the classification stage, it was discovered that Decision Tree recognition outperformed SVM recognition in terms of proper classification.

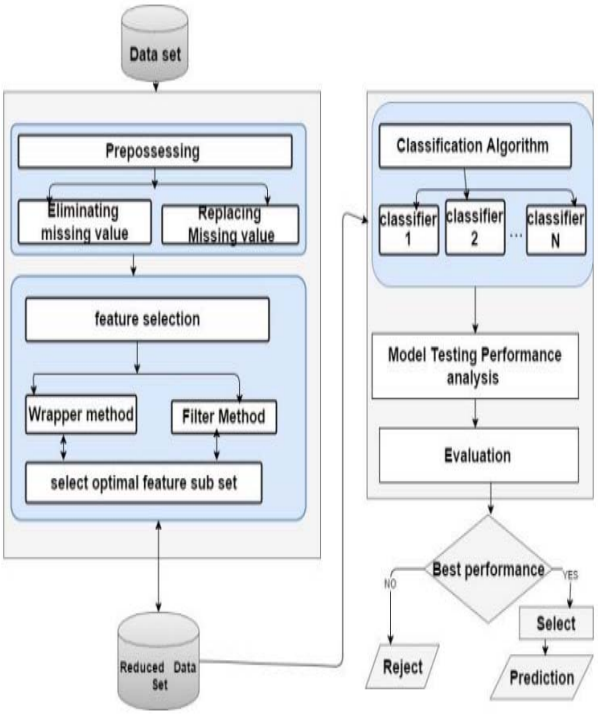


Figure 1.1: proposed system architecture

A Data Feature Selection (DFS) model is suggested in this work to pick and filter important characteristics from the medical dataset for early CKD prediction, using CKD clinical data with 12 numerical and 12 nominal features. Separate feature selection methods on numerical and nominal data are used in the proposed approach to determine the most prevalent qualities that might help in early CKD prediction.

Data Collection:

The source of data for this study is a patient's renal disease record. This data was gathered at the General Hospital in Yobe State's Gashua Local Government Area. It comprises 400 patient records with 11 attributes/parameters, which includes a goal variable defined as CKD or non-CKD illness.

Attribute	Attribute Description
Sex	Gender
Age	Age
Sod	Sodium
Pot	Potassium
Chl	Chloride
Bica	Bicarbonate
Urea	Urea
Cre	Creatinine
UA	Urea Acid
Alb	Albumin
Class	{Kidney Disease, NoKidney Disease}

Figure 2: Dataset Attributes

Data Pre-processing

Pre-processing is the majority significant work in data mining techniques; it entails cleaning, taking out, and transformation of information into a machine-readable layout. Raw data holds missing information, improper layout, and incorrect data, which leads to catastrophe in machine learning calculation. Because string values are not understood by the machine, they had few unfilled cells, which were restored using attribution.

Target variable

The CKD dataset has a wealth of valuable factors that are critical for identifying the illness in patients. We based our factors on the test and procedure used by the hospital in detecting the existence of renal disease, which includes ten blood tests. Names were also included in the exam, but we opted to delete them because they had no bearing on our test and the patients' privacy must be protected.

Prediction using DNN

DNN is a subset of ANN that simulates the structure and functionality of biological neural networks, which include an input, weights, and activation function. DNN contains an input, hidden layer, and output structure. The output in DNN is denoted by a, where Wi and Xi are the weight and input, respectively. This is expressed as follows: The accepted model contains ten (10) inputs, (2) hidden layers, and (1) output.

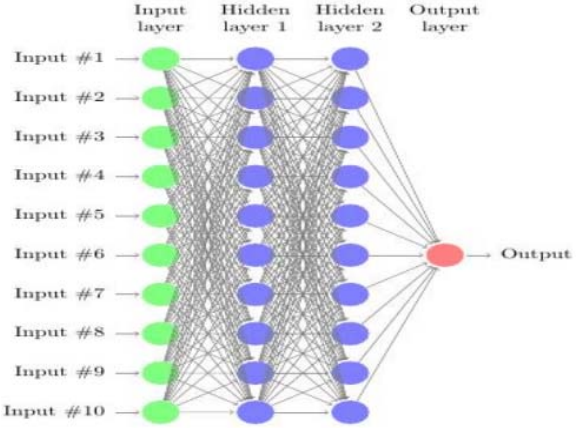


Figure 3: Deep Neural Network

The key in layer is made up of neurons that process the real incoming information. The number of neurons may be determined based on the data supplied. Three layers were utilized to train the system. The inauguration function "Relu" is utilized for key in and the secreted layer. Relu produces a 0 or 1 output. With Sigmoid as the activation function, the result layer has just one output result: KD or NKD. The optimizer for the model was Stochastic Gradient. The Python programming language was used to create the experiments.

4. EXPERIMENTAL RESULT

Confusion Matrix: A confusion matrix is a table structure that is especially used for algorithm presentation. It demonstrates the statistical adequacy of the system and its compatibility with the dataset.

Classification		Observation	
		Negative	Positive
Observations	Negative	True Negative(TN)	False Positive(FP)
	Positive	False Negative(FN)	True Positive(TP)

Classification		Prediction	
		Absence	Presence
Observation	Absence	29	0
	Presence	1	30

Accuracy- It's used to count how many data points were successfully predicted out of all the data points. The work is to calculate by using dividing the to entire number of right guesses by the entire number of forecasts.

Sensitivity: It's the number of positive events that were predicted as positive. The ratio is true positive to the sum of true positive and false negative. The ability is to correctly identify persons who have the ailment in medical diagnosis is known as test sensitivity (recall).

Specificity: It's distinct as the percentage of real negatives that were anticipated as negatives. It's determined by the method of dividing the entire number of negatives by the total number of valid negative predictions. True negative rate is another name for it.

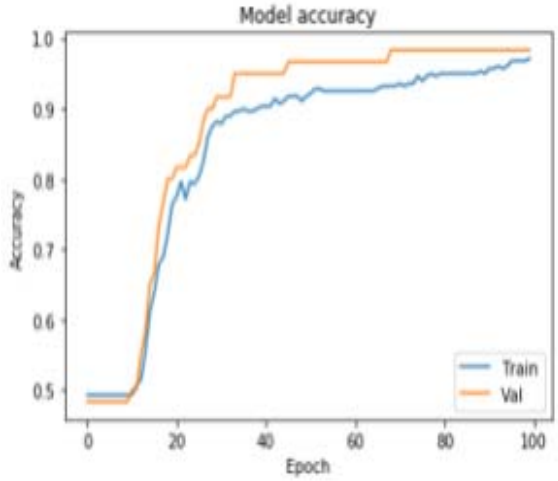
Cohen Kappa: This is a comparison of the presentation of two sets of categorizedinformation. The Kappa output values range from 0 to 1. With higher kappa values, the results become more relevant. It assesses how well the ML classifier's classifications coordinated the data labelled as the positive.

Precision: It's the proportion of retrieved cases with relevant occurrences. This is a correlation between correctly classified modules and also the overall faultprone modules.

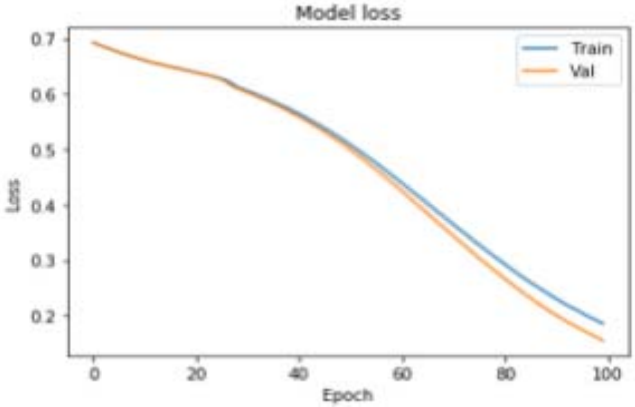
Recall/ Sensitivity: The number of positive identifications of a disease produced out of all potential positive predictions is known as recall.

F1 Score: It is to define the harmonic mean of accuracy, specificity and recall. The ranges from(0 to 1) It describes the model's precision (how many records it can properly classify) and resilience (if it misses a significant number of data).

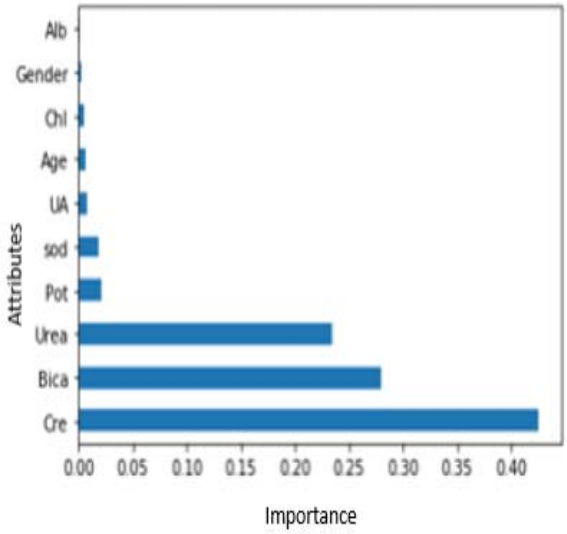
Performance evaluation for Deep Neural Networks Model



Graph of training against theValidation Accuracy



Graph of Training against the Validation Loss



Importance of the feature

For testing and training, we partitioned our dataset into 70 percent (280) and 30 percent (60). The confusion matrix revealed the Deep neural network model's performance on the given dataset; this model successfully identified 34 non-CKD samples and 25 CKD samples, while one CKD sample was classified wrongly. The DNN model worked on our datasets, with 59 trained samples correctly identified, and only one sample out of the sample picked for tested was wrongly classified. When the model was tested with unknown data, it correctly classified renal patients' records as CKD or non-CKD with an overall prediction accuracy of 98 percent. The algorithm stated that it is highly intelligent to generate seamless predictions into CKD and non-CKD based on its accuracy of 98 percent.

5. CONCLUSION

The primary purpose of this study is to develop a DNN model that can accurately and easily to predict the renal illness.. The DNN model that was used proven to be effective and appropriate for predicting renal disease. The research also emphasized the significance of the variables employed in renal disease prediction. This demonstrated that, out of the ten qualities, Creatinine and Bicarbonate had the very important role on CKD, contrary to Ahmed and Alshebly's results that Creatinine and Urea had the most impact on CKD.

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A NEARLY DIAGNOSIS OF I SCHEMIC STROKE USING HYBRIDIZED MACHINE LEARNING ALGORITHM

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Abstract

The evolution of new technologies and approaches paves the way for non-invasive techniques in healthcare system. Speaking about strokes, it is one of the life-threateningdiseases, but there's a chance to save patient by predicting it early. Cardiovascular diseases are classified on the basis of MRI and CT scan images which are actually quite expensive. As there is a demand for non-invasivelow-cost methods for diagnosis, we propose an approach where forecasting of strokes is totally based on extracted EEG data. Classification of EEG signals is important to construct an accurate brain computer interface (BCI). There are several approaches for deep learning and machine learning techniques to classify EEG data, but dynamics of Brain is quite complex across it's mental task, hence it is a complicated task to built efficient algorithm with prior knowledge.so,2D Alex net in convolutional neural network(CNN) is used to analyse EEG covers different mental task in this study.

In this paper we are using machine learning algorithm like Random Forest, Logistic Regression and Synthetic Minority Oversampling Techniques. And going to develop a model called" Hybridized ML model to predict the strokes."

Keywords – Stroke, EEG, Machinelearning, Random forest, Logistic Regression.

1. INTRODUCTION

Nowadays, our lifestyle has changed a lot due to technical advancements and gadgets. Irrespective of age factor many are facing several health issues like hypertension, stroke, diabetes and cardiovascular diseases as a result of deleterious life. For a kind information, stroke has become a common disease which could be fatal or could cause long term disability. Approximately 20 million people experience by a year where 33% is left with disability and 40 to 45% result in death. Reportssays, by 2030 that will be a result of 200 million death cases globally. The cost for treatment & rehabilitation is extremely high which is difficult to afford.

In recent report, from 2014 -2015, the cost due to stroke incidents where around 50 billion dollars (1).Hence, stroke prediction is quite costly and it is highly desirable to reduce the risk. Predicting functional outgrowth after stroke would assist the doctors to take specific decisions.

Thus we are focusing on strokes in this paper and we attempted to build a system which uses bioelectrical images to predict. Machine learning has become a key factor in health technologies, which improves the quality and plays a vital role in improvisation of the system.

While use biomarkers and non-invasive technique to monitor the health. There are many other works which utilize ML to develop Strokes Risk Predictions (SRP) Models. These methods are classified as classical machine learning approaches like Decision Tree, Logistic Regression, Support Vector Machine (SVM)and deep neural network (DNN) best performance in stroke prediction can be achieved, but unfortunately those models rely on availability of large data whereas in reality such amount of data is not available.

SignalsfrombrainareusedtotakecontrolovermachinebyBrainComputerInterface(BCI). BCI system is enabled to translate brain activities into multiple task by the EEG signal recording by experiments conducted during training process. Neuro prosthetic based application such as improving vision and hearing impairment were mainly focused by BCI according to current trends.Likewise nervous system impairment brain related problems as well as damage in sensory organ can be replaced with the help of prosthesis [2]

The main challenges of BCI system in EEG signal processing is making a liable interface for a variety of BCI operations. The data which is give as input for training is come from continuous EEG data recording. Better performance will be provided by Deep learning if the size of the recorded data is high. Famouslyfor classification of MI signals for image representation CNN or Recurrent Neural Network (RNNs) are currently using technique.There are many studies available.Polar projection method was utilized to extract different frequency bands from power spectrum of each electrode which index is used to map the electrode location from 3D to 2D projection.For the given EEG time window each electrode is mapped to its location onto a skill like image, to construct an EEG topographic map,at each time index.

Atfirst,thestudyaddsspatialandtemporaldimensions of EEG signals to a 2D EEG topographicmap then, topographic maps at different time indiceswere cascaded to populate a 2D image for a giventimewindow. At last, Alex Net was enabled by topographic maps to learn features from the spatial and temporal dimension of the brain signals. The classification accuracy for BCI system was improved by showing the result by converting the EEG classification problem from 1D static to 2D image. Therandomforestalgorithm with accuracy 95.44% and the model wedeveloped gave a best accuracy rate of approximately91%.Also, to colonize 2D topographic image the illustrated topographical characters were converted to grayscale, cascaded sequentially per each subject and resized.The signal activation changes in both temporal and spatial dimensions are represented by the constructed EEG topographical images. Also, the completely different EEG MI takes are classified from the constructed topographical images by Alex Net CNN architecture.

Large scale studies show the result in favor of classierapproaches like Random Forest (RF). RF has beenused successfully in various biomedical applications,suchastheautomatedpulsedetectionduringelectrocardiogram-based cardiopulmonaryresuscitation.
According to stroke, most of the researches neuroimaging and outcome estimation to detect (IS) ischemic stroke lesions with the use of ML methods.If has only been recently, however in a group of non-traumatic intracerebral hemorrhage (ICH) patients a study estimated stroke outcome prediction at 3 months. Using a nationwide disease registry.
Previous studies concluded that ML techniques can beeffective topredict functionaloutcomeofIS long-termpatientsorforpredictionofsymptomaticintracranialhemorrhage following thrombolysis from CT images, stillall works agree on the need to carry out further studies inorder to confirm results, incorporate new variables andresolve their limitations/weaknesses.The chance of recovery of the patients ,the accurate prediction of the stroke is essential for that we are taking into account the frequency of cerebrovascular diseases .The famousmachinelearningmethodstogetthebestresultofprediction of stroke or any other diseases are RandomForest (RF), Logistic Regression (LR) Synthetic MinorityOversamplingTechnique (SMOTE).
The control of remedial homeostasis need to be increased and select and follow up for reperfusion has to be possible hence each patient needs should be addressed by constructing predictive model which find stroke patient at worst case. Likewise, identifying the most suitable cases is essential to respond exactly to treatments regarding to new regenerative cellular or molecular therapies.

2. LITERATURESURVEY

In[4]theauthorshaveusedtwoalgorithmsnamelydecision tree and random forest to classify and analysisstroke. Decision tree is for feature extraction and randomforestalgorithmisforpatternclassification.Theyusedindependent variables like age, hypertension, blood sugarlevel, body mass index (BMI), married status and history ofheart disease. In the article [5], the deep learning-basedclassificationanddecisiontreealgorithmhaveusedtoexhibits strong classification performances with a little runtimeandcomputationalcostandnotsuitableforonline prediction, butbetterforoffline.In[6],theauthorhadhatched one device to predict the disease of stroke alongwithlocations,timeanddurationusingtherawEEGsignals.Thestudyinthearticle[7]representstheresultsforchangingtheEEGclassificationproblemfromonedimensiontimeseriestoatwo-dimensionimageclassification problem with average accurate value of 81.09%. In[8], the author has developed a prediction model in whichtheEEGsignalsaretransformedtoimagesandclassification of signals to predict the early stage of strokewith accuracy of 70.64%. The article [9] is describing thesolution and model to deal with small data and imbalanceddata in the prediction of early stroke by using ElectronicHealthRecord(EHR)asdatafortheirmodel.Thestudyin
[10] is concocting the software-based model where there isaclassificationofdepressionbrainsignalsandnormalbrain signals which used to predict or induce stroke byusing EEG signals. There is no requirement for a set offeatures to fed a classifier for classification. In [11,22], theauthorhas given an improvement for the diagnosis ofstrokebyconsolidatingtheelectroencephalogram(EEG)andgalvanic skin response (GSR) signals by using theopendatasetforemotionanalysis,buttheaccuracyis73.4%. In [12], the automated detection of ischemic strokeby using EEG data which is gathered from EEG sensorsand the overall performance of the developed model is wasmeasured by the value of accuracy, sensitivity, specificity.In[13,23],theauthorhasusedmachinelearningtechniques for classifying the stroke signals and normalsignals and also the bioelectrical signals are combined withnatural processing language (NLP) for the better output forunderstanding.In[14],fordetectionEEGbasedimageclassificationtheauthorshaveusedbi-directionaldeeplearningframeworks.Theclassificationisinabnormalsignals and normal signals and this gives the distinguishbetween two hemispheres (right and left). In the article [15],theauthors aretryingtopredict thecerebralstroke fordiagnosisbyusingthephysiologicaldata ofincompleteandimbalanceddatasetusingthedeeplearningapproaches.Itreduces the false negative rate effectively.In [16, 17, 18], there are many approaches that can dealwith strokes to avoid the human's death and damage ofheart and brain tissues. The already available techniqueshave some pitfall the prediction like producing the correctresults, time and space complexities, if we are using inputdata in the form of MRI and CT scans means it costs highwhich is notsuitable foralleconomic levelpeople. Andalsofindingtheaccurateresultforclassificationofministroke (TIA) and actual stroke is somewhat difficult tofind.So,tosolveallthesestruggles,thispaperproposedahybridizedmachinelearningtechniquestopredictthe strokewith bestaccuracy.

3. PROPOSEDMETHODOLOGY

Inthissectionwearegoingtoseethedetailedprocessofthebuildingmodel.Themethodologywe

proposedinthispaperisbasedontimeseriesprediction methods because in this we are making thescientific predictions. The flow of the proposed modelisgivenintheFigure1,thefirststepisdatacollection, for this we are collecting the raw data fromEEG signals, MI (motor imaginary) captures the signalsin the form of1D. For converting 1D image to 2Dimage we are using Alex Net CNN). We will convertthe image as a value using in integer to binary vectors"One Hot Coding" is used. We decrease the value oftherangeofthepixelsfrom0to1.Nextstepisfeature extraction for this are using pooling layers inconvolutionalneuralnetworks.Andthenwewillextract the main features of characteristics from thesignals data, and store the data for input data. Basedoncomparison wewill predictthe stroke.

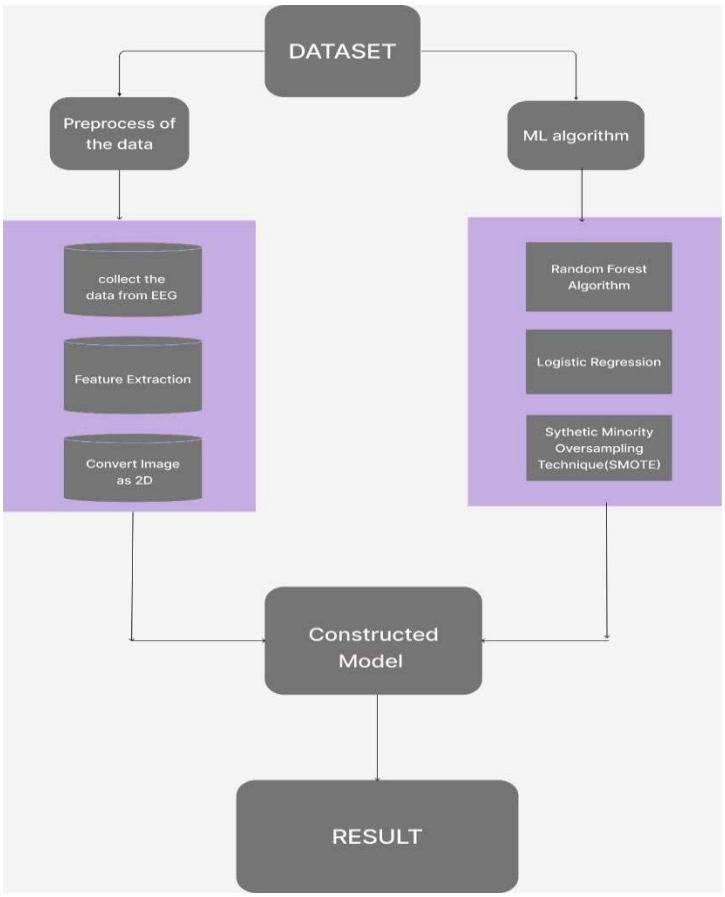

Figure1:Architectureofproposedmethodology

DataCollection

EEG was used to collect dataset for few models in the form of bioelectrical signal. EEG is a componentof ECG+EMG by using this method we are collectingraw data. Sometimes we also get imbalanced data, sotoavoidthoseissuesherewareusingSMOTEtechnique for balancing the dataset in order for bestaccuracy.

Pre-Processing

ThegatheredEEGinformationis from6channels(alpha,beta,gamma,theta,anddelta)atthefrequency1000HZ.Thedatawillbeportedtotheserver as the raw data and the server will create adatabase for the given data and then it will prepare forpreprocessing.

variety of classification methods is used to train the model after the splitting process.Once the model training on offline stroke based data in initiated, the training phase also get initiated.Thetestingisontheonlinetocheckttheefficacyofthemodel.

Randomforestandlogisticregressionaretheclassificationalgorithmusedinthisstudy.

Proposedalgorithm

Usingthemachinelearningmethods,weareusingthefollowing algorithmsforthismodel:

1) Randomforest
2) LogisticRegression
3) SMOTE
4) CNN

In CNN algorithm, an input image was taken by the model and is differentiated from one another by assigning the aspects/objects in the image with importance (weight and biases). It is mainly used inimage analysis process, as we are giving image alsoan input, we are using this. It has four layers namelythe convolutional layer, pooling layer, Rectifier LinearActivation Unit (ReLu) correction layer and the fully-connected layer.

Random forest:

Random sample of data is used to train numerous independent decision tress individually which resides on RFs.During the training process,these trees are created and the result of the decision trees are collected as output.The final results are determined by voting process.Each DT must has vote for any one of the output classesAccording to the majority votes,the final predication is made with RF.TheRFclassificationdiagramisshownin Figure 2. The most allowing feature of the RFs is its flexibility and us addition it provides us with

unambiguous expectation since its employs default hyperparameters.

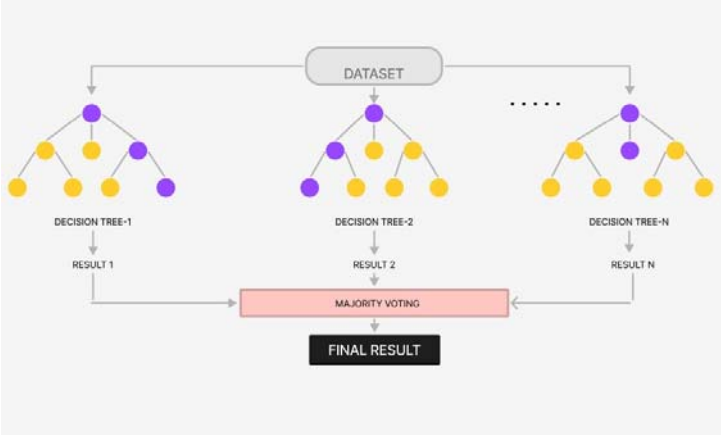

Figure 2:RandomForest

Logisticregression

The most commonly used ML algorithm [20] in the supervised learning approach is LR.Logistic regression used to predict the categorical dependent variable's output.The categorical dependent variable's output is predicted by using logistic regression.The nature of the output should be distance or categoricalthe result should be either 0 or 1. true or false etc.Logical regression & linear regression are more alike.

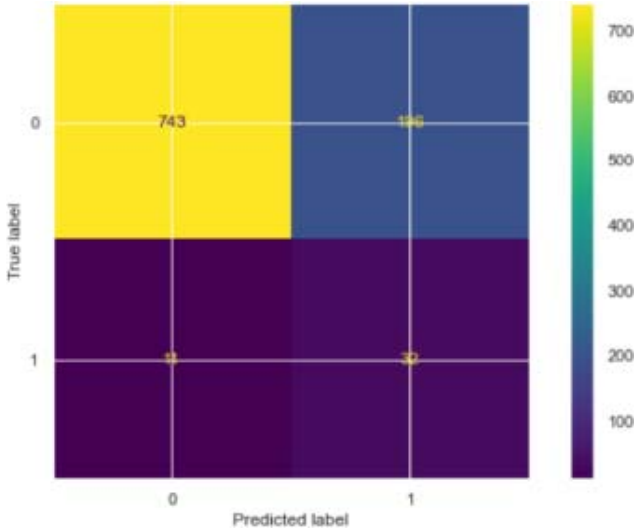

Figure.3. PredictionofLogisticRegression

The linear regression is used to address regression problems &LR is used to address the classification problems.The S-Shaped logistic function is used to forecast the two maximum values (0 or 1)

LRequation,

$$ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 x$$

$$=> P = \frac{e^{\beta_0 + \beta_1 x}}{1 + e^{\beta_0 + \beta_1 x}}$$

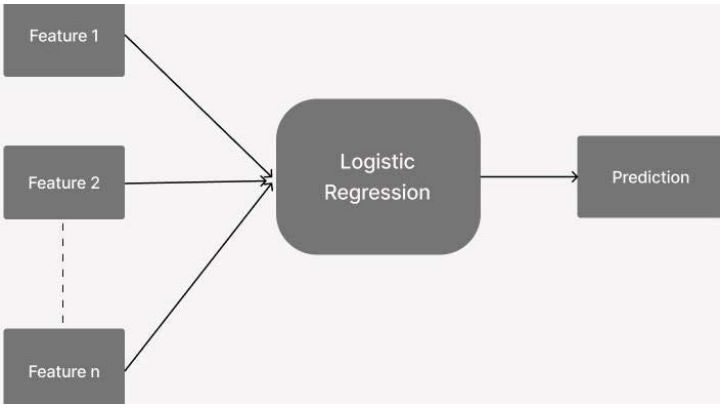

Figure4:Logistic Regression

Balanced dataset after applying SMOTE

Synthetic Minority Over-SamplingTechnique(SMOTE):

TheSMOTEmethod[21]isusedtobalancetheimbalancedataset.Inrealtimeworldgettingdataset,theremaybeapossibilityofgettingimbalancedorsmall data, so to solve this we are using this method.SyntheticMinorityOversamplingTechnique(SMOTE)isastatistical Technique is used to rise the numberof cases in a balanced way by smote.From the existing minority cases, the new instance is generated based on which the components works. The number of majority cases cannot be changed by the implementation of the smote.

SMOTE takes the whole dataset and processing if it is a minority cases, the percentage will be increased.

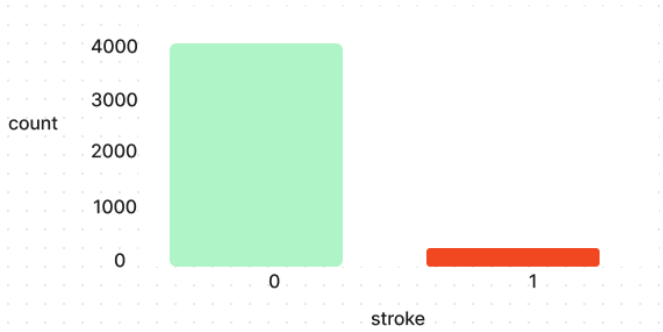

Figure.5.DataImbalance

4. RESULT ANALYSIS

From our analysis we conclude thatRandom Forest model is more efficient and easier of among algorithm by our analysis.Ithas more precision andbetter recall. Even though we have lotsof algorithm, we prefer because of its higher level ofprecise.Thispaperachieved95.44%precise by using SMOTEthe imbalanced datasetalso balancedin order to achieve best accuracyinpredictionofstroke.

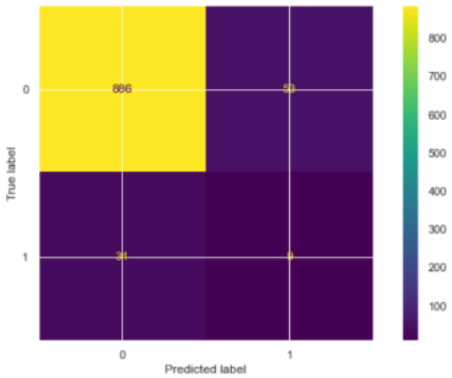

Figure.6. PredictionofRandomForest

5. CONCLUSION

Stroke is a very serious, life threatening medical condition in our society that must behealed before it harms or affect the human living. Fabricating aneffective machinelearningmodelcanhelpintheearlyforecasting and prediction of stroke and downgrade the serious impact ofthefuture. Based on multiple physiologicalvariables investigated in this study, we had constructed a predictive model to predict the stroke (Ischemic) in the early stage using various ML algorithms. According to theresearch studies,theRandomForestmethodwas testedwithbest accuracyof95.44%andduring cross validation the forecasting of brain stroke also found. Infuture we can enhance our model to use larger dataset by using an advancedmachine learning we can also build a model with moreaccuracy than we predictednow.

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PERSON RE-IDENTIFICATION USING K-RECIPROCAL ENCODING

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Abstract— In recent years, individual re-recognizable proof of interest is the retrieval process with improving precision by re-ranking as a basic advancement. In the re- ranking process effort in re-ranking with the fully programmed, unique arrangements are established. The proposed encoding technique is K-reciprocal results using the LBPH (Local Binary Patterns Histogram) Algorithm. The objective of this work is to obtain a genuine image match more prone to the probe in the K-corresponding closest neighbor. When given a probe image, complementary is encoded with the k-equal nearest neighbors into a vector to re-rank using the Jaccard matrix. The obtained result is a combination of a Mahalanobis metric, the Jaccard metric, and the LBPH algorithm. The re-ranking activity needs no Human interference in producing an appropriate enormous scale dataset. The possibility of the proposed approach is affirmed for large-scale Market-1501, CUHK03, MARS, and PRWdatasets.

Keywords: Image Matching, Image Retrieval, Person Re-identification, Graph Theory.

I. INTRODUCTION

Initial ranking is the standard re-ranking process for effective work that shows the ranking of similar images among pre-ranked images. An assumption with the ranked images within the probe of K-nearest neighbors, become the true match for the subsequent [4] re-ranking process. K-reciprocal encoding is forming a single vector from the K-reciprocal feature of the given image used for re- ranking. K-corresponding neighbors result in new queries which aid in producing the new ranking list. K-nearest neighbor [5] group includes both the true matches and the false matches. K-complementary finds false matches for the truly matched images.

The process starts to join asymmetric feature mapping and discriminative dictionary learning in a unified scheme for heterogeneous person re-ID. It alleviates data biases across modalities in the projected subspace, and thus heterogeneous data can be represented by a shared discriminative dictionary.

Fig. 1. Person re-identification challenge scenes

Fig. 1 displays a collection of images for the topic below taken in various settings. These photos were shot throughout the day at various times from two distinct security cameras. Inherent topic differences, changes in perspective, pose scale, and lighting conditions are all shown in this image. A person is confronting one of the biggest and most difficult difficulties [2]. The need for a re-identification technique emerges when the vast majority of used apparel tends to be non-discriminatory.. By adding qualities, attributes-based techniques aim to address this flaw. The terms "masculine," "skirt," and "jeans" all allude to examples of linguistic characteristics. Linguistic characteristics are learnt from a bigger dataset with priority as mid-level alternatives. They are advantageous when just one picture [3] is used to describe the individual. Mixing linguistics traits with low-level parameters in a model. Planned and shown areas that will improve a person's performance Re-identificationstrategies.

The relaxation of this paper is geared up follows, in area II, the related works are discussed, section III is focused on the design of the system, and in section IV the experimental results are presented and graphs are plotted, followed by concludingremarks.

II. RELATEDWORK

Person Re-identification aims to match a person captured by multiple cameras. However, the persons across cameras with a pose, illumination, variation, and occlusion are rarely focused. These are caused mainly by environmental conditions like Weather, forecasting,and

positioning of the camera. In this work, these challenges are worn off by the distance metric learning process. This proposed model eliminates the asymmetrical matches of the probe and provides an efficientoutcome.

III.DESIGN OF THESYSTEM

The interference of mismatched pairings is lessened by the closest neighbour, and the similarity between the probe and the gallery [5] is found to compare distance in the re-ranking mechanism. Re-ID model learning is aided by the use of feature extraction, metric learning, and re-ranking. The ranking list's false positives are removed via the extended K-reciprocal closest neighbour algorithm. As a result, this completely automated unsupervised model performs well with known re-computation for every ranklist. Wu [15] proposed retrieval system of the faced image being scalable to represent a face both local and global features are used. A new component by using the special properties of faces [8] was designed as a local feature. These local features are quantized into visual works based on a quantization schema. The hamming signature was used in encoding the discriminative feature for every face. The pedestrian image was refined by constructing a reference image set. From the inverted index of visual words [7], the person images are retrieved. A multi- reference distance by using a hamming distance was used to re-rank the person images.

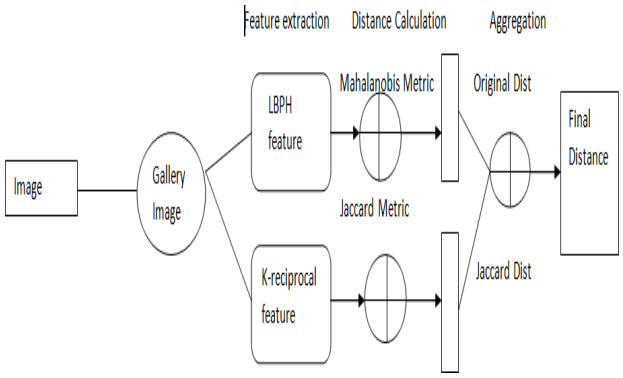

Fig. 2. Proposed System Architecture of LBPH

Each pair in the gallery and the probe's initial distance is calculated using the LBPH feature. The final distance is used to generate a rating list. In this study, a single vector was created by encoding the k- reciprocal feature. The re-ranking procedure is made simple by the use of the LBPH metric and vector comparison. having previously been removed, cropped, shrunk, and often turned to grayscale are the face images. The face recognition algorithmic rule may be used to determine the traits that best characterise a picture.

As measured by the size of the union of the picture set, the Jaccard similarity coefficient. The set of predicted photos for a sample is compared to the corresponding collection of photographs using this technique.

The current phase of the effort involves testing the suggested strategy on the re-ID dataset. Compared to video [3] and image-based datasets, the dataset is more difficult and calls for the detection of probe from a raw dataset and the identification of the proper probe from the selected galleries..

III. EXPERIMENTALRESULT

The suggested Jaccard distance provided constraint outperforms, and taking into account metric distance aggregation produced an additional improvement highlighting the significance of re-ranking.

The classification model is properly trained for ID-Discriminative Embedding. Each picture receives a 1,024-point vector, which is helpful for re-ID datasets. Contextual dissimilarity measure (CDM), which considers a point's surroundings. By regularising the average distance of each component to its neighbourhood, this metric is repeatedly obtained. Cross-view Discriminant Analysis (XQDA) uses discriminative subspace learning to keep discriminating data in the unique characteristics space, which often results in better performance with a lower-dimensional subspace.

We measure the accuracy of our technique using rank i. In this case, rank accuracy refers to the likelihood that one or more properly matched images would display in position top-i. Rank-1 equals zero if there are no appropriately matched photos in the top I of the retrieval list, else rank-i equals one.

TABLE I. Comparison of Various Methods

Batch	***IDE-C + CDM***	***IDE-C + XQDA***	***LBPH PROPOSED***
1	68.91	62.31	85.66
2	75.72	73.23	79.89

3	72.23	63.34	76.67
4	70.23	70.56	74.45
5	75.67	66.57	79.8
6	77.67	69.89	81.34
7	69.23	71.23	84.55
8	74.45	70.17	89
9	80.45	89.78	94.45
10	79.65	76.56	76.56
Average	**74.42**	**71.36**	**82.23**

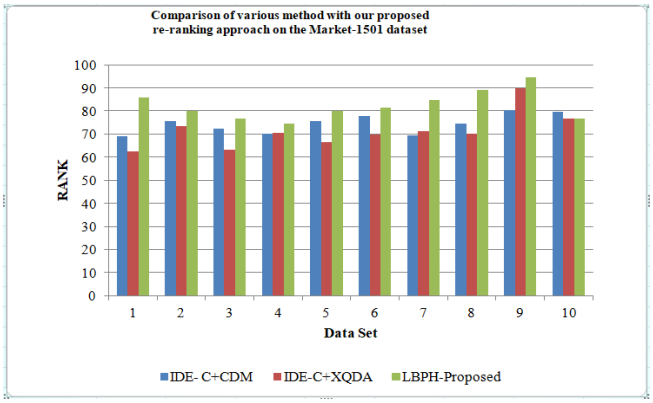

Fig. 3. Comparison of various methods with proposed re-ranking approach on Market-1501 Dataset

The results showed that our proposed LBPH algorithm is better than the existing algorithms IDE-C+CDM and IDE-C+XQDA in terms of Rank-1 feature parameter for Person Re-identification using Market – 1501 dataset samples.

TABLE II. Comparison of variety of methods with proposed re- ranking methods on CUHK03 Dataset.

Batch	***LOMO+XQDA***	***IDE-C+XQDA***	***LBPH PROPOSED***
1	31.24	38.21	63.24
2	33.88	41.11	65.32
3	35.68	43.25	68.25
4	37.21	46.38	71.24
5	39.98	49.96	74.32
6	42.45	52.87	77.58
7	43.25	56.36	80.47
8	45.22	58.32	83.21
9	47.21	61.71	86.32
10	49.77	54.22	89.22
Average	**40.59**	**50.24**	**75.92**

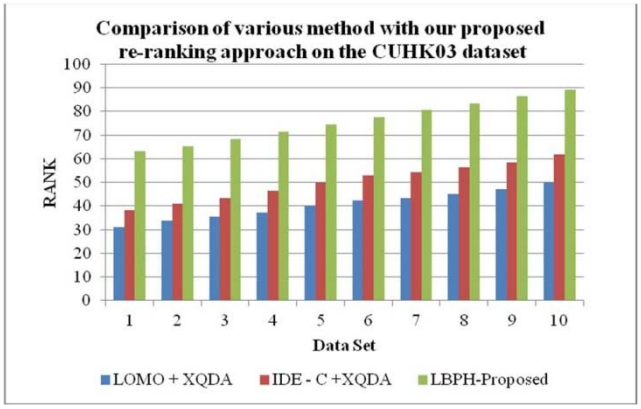

Fig.4. Comparison of variety of methods with proposed re-ranking method on CUHK03Dataset

The results evidenced that our proposed LBPH algorithm is performed better than the existing algorithms LOMO-+XQDA and IDE-C+XQDA in terms of Rank-1 feature parameter for Person Re-identification using CUHK03 dataset samples.

The identification process for a query is illustrated in Fig. 5. The images 1 to 10 are the observed output using the proposed method. Images within green boxes are correct matching images. Red boxes indicate incorrect matching images.

Fig .5. Identification process

IV. CONCLUSION

The K-reciprocal closest neighbour sets are found using three huge datasets throughout the re-ranking process using metrics like Mahalanobis and Jaccard. The outcome with the Market-1501 dataset was 82.4, but the outcome with the CUHK03 dataset and the suggested Local Binary Pattern Histogram was 89.22. The ranking list, where re-ranking was also done to enhance the outcome, readily matched the query.

A significant K-reciprocal feature was obtained thanks to the similarity connection that the local expansion query suggested was recorded from related samples. The findings are straightforward since the ultimate distance is calculated by adding the initial distance and the Jaccard distance..

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ISOLATED BIDIRECTIONAL MICROINVERTER WITH PROPORTIONAL RESONANT CONTROLLER FOR RENEWABLE ENERGY SYSTEM

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Abstract

An isolated bidirectional microinverter with single-stage, single-phase, proportional resonant (PR) control is created in this work. From zero to infinite, resonant converter voltage conversion ratio may be modulated by the use of PR-PWM, which can be used in single-stage isolated inverters with a wide voltage range. It's for these two reasons: Power transmission is not an issue when it comes to determining voltage conversion ratios. A bidirectional DC/AC conversion is possible because the converter's value and flow direction may be easily altered. When calculating the voltage conversion ratio, one uses the equivalent duty cycle, which does not change regardless of how much power is sent in either direction. A bidirectional DC/AC conversion is possible because the converter's value and flow direction may be altered with ease. This means that an inverter and rectifier may both use the same basic unified current controller. In addition, the suggested system may provide gentle switching for the majority of the grid time and high efficiency. The suggested microinverter's functioning principles, features, design concerns, and control method are explained.

Keywords. Renewable Energy, Microinverter, Resonant controller

1. INTRODUCTION

The need to use renewable energy for satisfying our residential consumption of power is a burning question now. Day by day, the total electrical system gets worse to worsen for fulfilling the incremental demands of industries, household users, irrigation machineries and nevertheless the backup sources of UPS (Uninterrupted Power Supply), IPS (Interrupted Power Supply), battery vehicles etc. The number of power plants have been increased in the last few years but, the total cost and fuel management is under question for choosing the best futuristic steps taken in our country. We can use this as a source of electricity for our residential users. Now, where a localized grid can be developed in some economically advanced area for saving that amount of energy, then those can be provided to other region instead of making load shed there. The concept is well judged and approved and we are going to give a better insight to these in the preceding sections, where micro-inverter with MPPT algorithm is elaborately described and a new one is designed for adopting in the natural situation to form a micro grid.

There are inverters available in sizes ranging from 50 watts to 50,000 watts, however they are rarely employed in residential or other PV systems. An inverter connected to an ac grid directly or through a battery is what we're interested in in this research for photovoltaic systems that provide DC current for charging. While solar cells are capable of generating direct current, a load must be placed between their outputs to do so. At the PV unit's output, there is usually an inverter to generate ac voltage, which drives the home's 98 percent demand. Due to their ability to optimize the power generated by each individual solar panel, micro-inverters may produce 5-25 percent more electricity than conventional solar panels (utilizing MPPT). Because of this, the string inverter will only produce power at the rate of the string's worst-performing solar panels. This is due to the fact that each panel has a slight variance in it. Between the highest and least efficient panels of a string, these changes can account for 5 percent of the variation in performance. Micro inverter generates optimum power output from that panel, regardless of its age or condition. As a result, the array's panels are all operating at their maximum capacity. This means that even a single panel that is covered in dirt or leaves might have a negative impact to the whole string inverter's output.

2. LITERATURE SURVEY

L. Zhang et al an inverter system with series-connected module integrated inverters for grid-connected photovoltaic (PV) generation (SC-MIIs). For maximal solar energy harvesting, the grid-tied SC-MII system uses individual MPPT-enabled MIIs with each PV panel. For the utility grid to meet its voltage requirements, the outputs of MIIs are linked in series.

A. Pal et an innovative single-stage soft switched high frequency link 3-phase DC-AC converter architecture is presented by al. Grid-integration of solar sources, a fuel cell, etc., are among the applications for which this topology is suited. High frequency magnetic isolation reduces system space, weight and cost. In the DC side converter, a sine-wave pulse width modulation is used. DC side converters are soft-switched for the most of the line cycle, despite being high frequency switched.

Y. S. Jeong et al proposes a control system for a highly efficient bidirectional grid-tied converter that utilizes a single power conversion to provide high quality grid current. Bidirectional flyback DC-DC converter and an unfolding bridge circuit are the components of the proposed converter. – Bi-directional power conversion between the grid and energy storage device may be achieved by altering the flyback's PWM signal. All three controllers in the system include an allow pass filter to prevent the system from overshooting its limits.

J. R. Kan, S et al CSR-HFL inverter was shown to be a new combination of synchronous rectifiers and high frequency links. The performance of three different types of conventional HFL inverters is examined and reported. According to cyclo-converter-type HFL inverter (CHFL) inverter, the combined rectifiers structure may be determined from. In the redesigned architecture, two more switches are employed to prevent the short circuit.

R. K. Surapaneni, et al experiments with high frequency ac to line-frequency ac conversion using a new half-bridge half-cycloconverter design on the load side, where

devices operate at line frequency. Full-bridge, half-bridge, or push-pull microinverter topologies for solar photovoltaic AC modules are also compared and evaluated in this work. The advantages of double-ended converters include no transformer saturation, smaller transformer and filter sizes, and the ability to use a single power supply.

S. Zhong, J et al the suggested SSA includes an HFL-SSI with bipolar phase shift modulation (BPSM) and a half bridge active clamp (HBAC). Using a cycloconverter switch to clamp voltages, HBAC may then use the energy stored in the filter inductor and leakage inductance in other circuits. Implementation of cycloconverter switches may be done using a ZVS active clamp circuit Switches with primary-side magnetizing current can perform ZVS.

T. Chen, et al DAB and GaN HEMTs are employed in this AC/DC converter's single-stage architecture. A wide range of input voltages and loads may be employed to create ZVS through the use of dual-phase-shift (DPS) modulation and variable-frequency (VF) control. PFC-enabled AC-DC converters may accomplish Zero Voltage Switching (ZVS) throughout the whole range of AC mains voltages, according to F. Jauch et al. To accomplish a single-step power conversion, this DAB employs an isolation transformer with a half-bridge and a full-bridge.

H. Wu et al for regulating power flow and achieving the following desirable outcomes in a suggested converter.

3. PROPOSED SYSTEM

PR controller system-enabled bidirectional resonance converters are suggested as a feasible solution. Single-stage microinverter based on the idea of PR-PWM driven resonant converters is provided in this research (RC). The following are some of the benefits of using an approach like this: Isolated single-stage DC/AC converters based on LLC converters are one approach to solving the zero-crossing issue. Voltage gain is unaffected by the amount of power given. Changes in power transmission may be made with ease. It is far more difficult to design DC/AC single-stage systems based on bidirectional resonant converters than unified current controllers are shown in figure 3.1.

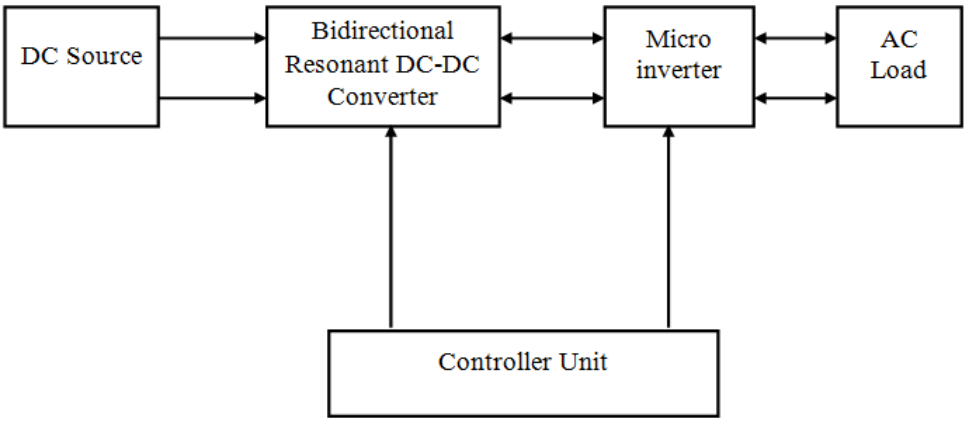

Figure 3.1- Proposed System Block

4. PROPOSED BIDIRECTIONAL MICROINVERTER

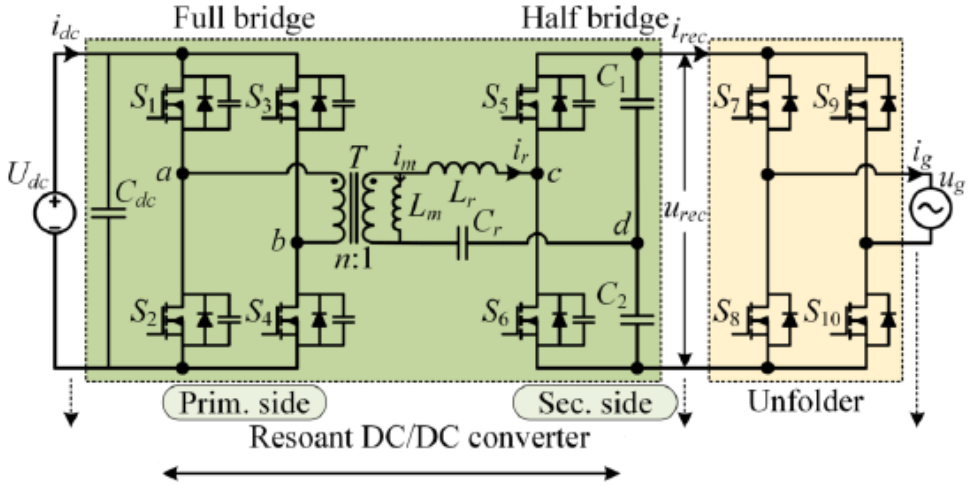

Figure 3.2-The proposed bidirectional microinverter

FIG. 3.2 depicts a single-stage, single-output isolated bidirectional converter. The device's heart is a resonant DC/DC converter and a line-frequency inverter. – (unfolder). To link the half bridges that make up the resonant converter, high-frequency transformer T, resonance inductor Lr and resonance capacitor Cr are used. Using a half bridge to minimize the turn-to-ratio of the high frequency transformer in a bidirectional DC/AC converter is necessary because of the low DC voltage. This device's primary function is in maintaining and improving the output current and power factor (PFC). To convert the pseudo-DC link current to sinusoidal alternating current, the unfolder is used. Using a converter or an unfolder, you can move power in both directions.

At resonant frequencies, LLC converters' voltage conversion ratio is not dependent on the load. Resonant frequency is stated as a frequency at which the suggested converter is constantly operating (1).

$$f_r = \frac{1}{2\pi\sqrt{L_r C_r}} \tag{1}$$

Using the resonant current and voltage as inputs, we can derive the following state function for the capacitor: (2).

$$\begin{cases} L_r \frac{di_r}{dt} = u_{ab} - u_{cd} - u_{Cr} \\ C_r \frac{du_{Cr}}{dt} = i_r \end{cases} \tag{2}$$

Uab and ucd represent the midway voltages of the primary and secondary sides, respectively. State function (2) may be reduced in complexity by using the essential components of ir and uCr: (3).

$$U_{ab1} - U_{cd1} = j\omega_s L_r L_{r1} + \frac{I_{r1}}{j\omega_s C_r} \tag{3}$$

What is the switching frequency's angular frequency?

These two components, Uab1 and Ucd1, form the core of their respective systems.

The fundamental impedance of the resonant tank is zero when the converter is operating at its resonant frequency. To put it another way, the amplitude and phase of Uab1 and Ucd1 are identical in this scenario. As a result, the main side and secondary side midpoint voltages uab and ucd have the same phase as one another, too.

4.1. Proportional resonant controller

The one of the most common transfer functions used to regulate closed-loop systems with sinusoidal behavior is the proportional resonant controller, abbreviated as PR. Having both a proportional and resonant term, they may be tuned in any way you see fit. The proportional resonant controller is shown in figure 3.3

Because of its high performance and ease of implementation, proportional resonant controllers (PR) for single-phase AC current/voltage regulation have become a hot topic in the field of power electronics.

Because the integral control action provides an essentially infinite DC gain in PI controllers in DC applications, the controllers have a very low steady-state error. Since PI controllers have finite gains that can't prevent steady-state error in AC applications, their tracking response is always delayed.

As a well-known solution to this problem, synchronous reference frame implementation is used. A rotating reference frame (dq) synced to the AC frequency is used to construct the PI controllers (if any are used at all) (e.g., of the grid or the electric motor). DC gain can be relocated to a chosen frequency, in this case 50/60Hz (or the motor rotating speed).

As an alternative, proportional resonant controller can be used. There are no coordinate transformations needed since they work in a stationary reference frame. Resonant terms give a limited, but extremely high gain at the AC frequency, which enables tracking and perturbation rejection capabilities comparable to dq-control.

Park transformations are not required in single-phase systems since the formulation of the direct and quadrature axes is not evident.

4.2. Operating principles of proportional resonant control

It is common for proportional resonant (PR) control systems to have a transfer function similar to the one seen in this figure

$$GC(s)=Kp+2Kiss2+\omega02 \quad (4)$$

The target reference current frequency is 0. The denominator term s2+02 produces an infinite control gain at 0 in this equation.

As a digital controller, this expression may be difficult to implement; instead, dampening around the resonant frequency may be more practical because it is easier to apply.

$$GC(s)=GCp(s)+GCr(s)=Kp+2Ki\omega css2+2\omega cs+\omega02 \quad (5)$$

When written as a fraction, c denotes the cutoff frequency for resonance (i.e. width of the resonant filter). A smaller steady-state error can still be enforced even if the gain at 0 in

this second formulation is limited. As a side effect of the broadening of the bandwidth around 0, grid-tied applications may tolerate minor frequency fluctuations more easily.

4.3. Proportional resonant digital control implementation

The bilinear (Tustin) transform makes it simple to construct a workable implementation in practice. Resonant term's discrete transfer function, discretized with a period Ts, yields:

$$GCr(z)=Y(z)E(z)=a1(1-z-2)b0+b1z-1+b2z-2 \text{ with } a1=4KiTs\omega cb0=Ts2\omega 02+4Ts\omega c+4b1=2Ts2\omega 02-8b2=Ts2\omega 02-4Ts\omega c+4 \quad (6)$$

Using the resonant component as a difference equation, we get:

$$y(k)=1b0[a1\cdot e(k)-a1\cdot e(k-2)-b1\cdot y(k-1)-b2\cdot y(k-2)] \quad (7)$$

Generate run-time code with this difference equation. Furthermore, a Simulink implementation is provided in the next section.

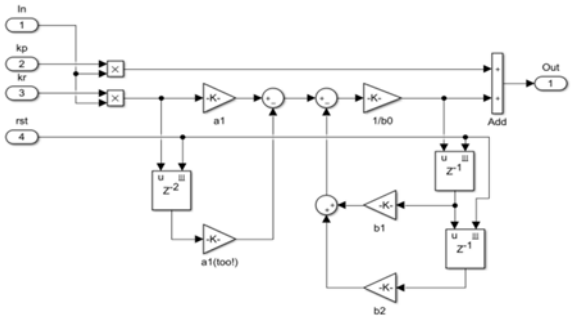

Figure 3.3-Proportional resonant controller implementation example

5. RESULTS & DISCUSSION

Dynamical systems modeling, simulation, and analysis are all possible using Simulink. If you're looking for a system that can handle both linear and nonlinear systems, it's the best option for you. Systems can also be multi-rate, i.e., sampled or updated at various rates by distinct components [2].

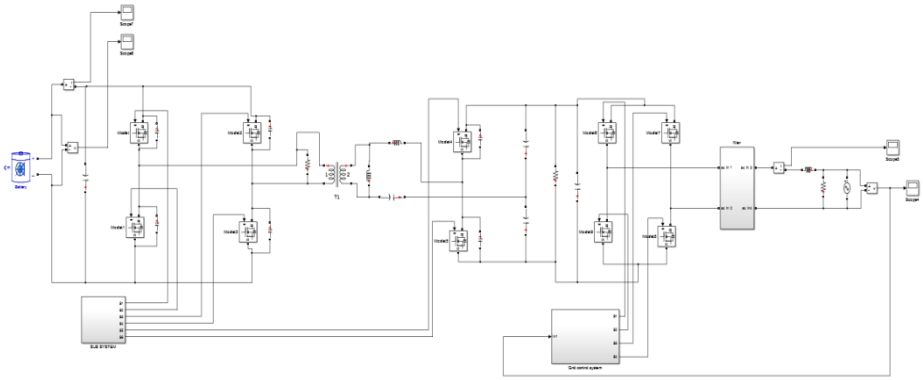

Figure 3.4- Proposed system model

MATLAB 2014a Simulink is used to create the suggested system model. Designing and simulating the circuits was accomplished with the help of the MATLAB Simulink and Sim power system tools. Figure 3.4 depicts the suggested Simulink model. Figures 3.5 shows control system and 3.6 shows PWM control.

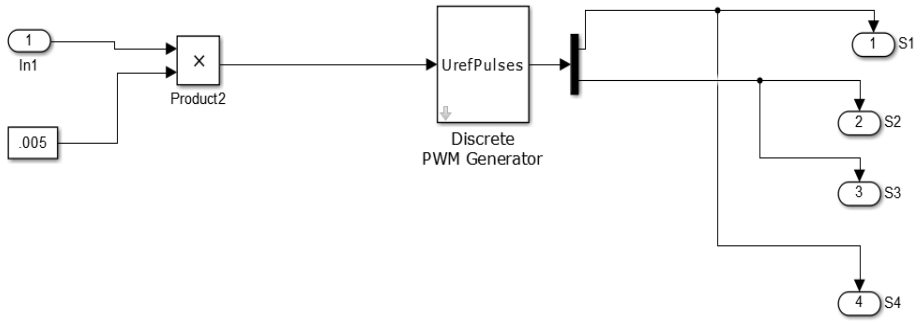

Figure 3.5-Control system

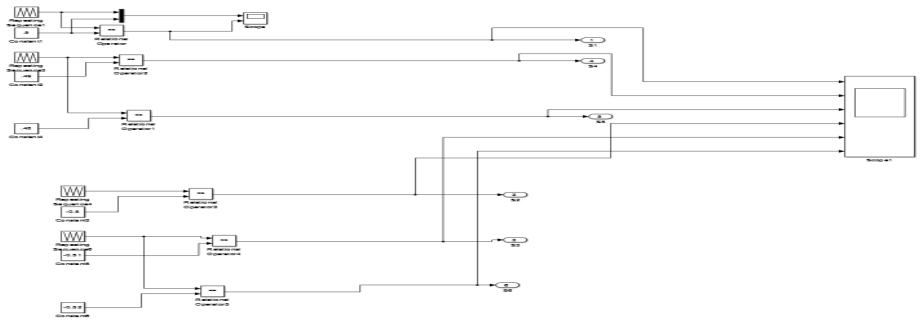

Figure 3.6 PWM Control

The DC voltage and current of the battery is shown in the following figure 3.7 and 3.8. The battery outputs 40 volts of DC electricity.

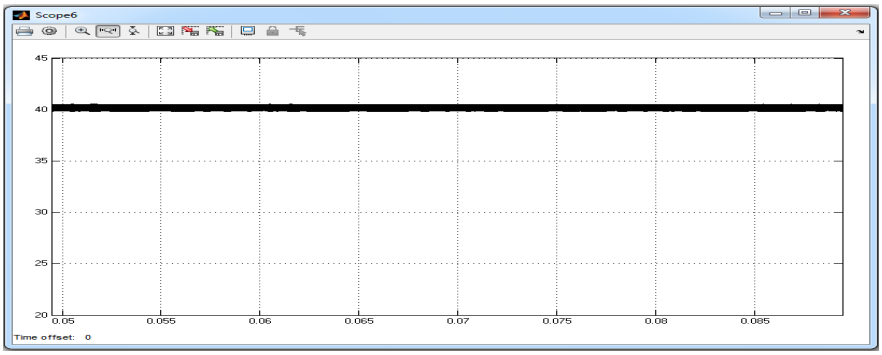

Figure 3.7- Battery voltage

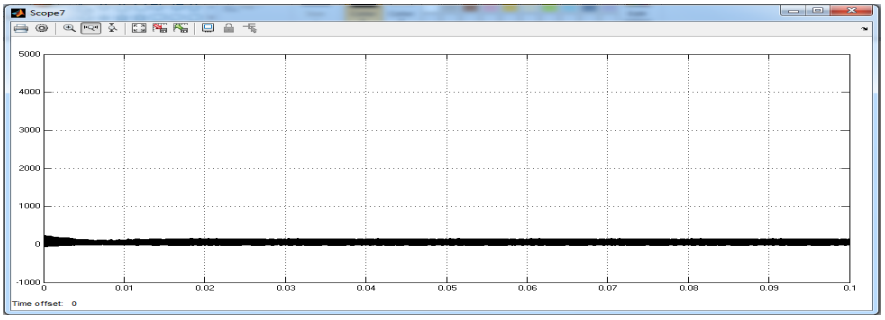

Figure 3.8- Battery current

Figure 3.9 illustrates the PWM gate signal. For the PWM pulse signal, ramp and sine wave are used in conjunction.

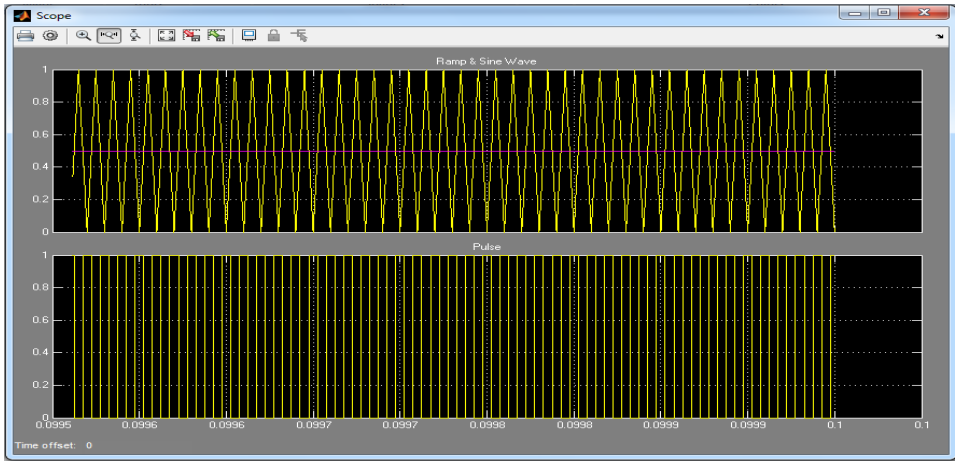

Figure 3.9- Ramp & Sine wave

Grid output AC voltage is shown in the following figure 3.10. To power the resonant converter and inverter, a battery voltage is sent into the system. Generator injects DC power into grid through inverter. A 230V AC output is provided.

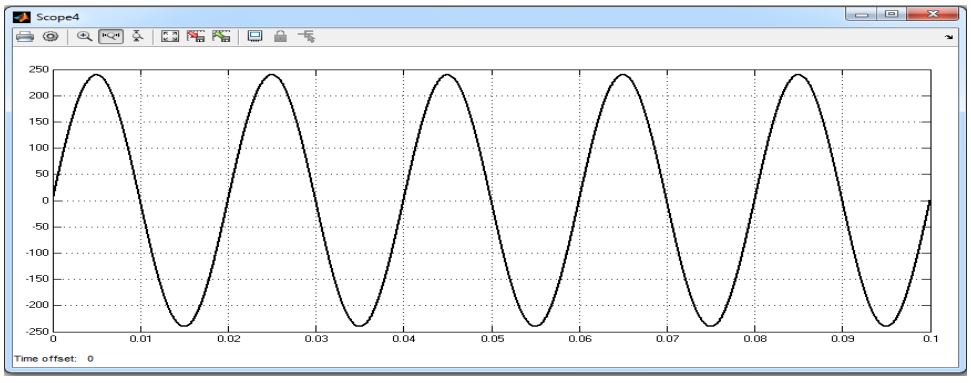

Figure 3.10 Output AC voltage

The following figure 3.11 shown the grid output current. It reached at 6A.

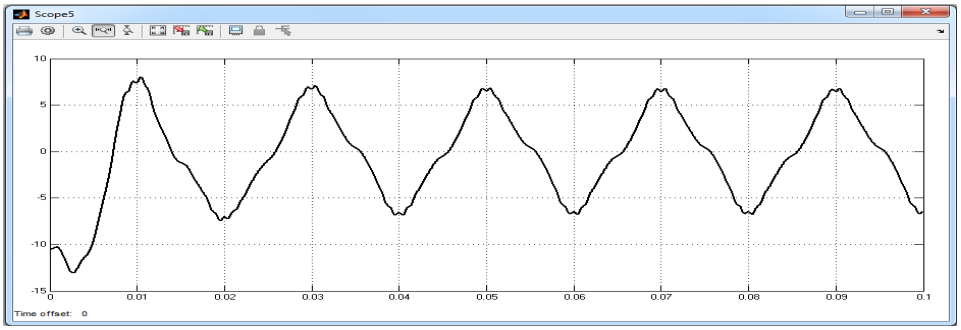

Figure 3.11 Output current

6. CONCLUSION

As part of this study, an embedded-based controlled resonant converter microinverter is suggested and tested for energy storage applications. Resonant converter voltage conversion ratio may be varied over a large range using PR-PWM control, allowing for step-up and step-down voltage conversion to be done. With a simple unified current controller, you may rapidly and easily alter the amount and direction of power being delivered. It has also been possible to perform soft switching during the majority of the grid time MATLAB/Simulink is used to simulate a PR (proportional resonant) controller for an isolated bidirectional microinverter and to observe its performance during a fluctuating load state.

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Welcome to the International Conference on Advances in Science, Engineering and Technology [ICASET 2022] which will be organised in association with River Publisher on the 27th and 28th of May 2022 at Cheran College of Engineering in Karur, Tamil Nadu. Artificial neural networks, fuzzy logic, fuzzy neural networks, expert systems, genetic algorithms, and communication are some of the methodologies and techniques that are commonly used to build intelligent, automated, and secure systems. The main purpose of ICASET 2022 is to promote intelligent technologies such as fuzzy logic, neural networks, support vector machines, evolutionary computing, machine learning, and probabilistic reasoning for addressing real-time problems. At ICASET 2022, researchers, professors, students, and professionals in the domains of engineering and technology will have a world-class forum to showcase their work, expertise, innovative ideas, and discoveries. A fascinating technical programme will be on show. The programme will include research presentations, keynote lectures, invited talks, tutorials, panel discussions, and poster presentations. In all areas of soft computing, we're searching for innovative ideas. Submissions from academia, government, and industry are all welcome. Submissions for technical papers, workshop/special session ideas, and tutorial proposal submissions are now open. Its goal is to provide a great platform for professors, researchers, and scholars from all over the world to present the most recent innovative research results as well as the most recent developments and trends in the fields of Electrical, Electronics, Information, Computer, and Communication Technology. The goal of ICASET 2022 is to stimulate communication between scholars and practitioners working in a broad range of engineering and technology fields. A large number of people are expected to attend ICASET 2022 to present research findings, discuss views and ideas, learn about new technologies, and extend their professional and social networks. ICASET 2022 will be held entirely online, with the authors presenting their papers. Original research papers (not under consideration for publication elsewhere) reporting novel theoretical and/or experimental research discoveries in the following tracks (but not limited to) are welcomed to be submitted in standard river publisher conference template by prospective authors.

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