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Foreword

We are here with the second edition of "VIGYAAN – 2020-21". The theme for the edition is "Technological Advancements in Computational Intelligence". Computational Intelligence is the theory, design, application and development of biologically and linguistically motivated computational paradigm. Generally, computational intelligence is a set of nature-inspired computational methodologies and approaches to address complex real-world problems to which mathematical or traditional modelling can be useless for a few reasons: the processes might be too complex for mathematical reasoning, it might contain some uncertainties during the process, or the process might simply be stochastic in nature. Indeed, many real-life problems cannot be translated into binary language for computers to process it. Computational Intelligence therefore provides solutions for such problems.

The methods used are close to the human's way of reasoning, i.e. it uses inexact and incomplete knowledge, and it is able to produce control actions in an adaptive way. CI therefore uses a combination of five main complementary techniques. The fuzzy logic which enables the computer to understand natural language, artificial neural networks which permits the system to learn experiential data by operating like the biological one, evolutionary computing, which is based on the process of natural selection, learning theory, and probabilistic methods which helps dealing with uncertainty imprecision.

Research adds to the stock of knowledge and provides the source of new ideas, methods, techniques, and findings across a whole range of disciplinary and multi – disciplinary areas. 'VIGYAAN' has been focusing on addressing the developing areas of computer science. To document this intellectual vibrancy will always be the key aspect of VIGYAAN. We focus to promote knowledge and make the various academic developments in the world accessible to every section of society. This conference proceeding is a hub of diverse ideas and arguments in the advance areas related to computational intelligence. In this COVID pandemic stage, even in an online mode, we believe that 'VIGYAAN' is a significant step in achieving our aims and principle.

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Campus of Things - A Survey of Applications, Challenges and Opportunities

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Abstract— Internet of Things has literally become ubiquitous that it has been integrated to almost every consumer and industrial appliance we know of. The IoT is not just a system that connects various devices which are in constant communication with other objects or machines, but it can also act a connecting platform for infrastructures and environments. IoT has found great adoption among educational campuses, typically centres of higher education such as colleges or universities. A campus powered by IoT, a Campus of Things or a Smart Campus is not merely about using digital tools in classroom or enhancing the learning experience. A Smart Campus links together information databases, IT resources, physical infrastructure and people associated with it. Campus of Things can prove to be beneficial in facility management, access control and security surveillance. It can transform the experience for campus dwellers with location based and context - aware services. When there is a greater volume of research assets, it enables proper tracking of such resources and their efficient usage. This paper explores the concept of Campus of Things, its applications in educational campuses, the existing challenges and the opportunities available. The existence of an innovative and favourable campus environment can enhance the learning outcomes and the total campus experience for all stakeholders. Considering the recent changes in instructional strategies brought about by the COVID-19 pandemic, it can be said that Campus of Things offers a certain level of preparedness to manage unprecedented situations. The Campus of Things can make the information resources accessible to all and also to traverse any adverse circumstances.

Keywords— Internet of Things, smart campus, information systems, campus network

I. INTRODUCTION

At the end of the last millennium, the world witnessed a revolution brought about by Internet explosion that radically changed education, culture, entertainment, business, communication, governance and civilization as a whole. For the current information age, the next leap in technology that can exert significant impact on every aspect of society is Internet of Things, abbreviated as IoT.Advances in technology and data communication has contributed to the rise of intelligent environments which can be termed as smart spaces or smart environments. [1] Different from a standalone consumer appliance, this will be an integrated ecosystem, synergizing communication networks, sensors, cloud computing and various other applications, which can identify the users and their current state or requirements and dispense services accordingly. Such smart spaces can find application in several domains. Smart spaces will be the most visible and promising implementation of IoT. This can range from development of smart cities, creating safe and energy-efficient industrial work-environment, smart public services, environment and weather monitoring to the design of smart residential complexes or workspaces.

This conceptthas been explored and promoted on campuses of educational institutions as well. A smart space in a campus can be considered a Campus of Things, a system in which physical objects or pieces of infrastructure are connected to a common network that establishes constant communication between these objects, thus enabling efficientuse of all facilities and minimization of energy consumption. Wireless sensor network in combination with cloud capabilities can serve as the foundation for a reliable, scalable anddynamic IoT framework suitable for campuses. [2]

II. LITERATURE REVIEW

Several academicians have contributed to the ongoing research on applications of IoT. It can be said that universities and colleges have the intellectual resources readily available that quickens the pace of research and adoption of Campus of Things.

In as early as 2008, Aqeel-ur-Rahman et al proposed the concept of smart university with the help of RFID technology. They developed a prototype considering the various use cases relevant for a university. The proposed system handled functions like maintenance of attendance record, switching control of electrical appliances and security locks of rooms.[3]

Kevin Ashton, who is considered to have coined the term Internet of Things, shared his vision of implementing IoT to monitor the physical environment. Computers connected to sensors for gathering information can see, hear

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and smell the world for themselves. RFID and sensor technology enable computers to identify the environment without the need of a human making observations and entering the data.[4]

Luigi Atzori et al suggested that an IoT is the confluence of internet-oriented, things oriented and semantic oriented visions. [5] Based on these observations, JayavardhanaGubbiand fellow researchersfrom University of Melbourneproposed that the architecture of an IoTsystem actually contains three segments which are the wireless sensor networks, cloud computing and the application or presentation segment. The paper also commented on extending IoT to build smart spaces, but failed to identify university campuses and educational institutions as a potential area of application.[2] The capabilities expected from IoTwere outlined in [6], which includes communication and cooperation, addressability, identification, sensing, actuation, embedded information processing, localization and user interfaces It was observed that most specific applications only need a subset of these capabilities.

Marian Cață studied the idea of creating a smart environment for a university campus, where she described the concept called Smart University, its advantages and a possible architecture leveraging smart objects. The paper identified university campuses to be the ideal places to build smart environments.[7]

Marti Widya Sari et al in [8] presented their vision of smart campus that included smart education, smart parkingand smart room. The implementation was modelled with Universitas PGRIYogyakarta campus as a case study.

A large corpus of literature is also available on specific functions or applications of smart campuses.In [9], Hsing-I Wang adopted IoT for energy-saving by properly managing the computer labs and air conditioners. He laid out the architecture of a smart and green campus, completewith a prototype of the system to track computer usage and temperature in labs.F. A. Rachman et al [10] introduced a new campus bike sharing system based on Internet of Things using MQTT protocol. Ahmed Abdi in [11] identified the various applications such as smart classroom, smart security, smart parking and smart office. There have also been attempts tointegrate IoT with cloud computing and education cloud to improve the quality of service delivered. [12], [13] A.A.NippunKumaaret al in [14] implemented an intelligent lighting system using WSN, creating a wireless system of lighting control suitable for existing buildings. [15] observed that in two of the universities the authors considered for study,IoT applications are implemented to monitor the occupancy of study spaces and have the facility to book study spaces beforehand. Exploring the concept of smart learning, [16] postulated the idea of "i-campus", envisioned as a modern campus with IoT infrastructure set up for learning environment, enabling easy sharing of handwritten notes and easy access within the network limit.

Recently, research efforts have also been directed towards bringing machine learning capabilities to a smart campus environment. Some of the interesting usage scenarios include surveillance video analysis for student action recognition and localization[17] and an emotionally aware virtual assistant for campus app[18].

III. CAMPUS OF THINGS

A. Concept

Digital teaching tools and ICT have found greater acceptance in educational institutions, from elementary schools to research centres. The terms like digital campus, smart campus, e-classroom, i-campus and smart classroom have all been used synonymously so far. Some have been assigned as commercial names as well. There is no universal definition for the term smart campus. The evolution of educational campuses have undergone three phases – traditional campus, digital campus and smart campus. This paper uses the term Campus of Things in a sense similar in meaning to smart campus, but giving more emphasis on smart connectivity, autonomy and intelligence. The distinction between the terms digital campus and smart campus is established in [13].Smart campus is different from the traditional campus, where a combination of Internet of Things, cloud computing and other Internet technologies is used to connect teaching, learning, research and management with campus resources. [12] This will be an integration of different information systems forming a unified information management platform. In general, the campus's information network becomes more transparent, efficient and flexible.

At the highest level, Campus of Things can be understood as a system that connects devices, applications, and people associated with the campus. It primarily requires a precise and reliable wired or wireless network, connecting the indoor facilities and the outdoor campus environment. Campus of Things not only allows the people, devices and applications on campus share a common technology infrastructure, but improves the interactivity, monitoring controllability, operational efficiency as well as the quantum and quality of information available for analysis.

Consider the example of a college library. If the institution maintains a digital library which the students and teachers can access, it comes under digital campus. If the library employs an access control system using RFID or similar mechanism and make the resources of the digital library available online with the facility to track usage statistics, it can be deemed an application of smart campus. Campus of Things brings in additional functions like

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automated light control, library occupancy monitoring, climate control and issue of books based on QR code/bar code.

B. Architecture

Based on the principles put forward in [5] and [2], several models have been proposed by researchers to implement a smart campus. Some systems were designed to work with cloud, while some made use of the internal network infrastructure and resources on campus premises. Drawing from the various models presented in [11],[13] and [19], a generic architecture for Campus of Things can be framed.

1) Sensor/Actuator Layer: The sensor/actuator layer acts as the linkbetween the physical environment and the information system of the organization.[19] It includes not only the RFID, wireless sensors, information gathering equipment, but also a set of actuators.Actuator can be considered as a device that is being acted up on. The layer is intendedfor the information collection function and effect the actions as per the instructions received. Sensor nodes are deployed in different areas like the indoor stadium, playground, library, labs, libraries, etc.

*2) Network Layer:*A Network layer is the backbone of campus-wide communication. It is concerned with transmission of information through the Internet, cable,wireless network and other networks, ensuring accurate, safe and reliable delivery of the message.[11] The information collected by the sensors have to be communicated in real-time without delays.

*3) Control Layer:*A Control layer is the brain of the system and is assigned the task of processing the massive volume of data and derive actionable information from it orredirect it to a cloud service for effective management and storage. Handling the big volume of data being generated every instant is the biggest challenge here. This is where the principles operation research, machine learning, data mining, big data and expert systems can be applied to make thesystem intelligent and autonomous.[19]

4) *Application Layer:* Application layer is located above the entire hardware and software layers. It is the one which is user-facing.It connects the users to the rest of the system. The application layer can be customized based on each internal modular

subsystem and but can improve the existing campus network.

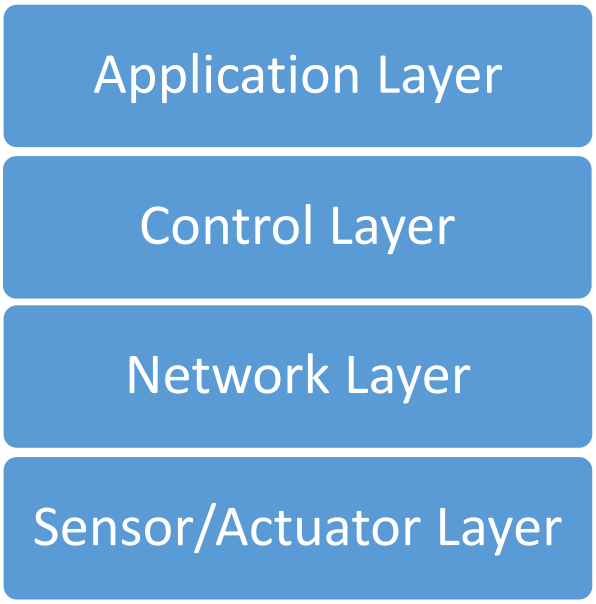

Fig. 1 A four layer architecture for Campus of Things

IV. APPLICATIONS OF CAMPUS OF THINGS

The applications of Campus of Things can be studied under the following heads.

A. Teaching Management

Teachers can focus more on academic functions as they will be relieved of the dutiesof attendance recording and student management. [13] Students can check in using their identity card,mobile telephone or the RFID label assigned to them. The attendance records are updated real-timewhich can be accessed by the teachers and

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parents as well.By implementing a barrier gate system, the exact time of the students entering and leaving the campus can be recorded.

B. Learning Management

The Campus of Things provide an e-Learning system for the students.[8] Students can connect to the digital information repository maintained by the college or university. The resources made available to the students can be rationed or filtered based on the IP address of the students' devices or the course they are undertaking. Leading universities such as Harvard and MIT have their classes of popular courses streamed online facilitating distance learning.

C. Logistics Management

Vehicular movement and commuting inside campus can be optimized through Campus of Things.Automated traffic control can be implemented by making use of cameras and an array of sensors. Parking lots can be controlled through this system, transmitting precise data on the available parking spots.Navigation around the campus can be made possible by GPS tracking or interactive maps placed in various points. Bike sharing can also be facilitated through Campus of Things.

D. Library Management

Rather than using traditional library cards, RFID tags or smart cards can used for access control and to check out books.[12] The availability of books can be checked through a common portal which can also act as a digital library. The physical environment of the library can be monitored or controlled through Campus of Things. The space occupancy patterns, average time spent, temperature readings, natural light intensity can be studied so that the lighting and temperature of the library can be controlled efficiently to cut down energy usage.IoT based smart library system can enrich the experience and add value to the current services.[20]

E. Lighting and Climate Control

Campus of Things aligns with the vision of a green and energy efficient campus. Sensors can detect the number of persons in the room and their positions so that only the required lights have to be turned on. If a room is unoccupied, the air conditioners can be turned off temporarily. Likewise, laboratory equipment or computers, if left idle for a long time, can be turned off automatically, through energy usage monitoring systems.[9]

F. Laboratory/Asset Management

Universities usually own several pieces of expensive equipment which are put to use in laboratories or workshops.[9] For the Campus of Things, each of these assets can be tracked around the campus. The details such as the exact location, the current state, the students or instructors who accesses the equipment and maintenance schedule can be recorded.

G. Security

Access control can be efficiently implemented using smart cards or authentication using mobile phone.[11] In case of emergencies, a mobile app can be used to alert campus authorities. An emergency siren or bell can also be created which can be triggered when a student or teacher authenticates themselves using their ID.

V. CHALLENGES AND OPPORTUNITIES

The following are the important challenges in the development of Campus of Things.

A. Scalability

The Campus of Things must be scalable to permit addition of new devices and systems. It must be able cooperate within a local environment. Even if the size of the network becomes large the quality of services delivered should not be affected.[6]

B. Interoperability

The technology stack used for different subsystems in the campus can be from different vendors. Objects or things in the systems must match in terms of energy usage or wireless frequency used. A common standard or convention must be followed while picking devices as well as the software products.[13]

C. Software complexity

Usually, the sensor nodes are attached to a microcontroller as in a typical embedded system. It will be a resource-constricted device. So, a more extensive software infrastructure will be required in the upper layers as the embedded systems have lesser computing power. [6]

D. Volume of data

As the sensors are generating huge volume of data, appropriate measures have to be taken to properly consolidate the data, analyze it and store only the required data for future use.[20]

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E. Data interpretation

To support decision making, the data collected by sensors must be properly interpreted. Having a time series data of temperature readings is useless, unless some generalizations can be derived from the raw data turning data into actions.

F. Security and personal privacy

Access to the digital services provided in the campus has to be in a controlled and selective manner.Students need not be provided control of the temperature and lighting, as this is an automated function and has to be overlooked by a responsible caretaker/employee.[13]

G. Fault tolerance

Campus of Things is composed of several number of smaller devices. Even if some of the devices fail, it should not affect the overall functioning of the system.It should be robust and capable of automatically adapting to changing conditions.

H. Power supply

Sensors and actuators deployed at various locations need continuous supply of power. Sometimes, power lines can be used and in some cases batteries are to be used. Energy saving is a critical factor while designing smart campuses.[20] It is not just dependent on the hardware and system architecture. The software components such as the protocol stacks used will also affect the energy consumption.

I. Interaction and short-range communications

Wireless communication forms the foundation of Campus of Things. When newer communication technologies surface, it must be able to be integrated to the system without considerable overhead.NFC, Zigbee, BLE and LoraWan are examples of such wireless communication technologies. Newer WPAN standards have a narrower bandwidth, but they do use significantly less power.

Many of the current challenges are being addressed by the ongoing industry innovations. There are also several driving factors contributing to the adoption of the Campus of Things.

Smartphones have become a part of our lives. Even students have access to mobile phones now. Mobile phones can be efficiently used to increase the quality of education, satisfy the learners' needs and reduce costs. [21]A mobile phone is an integrated IoT device. It has cameras, daylight sensors, NFC, Bluetooth, Wi-Fi, gyro meter, GPS and several other sensors. A mobile phones can serve as an access point for a user to tap into the services provided by Campus of Things. [6]

Cloud computing has reduced the expenses on IT infrastructure to be maintained in the campus. In a traditional network system, the data center is complex, and a lot of money is spent in purchasing hardware and software equipment in order to manage and maintain it.A smart campus can work well with cloud computing facilities, migrating non critical and seasonal services to the cloud.

The adoption of Campus of Things can provide better security. Proper access control measures can be implemented and security policies can be updated any time which will take effect instantaneously. Thesystem will also be monitoring internal operations in real-time thus improving the overall security of network. If a wireless attack is attempted at any access point, the information is immediately reported so that the incident can be managed efficiently.

The Campus of Things develops an environment of openness and sharing. [12]It improves the campus experience for teachers, students, visitors and employees. Some examples include using mobile phones or smart cards for making payments in campus, identification and authentication while accessing dormitory formalities, sports facilities, laboratories, etc.When students want to borrow or return books in library, they can use an RFID card for identification. As such a smart campus has integrated all information resources, students can access all several services right in their mobiles.

VI. Conclusion

Adoption of the Campus of Things philosophy can be considered as the upgradation of the existing campus information system, which is superior to traditional campus network or can be regarded the next step in the evolution of campuses. Campus of Things brings together the various physical elements of the campus environment totally overhauling the campus experience for all. The system can improve user experience, overall operational efficiency and contribute to management decision making as there is more data to analyze. Moreover, the construction of smart campuses will be a long-standingtest of the stability of IoT technology.

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Predicting when COVID-19 patients shall need respiratory support using Machine Learning

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***Abstract*—**This paper describes a noval approach to predict when COVID-19 patients shall need respiratory support using Machine Learning. This can be used tofor shift people under quarantine to first line treatment centers or hospitals with the help of multiple supervised machine learning models. The possiblity explored is that of using a sequence of heart beat data obtained from wearables or other devices, feeding it into a machine learning model to predict the oxygen level in the blood. Such predictions are then extracted,and fed into another supervised machine learning model which predicts possiblity of oxygen level degradation in the blood in the future. This can help in making decisions as to when a person will need atrifical respiratory support.

Index Terms—machine learning, data science, COVID-19, healthcare, supervised learning, deep learning

I. Introduction

The normal blood oxygen saturation for humans is be- tween 94 per cent and 100 per cent and anything below 90 per cent is abnormal. In silent hypoxia induced due to the severe acute respiratory syndrome coronavirus 2 (SARS- CoV-2), the depletion of oxygen happens rapidly leading to respiratory failure, which is why people die suddenly without any protracted experience of shortness of breath. They report to hospital complaining of breathlessness or chest pain. Silent hypoxia which precedes a serious condition such as COVID pneumonia, is a challenge for doctors as it is difficult to detect, as compared to regular hypoxia. The solution to this is using the oximeter to gauge the oxygen saturation in blood.

Recently, studies have verified this information and experts point out that the second root cause of death among people infected by the SARS-CoV-2 is hyperoxia and the inablility to predict low oxygen levels and give proper care to such people [1]. Considering the aysmptotic nature of most patients without any additional monitoring this become very difficult.

In this study we explore using deep learning in aiding health care workers and users to shift needy people to proper care without compromising their privacy or requireing additional medical equipments.

A. Previous Works

The noval corona virus has spread itself throughout the world and there has been considerable work in the field of data science research in relation to it. Machine learning has been used to identify several independent variables including lactate dehydrogenase, procalcitonin, pulse oxygen saturation, smoking history, and lymphocyte count that have direct co- relation with ICU admission rates and deaths of persons contradicted with the coronavirus disease (COVID-19) [2]. Further, methods were suggested to optimize ventilator usage to needy patients as in [3]

Considerable amount of work has been done in figuring out the diretion in which various graphs of COVID-19 are heading and finding out ways to lower the graphs through machine learning as in [4], [5], [6], [7] and [8]. Some of these research was confined only to a particular area while others were spread over the entire world.

Several studies have also focused on evaluating multiple ma- chine learning models to accurately predict the effectivenessof various decisions such as the implementation and withdrawals of lockdowns and curfews [9] and various other parameters [10]

Other notable and very important studies include predicting the presence of SARS-CoV-2 by analysing nasal swabs [11], predicting lung disease severity from cardiogram imagery [12], predicting COVID-19 mortality using blood-borne biomarkers [13], and COVID-19 vaccine design [14] all using machine learning and data science.

However there has not been any work whatsoever in eval- uating any independant risk factor and moving non-tested or test awaited patients to proper care by utilising only minimal fundamental parameters such as blood oxygen saturation level. This study hence focuses on that aspect.

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II. The proposed approach

The approach proposed is described in this section. A high level overview is as folows. Heart beat per minute or pulse shall be derived from fitness equipments, wearables, or simply using the mobile phone flash, mobile phone camera, and a machine learning model. For best accuracy, we have found heart beats at rest to show maximum potential of predicting the accurately the oxygen saturation levels in the blood. Thus, these sequences of heart beat data spread over specific period- days or hours - shall be fed into a machine learning model to predict the current oxygen saturation level in the blood. For better accuracy it is recoommended to use 5-10 heart beats obtained at rest. Most wearable provide the activity recognition API and obtaining heart beat at rest therefore, should be easy.

This way successive oxygen level data shall be otained. This can be given as input to a supervised machine learning model to predict as to when artifical oxygen support should be needed for the person. For best results it is recoomended to use this model with sequence of 5-10 previous oxygen levels predicted by the former model with a time span spanning over days or hours.

A. Co-relation between heart beat and blood oxygen satura- tion level

Blood oxygen saturation is measured by examining hemoglobin, which is the oxygen-carrying pigment of red blood cells that gives them their red color and serves to convey oxygen to the tissues. Hemoglobin is found in two forms. The first is called oxidized (oxy-) hemoglobin, which is denoted as HbO2 (also called "oxygen-loaded"). The second is called reduced-oxygen (deoxy-) hemoglobin, which is denoted as Hb ("oxygen-depleted"). Blood oxygen saturation (SpO2) is the ratio of oxy-hemoglobin to deoxy-hemoglobin. When your heart beats it pumps blood through your body. During each heartbeat, the blood gets squeezed into capillaries, whose vol- ume increases very slightly. Studies have shown that there exits a direct corelation between heart beat and oxygen saturation in blood. Various clincal trials have verified the co-relation [15].

B. Co-relation between oxygen level and COVID-19 mortality

The co-relation between blood oxygen saturation level and COVID-19 mortality was shed to light in a recent study **??** whose results highlights that among all those who died due to covid-19, the age was not a factor associated with intubation. It noted that most patients had 1 or more comorbidities and all patients received oxygen therapy during their hospital stay. However it also highlight that a small number of patients only received nasal or face mask oxygen before they died. Approximately one-third of patients received high-flow nasal oxygen therapy, and the rest received noninvasive ventilation, they noted. The mean oxygen level among the patients who died was below 90%. The study also notes a gradual decrease of oxygen saturation level in COVID-19 patients who faced death or underwent significant difficulties.

C. The machine learning models

The machine learning models used in the study was Long Short Term Memory Cells (LSTM). Long short-term memory (LSTM) is an artificial recurrent neural network (RNN) ar- chitecture used in the field of deep learning. Unlike standard feedforward neural networks, LSTM has feedback connec- tions. This helps persistence of previous data and allows personalisation and better prediction rates.

The first model takes in heart beat data and outputs blood oxygen data. This data is fed as input to the second model which predicts future oxygen levels and the need for the user to be shifted for additional care.

III. Experiments

We have trained both these models on openly accessible data. The data was collected from openly available clinical databases from Kaggle and after a manual optimization opera- tion, the data was split randomly with 70% of the data reserved for training and the rest 30% for testing. The results were highly favourable and after twweaking the number of nueral layers to a specific value, we managed to obtain a 98.56% accuracy for the first model and a 96.51% accuracy for the second model.

IV. Summary

In this work, we propose a deep learning based approach which comprises of multiple machine learning models to accurately determine and provide care for persons in times of ragging COVID-19. We have determined that this method when aplied properly has the ability to save millions of valuable lives which may have been lost otherwise. Thus, we encourage more reseearch in this sphere. The experiments and the accuracy

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level noted above shows that our methodology is robust, can work offline, realtime and tolerates a considerable amount of noise.

The method was evaluated on a very diverse set of bench- marks spanning from different data sets and it has shown that models are mature enough to interact freely and with minimal tweeking can be deployed on real life systems and wearables.

A. Future work

As future work, we would like to further improve the accuracy of the machine learning models and find the most optimal parameters. Also, another significant area where work can be carried out is in the support of much more parameters from live systems and establishing connection between these variables to the topic under consideration in this study. We would also like to integrate the finding of this study and models to currently exisitng wearables or provide apps that can use data from these devices.

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A STUDY ON THE ROLE OF ARTIFICIAL INTELLIGENCE IN HEALTH CARE SECTOR

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***Abstract*—** Artificial intelligence (AI) is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.AI is the most powerful and influential technology in today's world.When it comes to our health, especially in matters of life and death, the promise of artificial intelligence (AI) to improve outcomes is very intriguing. .AI programs are applied to practices such as diagnosis processes, treatment, protocol development, drug development, personalized medicine, and patient monitoring and care. In this paper we discussed about various applications of Artificial Intelligence in health care like AI-assisted robotic surgery, Virtual nursing assistants, Aid clinical judgment or diagnosis etc.

Keywords— Artificial Intelligence, healthcare, ethical health record, early detection of alignments, wearables.

I. INTRODUCTION

According to John McCarthy, the father of AI (Artificial Intelligence), it is "The science and engineering of making machines with human intelligent, especially intelligent computer programs". Artificial Intelligence is a way of making a computer system, a robot controlled by a computer system, or a software which can be think like a human being.AI is trained by learning how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

Artificial intelligence in healthcare is an overarching span used to describe the utilization of machine-learning algorithms and software, or artificial intelligence (AI), to emulate human reasoning in the analysis, interpretation, and comprehension of complicated medical and healthcare data. Specifically, AI is the ability of computer algorithms to fairly accurate conclusions based exclusively on input data.

What distinguishes AI technology from traditional technologies in health care is the ability to gather data, process it and give a well-defined output to the end-user. AI does this through machine learning algorithms and deep learning. These algorithms can recognize patterns in behaviour and create their own logic. To gain useful insights and predictions, machine learning models must be trained using extensive amounts of input data. AI algorithms behave differently from humans in two ways: (1) algorithms are literal: once a goal is set, the algorithm learns exclusively from the input data and can only understand what it has been programmed to do, (2) and some deep learning algorithms are black boxes; algorithms can predict with extreme precision, but offer little to no comprehensible explanation to the logic behind its decisions aside from the data and type of algorithm used.[1]

The primary aim of health-related AI applications is to analyse relationships between prevention or treatment techniques and patient outcomes.[2] AI programs are applied to practices such as diagnosis processes, treatment decorum development, medicine development, and patient observation and care. AI algorithms can also be used to analyse large amounts of data through electronic health records for disease prevention and diagnosis. Hospitals are looking for an AI software to support operational advantages that increase cost saving, improve patient satisfaction, and satisfy their staffing and workforce needs.

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II. ROLE OF AI IN HEALTH CARE

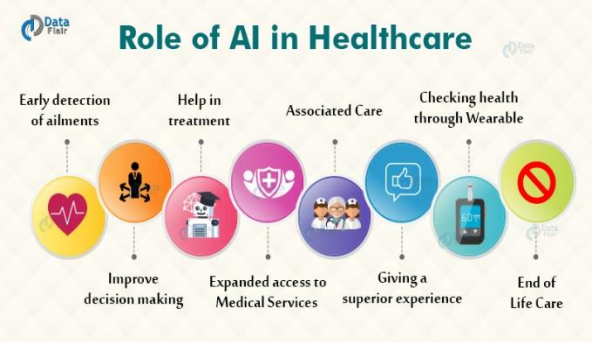

Fig 1..Role of AI in health care

i. EARLY DETECTION OF AILMENTS

Deep learning, Convolutional Neural Networks (CNN), presents a unique methodology to automatically learn and process theoretical features acquired from clinical data. It embraces the potential to solve quite challenging health care problems such as injury/knobble classification, organ segmentation, and object detection. CNN is an image classification technique for glitches involving multi-level representation learning. The learning starts from raw data input and gradually moves to more abstract levels via nonlinear transformations. With proper training data, neural networks can find out sophisticated structures in the radiologic or histopathological data to supplement diagnosis and triage process. The true benefit of Deep-learning (CNN) fabrications in focused Health care access solutions.In general, the earlier the detection of a disease, the better it can be treated.

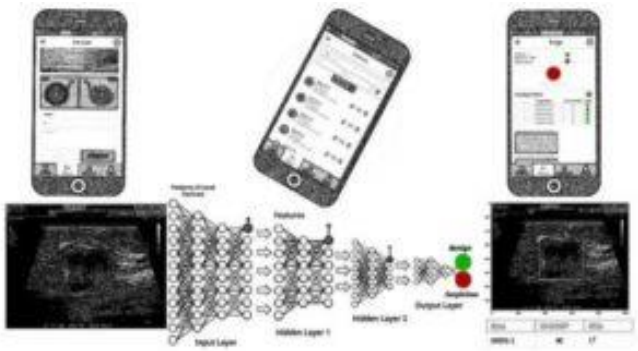

Fig 2. Early detection of ailments

For example, Breast cancer triage is such a use case. It is a known circumstance about breast cancer is the leading cause of cancer deaths among women in global, and the numbers are excessively high for young women in low- and middle-income countries especially where the number of trained health care resources are limited. A breast cancer triage AI model along with mobile app can enable health care workers in helping women in need throughout the world. AI model be situated on ultrasound images with known BI-RADS Score. The model learned the subtle patterns in breast grazes to classify it as benign and malignant tumours. The objective of this powerful solution (AI model and mobile app) is to deliver the Minimally Trained Health Care Workers with a triage precision tool for breast cancer.

ii. IMPROVE DECISION MAKING

Decision-making capability consists of the ability to realize the information related to a decision, to appreciate its significance, to reason about the costs and benefits of different courses of action, and to communicate the decision one has made. Although thinkers use terms such as “understand,” “appreciate,” and “reason” in a variety of ways, in broad terms this is the definition accepted by the medical community. [10]

Incapacity is no small problem: estimates suggest that more than one-third of elderly and psychiatric hospital inpatients lack decision-making capacity.[11],[12] Moreover, in one study, health care professionals failed to identify incapacity in 42% of cases.[13] When clinicians do correctly identify a patient without decision-making

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capacity, the evidence suggests that they often fail to match their treatment plan to the patient's preferences.[14] Reasons for this disconnect are multifactorial and include clinicians' difficulty in synthesizing information about the patient and cognitive biases at work in the hospital environment.[15] [16]

Making life-and-death decisions for incapacitated patients takes a considerable toll upon clinicians, as studies indicate an association between end-of-life decision-making and health care professional burnout.[17] Involving family members or patient surrogates in the decision-making process, however, is no panacea. Surrogates predict patients' preferences incorrectly in roughly one-third of cases, typically projecting their own wishes onto the patient concerned. Moreover, many surrogates experience subsequent stress and mental health problems, with the effects sometimes persisting for years.[18] One proposed solution to this problem is the advance directive or advance care plan.

iii. HELP IN TREATMENT

By looking at the previous medical records of patients, AI can help individuals who are at a greater risk of medical conditions like heart stroke. AI can help clinicians with devising better treatment plans for these patients. We use Robots in the prescription for more than 30 years. Despite clinical strategies, we use them in crisis facilities and labs for excess tasks, in recuperation, non-nosy treatment, and on those with long stretch conditions.

iv. END OF LIFE CARE

With time, the future of a normal human has impressively expanded because of better social insurance offices. Presently, as we approach the finish of our lives, our body capitulates to death in a more slow way, from conditions like dementia, cardiovascular breakdown, and osteoporosis. Robots can modify the finish of life care, helping people to remain self-ruling for additional, reducing the necessity for hospitalization and care homes. In this way, AI can help to make the experience better for critically ill or old age patients

v. ASSOCIATED CARE

Healthcare doesn't just mean treatment by doctors. It involves a lot of hospital staff, nurses, managers, technicians, and pharmacists to efficiently run this entire healthcare ecosystem. For progress healthcare, this whole ecosystem has to evolve.These zones rely upon a lone propelled structure. Concentrated war rooms dismember clinical and zone data to screen showcase enthusiasm over the framework persistently. Similarly, as using AI to spot patients at risk for deterioration, this framework can in like manner remove bottlenecks in the system.

vi. CHECKING HEALTH THROUGH WEARABLES

Wearable technologies can be ground-breaking solutions for healthcare problems. some wearable technologies are designed for expectation of diseases and maintenance of health, such as weight control and physical activity observation. Wearable devices are also used for patient management and ailment management. The wearable applications can directly influence clinical decision making. Some trust that wearable technologies could increase the quality of patient care while dropping the cost of care, such as patient restoration outside of hospitals. The big data generated by wearable devices is both a challenge and opportunity for researchers who can apply more artificial intelligence (AI) techniques on these data in the future. Most wearable technologies are still in their incremental stages. Problems such as user acceptance, security, integrity and big data concerns in wearable technology still need to be addressed to increase the usability and functions of these devices for practical use.

Wearable technologies facilitate the nonstop observing of human physical activities and behaviours, as well as physiological and biochemical parameters during daily life. The most commonly measured data include dynamic signs such as heart rate, blood pressure, and body temperature, as well as blood oxygen saturation, posture, and physical activities through the use of ECG, BCG and other devices. Hypothetically, wearable photo or video devices could deliver additional clinical information. Wearable devices can be attached to shoes, spectacles, earrings, dresses, gloves and watches. Wearable devices also may develop to be skin-attachable devices. Sensors can be embedded into the environment, such as chairs, car seats and mattresses. A smartphone is usually used to gather data and convert it in to a remote server for storage and analysis. There are two major types of wearable devices that are used for studying posture patterns. Some devices have been advanced for healthcare specialists to monitor walking patterns, including the accelerometer, multi-angle video recorders, and gyroscopes. Other devices have been scientifically advanced for health consumers, including on-wrist activity trackers and mobile phone apps. Wearable devices and data analysis algorithms are often used together to perform gait assessment tasks in different scenarios.

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vii. EXPANDED ACCESS TO MEDICAL SERVICES

Absences of organized human administration providers, including ultrasound experts and radiologists would altogether be able to limit access to life-saving thought in making homelands around the world.

More radiologists exertion in the around clinical centres covering the prominent Longwood Street in Boston than in all of West Africa, the gathering pointed out.

Efficient thinking could help enough the impacts of this extraordinary shortage of qualified clinical staff by accepting authority over a segment of the suggestive commitments usually doled out to individuals.

viii. RADIOLOGY

AI is being planned within the radiology field to detect and diagnose diseases within patients through Computerized Tomography and Magnetic Resonance Imaging.[13] The emphasis on Artificial Intelligence in radiology has rapidly increased in recent years according to the Radiology Society of North America, where they have seen growth from 0 to 3%.[13] A study at Stanford invented an algorithm that could detect pneumonia in patients with a better average F1 metric , than radiologists involved in the trial. Through imaging in oncology, AI has been able to serve well for detecting abnormalities and monitoring change over time; two key factors in oncological health.[14] Many companies and vendor neutral systems such as icometrix, QUIBIM, and UMC Utrecht's IMAGRT have become obtainable to deliver a trainable machine learning platform to detect a wide range of ailments. The Radiological Society of North America has implemented presentations on AI in imaging during its annual conference.[13] Many professionals are optimistic about the future of AI processing in radiology, as it will cut down on needed interaction time and allow doctors to see more patients.[14] Although not always as good as a trained eye at deciphering malicious or benign growths, the history of medical imaging shows a trend toward rapid advancement in both capability and reliability of new systems.[14] The emergence of AI technology in radiology is perceived as a threat by some experts, as it can improve by certain statistical metrics in remote cases, where experts cannot.

ix. ELECTRONIC HEALTH RECORDS

Electronic health records (EHR) are crucial to the digitalization and information spread of the healthcare industry. Now that around 80% of medical practices use EHR, the next step is to use artificial intelligence to interpret the records and provide new information to physicians.[15] One application uses natural language processing (NLP) to make more succinct reports that limit the variation between medical terms by matching similar medical terms.[5] For example, the term heart attack and myocardial infarction mean the same things, but physicians may use one over the over based on personal preferences.[15] NLP algorithms consolidate these differences so that larger datasets can be analyzed.[15] Another use of NLP identifies phrases that are redundant due to repetition in a physician's notes and keeps the relevant information to make it easier to read.[15]

Beyond making content edits to an EHR, there are AI algorithms that evaluate an individual patient's record and predict a risk for a disease based on their previous information and family history.[16] One general algorithm is a rule-based system that makes decisions similarly to how humans use flow charts.[17] This system takes in large amounts of data and creates a set of rules that connect specific observations to concluded diagnoses.[17] Thus, the algorithm can take in a new patient's data and try to predict the likeliness that they will have a certain condition or disease.[17] Since the algorithms can evaluate a patient's information based on collective data, they can find any outstanding issues to bring to a physician's attention and save time.[6] One study conducted by the Centerstone research institute found that predictive modeling of EHR data has achieved 70–72% accuracy in predicting individualized treatment response.[18] These methods are helpful due to the fact that the amount of online health records doubles every five years.[17] Physicians do not have the bandwidth to process all this data manually, and AI can leverage this data to assist physicians in treating their patients.[18]

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III. FUTURE OF AI IN HEALTH CARE

We all must accept that there is a significant role of AI in the healthcare sector in the coming years. Like AI, it is the essential ability behind the improvement of precise medication, broadly consented to be a painfully required development in care. Albeit early endeavours at giving analysis and treatment proposals have demonstrated testing, we expect that AI will at last ace that area also. Given the fast improvements in AI for imaging examination, most radiology and pathology pictures will be analyzed sooner or later by a machine. Discourse and content acknowledgment is now utilized for errands like patient correspondence and catch of clinical notes, and their use will increment. The best test to AI in these social insurance spaces isn't whether the advances will be able enough to be helpful, but instead guaranteeing their reception in every day clinical practice. For broad assumption to happen, AI frameworks must be endorsed by controllers. They must also incorporate EHR frameworks. Thus, we hope to see constrained utilization of AI in clinical practice inside 5 years and increasingly broad use inside 10 years.

It additionally appears to be progressively certain that AI frameworks won't supplant human clinicians for an enormous scope, yet rather will expand their endeavours to think about patients. After some time, human clinicians may push toward undertakings and employment plans that draw on remarkably human abilities like compassion, influence, and enormous picture joining. Maybe the main social insurance suppliers who will lose their positions after some time might be the individuals who won't work close by man-made brainpower.

IV.CONCLUSION

AI will give some assistance to people in a considerable lot of their amazingly basic works. Everything looks good, as is the innovation, for AI to rise as a structure obstructs whereupon further mechanical improvements are sought. The guide of AI in human services is only one of these underlying building blocks.

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APPLICATIONS OF BIG DATA AND MACHINE LEARNING IN SMART GRID

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Abstract— This paper conducts a comprehensive study on the application of big data and machine learning in the electrical power grid introduced through the emergence of the next-generation power system the smart grid (SG).Connectivity lies at the core of this new grid infrastructure, which is provided by the Internet of Things (IoT). This connectivity, and constant communication required in this system, also introduced a massive data volume that demands techniques far superior to conventional methods for proper analysis and decision making. The IoT-integrated SG system can provide efficient load forecasting and data acquisition technique along with cost-effectiveness. Big data analysis and machine learning techniques are essential to reaping these Benefits. In the complex connected system of SG, [1] cyber security becomes a critical issue; IoT devices and their data turning into major targets of attacks. Such security concerns and their solutions are also included in this paper. Key information obtained through literature review is tabulated in the corresponding sections to provide a clear synopsis; and the endings of this rigorous review are listed to give a concise picture of this area of study and promising future ends of academic and industrial research, with current limitations with viable solutions along with their effectiveness.

I.INTRODUCTION

The electrical power system is poised to move towards the next generation smart grid (SG) system, and thus this topic has acclaimed significant attention in the research community. SG is the integration of information and digital communication technologies with power grid systems to enable bi-directional communication and power that can enhance security, reliability, and efficiency of the power system. Smart grid solutions aim at calculation of optimum generation transmission-distribution pattern and storing power system data. [2] For the growing concern about environment along with efficient generation and distribution, distributed energy resources (DER) with smart micro grid can be a potential solution. It can be said that distributed smart micro grid can bring additional benefits for global power system planning. [2] In other words, SG is the integration of technologies, systems and processes to make power grid intelligent and automated and the figure shows basic constructions of conventional grid and smart grid to demonstrate their dissimilarities. This paper presents a concise picture of the electricity grids transition towards the smart grid, the ensuing rise in IoT usage, and the challenges this new system brings forward.

In the internet of things each object has its own identity in the digital world. Everything is connected through a complex network. IoT comprises of smart objects which possess self-awareness, interaction with the environment and data processing. Smart devices are capable to communicate with other such devices in this system. Mostcommon smart devices employed in the grid, such as the smart meter, falls into this category. These devices provide the detailed data required for accurate information and automated decision support which give the smart grid the unique capabilities it demonstrates over the legacy system. The most obvious trials are of course the handling of the huge amount of data in this connected system, their proper analysis and safety, as well as protecting this new power grid from attacks generated in both physical and cyber dimensions. This work can act as a base for future academic and industrial researchers, while pointing out the current limitations with possible solutions along with their effectiveness.

II.SMARTGRID

The smart grid refers to an advanced electricity supply bond which runs from a major power plant to all the way inside your home. For example, there are many power plants in the United States and these power plants produce electricity by using the wind energy, nuclear energy, hydro, natural gas and from other resources. [4] These producing stations produce electricity at a fixed electrical voltage and this certain level of voltage is enhanced to very high voltages so that the power transmissions efficiency is enhanced over long distances. When this electrical power gets near your town or city or village then the high electrical voltage is decreased in a process called stepped down, the voltage value is decreased in an electrical substation for the distribution in an area. [7]

The most important concept of the smart grid is to include the capabilities of monitoring, analysis, control and communication in the national electrical delivery system to improve the output of the system

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while decreasing the consumption of energy.

A. *Features of the Smart Grid*

The smart grid has the numerous range of factor and the features of the smart grid are as below

- Reliability
- Flexibility in network topology
- Efficiency
- Load adjustment/ load balancing
- Peak curtailment/leaving
- Time of use pricing
- Sustainability
- Market

B. *Components of the Smart Grid*

The commonly used components of smart grid as follows

Fig 1. Smart Grid

- Smart meter

Is a generic term for electronic meters with a communication link. ”Advanced Metering Infrastructure” (AMI) allows remote meter configuration, dynamic tariffs, and power quality monitoring and load control.

- Phasor measurement

A phasor measurement unit (PMU) is a device used to estimate the magnitude and phase angle of an electrical phasor quantity (such as voltage or current) in the electricity grid using a common time source for synchronization.

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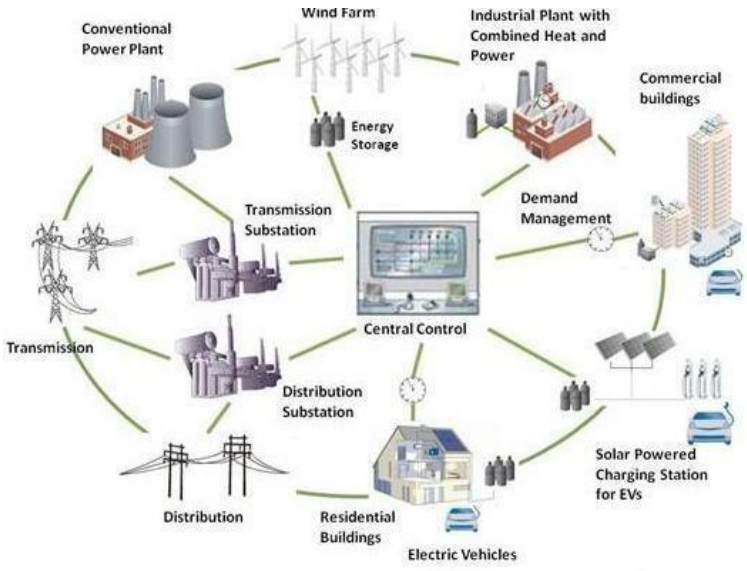

Fig 2. Components of Smart Grid

• Information transfer

In telecommunications, information transfer is the process of moving messages containing user information from a source to a sink via a communication channel. In this sense, informationtransferisequivalenttodatatransmissionwhichhighlights more practical, technicalaspects

• Distributed generation

The concept of distributed generation (DG), power generated from numerous micro-scale sources for local distribution or to be fed back into the main grid, certainly makes for an enticingpicture. [9]

III. MACHINE LEARNING

Machine learning (ML) is the scientific study of algorithms and statistical models that computer systems use to perform a specific task without using explicit instructions, relying on patterns and inference instead. It is seen as a subset ofartificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as ”training data”, in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or in feasible to develop a conventional algorithm for effectively performing the task. Machine learning is closely related to computational statistics, which focuses on making predictions using computers.

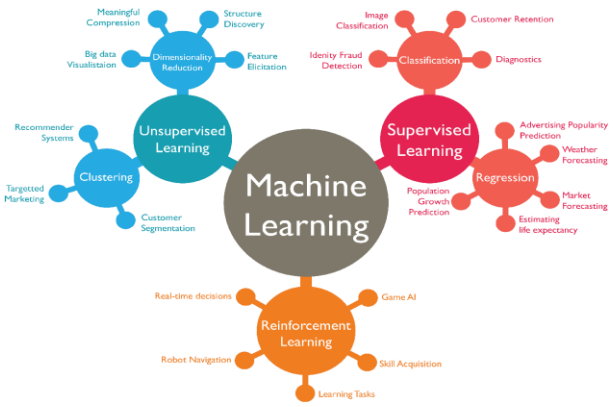

Fig 3.Machine Learning

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The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a field of study within machine learning, and focuses on exploratory data analysis through unsupervised learning. In its application across business problems, machine learning is also referred to as predictiveanalytics

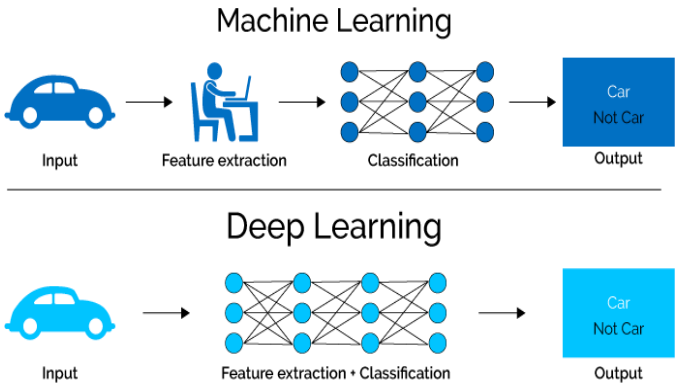

Fig 4.Deep Learning V/S Machine Learning

IV. BIGDATA

Big data can be defined as the massive datasets that are collected from a variety of data sources for business needs to reveal new insights for optimized decision making. It consists of large data set that cannot be managed efficiency by the common DBMS.Big data challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy and data source. Big data was originally associated with three key concepts: volume, variety, andvelocity.

Big data can be described by the following characteristics

- Volume
- Variety
- Velocity

Fig 5.BigData

V. STRUCTURE OF CONVENTIONAL GRID AND SMARTGRID

In the conventional system power flows from in one direction only; but for smart grid, there is no strict structure. Generation can occur at the consumer side too, such as the wind and the solar farms at the outer periphery of the topology. Power flow can also be bidirectional, demonstrated by the energy storages and the house in this illustration.

A.Conventional grid

The Conventional Grid System remains one of Civil Air Patrol's lasting contributions to Search and Rescue. The CAP (Conventional) Grid system was originally developed in the early 1960s by CAP members in Washington State.

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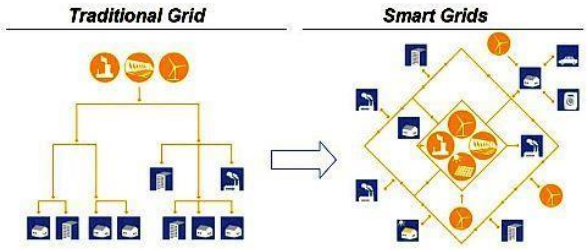

Fig 6.Conventional Grid

B. Smart grid

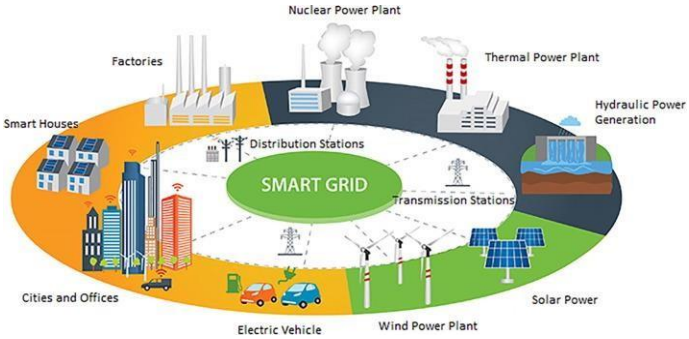

Fig 7. Smart Grid

The smart grid is an alliance of hardware, management and reporting collection of programs; in the world of the smart grid, the consumers and profit firms have the equipment to manage, monitor and respond to the energy problems.

VI. APPLICATION OF INTERNET OF THINGS (IOT) IN DISTRIBUTED POWER SYSTEM

The underpinnings those make the smart grid do so many things that the legacy grid is incapable of are a lot of connected devices, which are capable exchanging information, and receive commands to act in a certain way. This extensive communication is made possible by the internet, and all these devices are connected to their respective networks. Devices connected to the internet are currently part and parcels of the daily life, and more and more of such devices are emerging every day. An example of such devices can be smartthermostats. [3]

These devices, which use the internet to stay connected to resources located elsewhere physically, and carry out their tasks through the resulting exchange, are termed as IoT devices. IoT stands for internet of things which can be denied as the interrelated system that links up such devices, and facilitate data transfer without any human intervention. IoT is an inter connection of sensing and actuating devices providing the ability to share information across platforms through an untied framework, developing a common operating picture for enabling innovative applications. This is achieved by seamless ubiquitous sensing, data analytics and information represent action with cloud computing as the unifying framework. Each of those objects has its own embedded computing system which enables it to be identified and to be interconnected with eachother.

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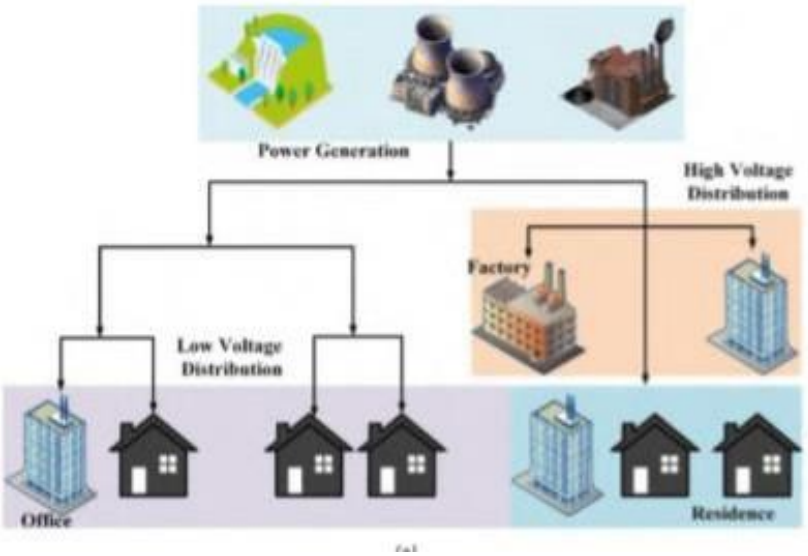
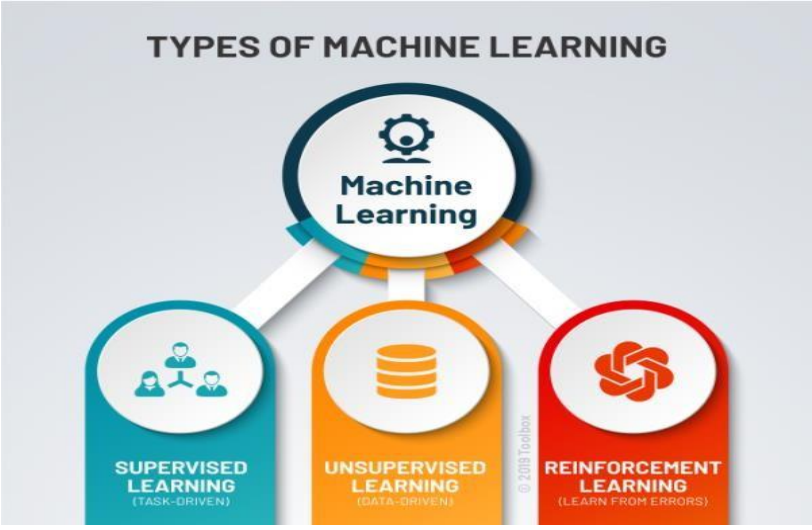


Fig 8.IoT Based System

VII. MACHINE LEARNING APPLICATION IN SMART GRID

The obvious question that arises from the big data generation from smart grid is efficient ways to analyze them for extracting valuable information. Without the extraction of useful information, the collected data holds little or no value. Machine learning appears as the tool required for the tall task of going through the massive amount of data generated in an IoT-based grid system. It as the final piece of the smart grid system which is driven by data collection, analysis, and decisionmaking. [7]

Machine learning techniques provide an efficient way to analyze, and then make appropriate decisions to run the grid; and thus enables the smart grid to function as it is intended to. Machine learning (ML) is a term which refers to learning and making predictions from available data by a system. It is comprised of various algorithms which analyze the available data through a set of instructions to produce data-driven predictions and/or decisions. Machine learning undergoes the rigorous process of designing and programming explicit algorithms with expected performance. Machine learning functionalities include predictions of consumption, price, power generation, future optimum schedule, fault detection, adaptive control.



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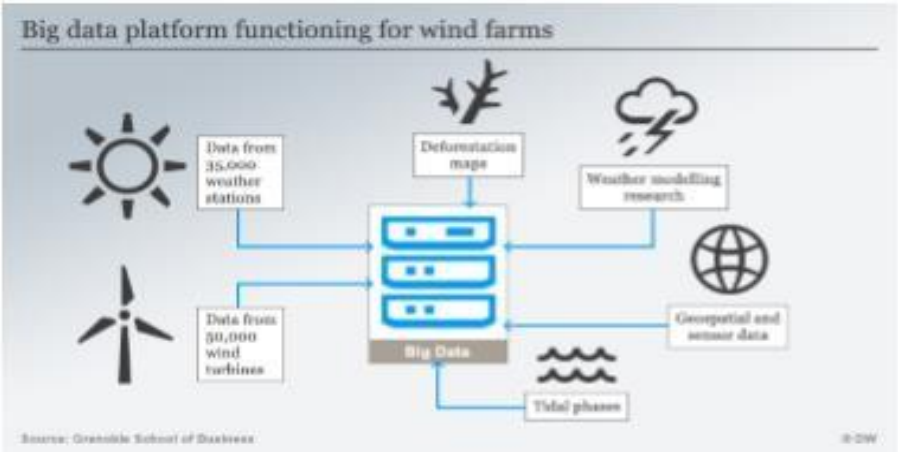

Fig 9.Machine Learning application in SG

Hence proper forecasting is required for wind energy based power grids, and can aid in making operational strategies Previously, several prediction models such as fuzzy modeling, auto regressive moving average, artificial neural network , K-nearest neighbor classification , computational fluid dynamics pre-calculated flow fields , extreme learning machine , adaptive neuron-fuzzy inference system , combination of relevance vector machine and differential empirical mode.[7] This proposed system was validated by applying on a74MW wind farm at Oklahoma, United States.

A.Machine Learning: Wind Energy Forecasting

Wind power is one of the fastest growing renewable energy sources in the world. About 12 percentage of the world's electricity will be supplied by wind generation by 2020. Integration of wind power sources with the grid provides several technical, economic, and environmental benefits. But due to the intermittent and stochastic nature of wind power, it provides some obstacles during power generation and distribution. Variation in wind speed causes fluctuation in the output of wind power plant, which leads to instability in the grid.

Reference	Institute	Year	Application
Zhou et al. [84]	Hefei University of Technology, China	2016	Determining residential energy consumption
Zhou et al. [85]	Hefei University of Technology, China	2015	Demand side management
Zhou et al. [86]	Hefei University of Technology, China	2016	Demand side management
He et al. [90]	Shanghai Jiaotong University, China (with external collaboration)	2017	High-dimension smart grid modeling
Ryu et al. [91]	Sogang University, Korea (with external collaboration)	2016	Short time load side prediction
Coelho et al. [92]	State University of Rio de Janeiro, Brazil (with external collaboration)	2017	Load forecasting
Bessa et al. [93]	INESC Technology and Science, Portugal (with external collaboration)	2015	Very short-term solar power forecast

Fig 10.Applications

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VIII. SMART GRID WITH BIG DATAANALYSIS

Integrating IoT devices in every sector of the grid infrastructure is a mandatory step for moving towards smart grid.Ithas also been stated that hardening featureofthesedevicesistheirabilitytocommunicate with other devices and control centers, and send useful information. Thus, an unprecedented amount of data gets generated in an interconnected network, posing challenges to the conventional methods of data transfer, storage, and analysis.[9] Monitoring of transmission line, generation unit, substation state, smart metering , and data acquisition from smart home-all produce a large amount of data from the smart grid, which are to be stored in a cloud- based system for proper analysis.[5] Cloud supported IoT system has been proposed in to manage all thosedata.

Analyzing big data is stated as a key functionality for energy management systems (EMS) for smart grids, control algorithms, and future energy market models. Although big data means a massive amount of data, technically it covers the predictive and behavioral analysis using those data. This huge amount of data is available at every aspect of our lives, and demands critical analysis. Scientists, businessmen, social welfare organizations, economists, and many others need to process through this large volume of information that is availableonline.

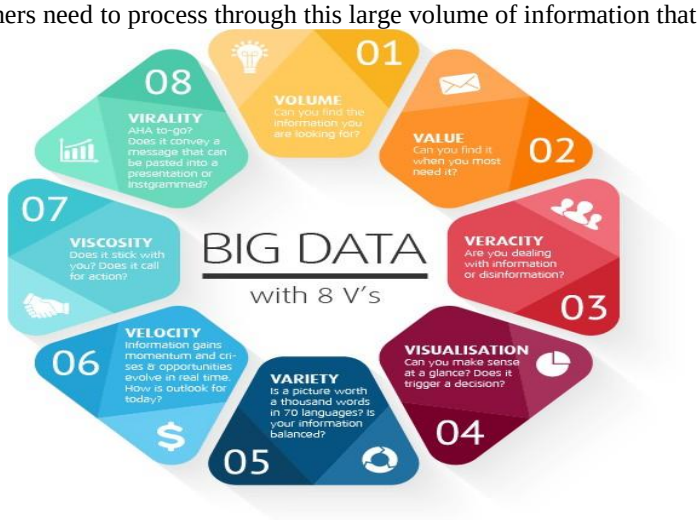

Fig 11. Big Data

Fig 12.V's of Big Data

A.BIG DATA: FAULT DETECTION

The carbon emission reduction and sustainability of environment are the driving force and construction purpose of smart grid, which is designed in a decentralized structure. The employment of distributed generator units in modern power distribution system now provides an effective means for the utilization of wide spread renewable energy such as wind and solar energy.

These emerging micro grids are vital for the expectation of a low carbon society. Moreover, the close distance

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between the generator and loads in micro grid improves the reliability of power delivery and reduces the power transmission loss. The ability to operate in an island model so protects the load from damages caused by power system including voltage fluctuation, frequency deviation, while the two general schemes discussed here may remain the first order choice for implementing feeder automation, there are evolutions of each of these basic architectures that can provide utilities with a combination of the advantages provided.

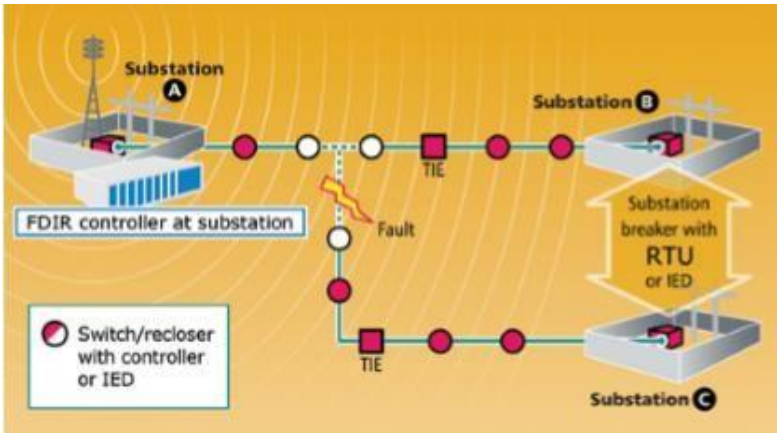

Fig 13.Fault Detection

A semi-distributed system is a model-driven scheme in which the FDIR algorithm is hosted at the substation level instead of at the control center.[8] In this configuration, an intelligent substation controller serves as the field host for FDIR, utilizing a local network connectivity model updated with real-time topology for the area of automation. All feeder devices that are part of the automation scheme communicate back to the substation level only, and specialized field hardware is not required.

The FDIR controller at the substation can also act as a data concentrator, communicating back to a primary SCADA or DMS system for enhanced system visualization at the control center level. [8]Expansion to multiple substations and feeders within the automation island is accomplished through the appropriate updates to the network model. The model can be updated offline when network updates or additions are made, and then downloaded to the controller remotely or loaded locally at the substation.

IX.CONCLUSION

The electricity grid is transitioning towards an IoT-based, connected smart grid, and with the benefits of such a system, concerns are also emerging that were unprecedented until now. The big data generated in the smart grid is requiring no analysis techniques such as machine learning methods for proper handling and data extraction. The connected devices, and the data they generate are also bringing forth the dire necessities of proper protection, as they are being targeted to attacks of varying magnitudes which highlighted the lack of proper counter-measures in place. In an attempt to present an overall picture of these issues, this paper had presented a brief timeline of the grids journey to the smart grid, and how internet of things (IoT) had become a part and parcel of the electricity grid. Challenges associated with IoT-generated big data, namely their analysis and protection, as well as other security concerns in the smart grid had also been discussed.

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A Comprehensive Study on the Current Trends and Future Scope of Machine Learning in Education Sector

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***Abstract*—**The current era, Machine Learning (ML) is one among the most emerging application areas in every field of technology where its application scope is nearly unlimited. The application of machine learning in an education space is presently very effective to researchers and scientists, and it's the most focus of our study. The aim of this paper is to identify the different chances of applying and contrivance machine learning within the education space. This paper focus on Faculty centered applications where machine learning is applied. The study of machine learning in education is to see the current trends of exploitation of machine learning in education, and to see its current and future applications.

Keywords—Machine Learning, Natural language Processing

I. INTRODUCTION

Educational technology contains competent type of phases, attractive, sequential, on the content to be grasped, the format of instructive messages, and additionally the communication between information technology systems and students. The orb is presently committed the study of learning in full, complicated, interactive and attractive learning environments.These environments allow every the simulation of experiences that students may would like among the globe and to boot the creation of compelling experiences that can't commonly be practiced directly. learning environments in addition allow students to talk their own ideas with the utilization of a variety of image systems. These situations are typically useful in creative learning among them a bundle of actions where learning is distributed among every people and artifacts. Finally, these learning environments are advanced. Learning but they contribute to learning thus wants analysis ways in which apart from controlled experiments. The main aim of machine learning is to train the computers to use sample knowledge or previous experience to resolve a given drawback.This study is targeted on application of machine learning in education. Education is dynamic on commonplace.There aren't merely students in space from now on, viewing the notebook, whereas a coach lectures. Today's college rooms use digital resources and are investing in machine learning.In education, as an example, machine learning could be applied to support lecturers, predict student performance, adaptive Learning Techniques, on-line assessments of scholars, etc. the target of our analysis was to categorise regarding the usage of machine learning in teaching space.

II. APPLICATIONS IN EDUCATION AREA

Machine learning may be considered a section of computing (AI). Machine learning is, at its central, the technique of allowing a machine or pattern access to meaningful data and letting it learn for itself. In 1959, Arthur Samuel came up with the brilliant concept that we should always not got to teach computers, but rather, we might allow them to learn on their own. He coined the term "machine learning" to explain his theory, that is currently a regular definition for the ability of computers to learn autonomously[1].

Machine learning is the technique used to train the computers to heighten a performance benchmark using sample knowledge or experience . Implementing a machine learning algorithmic program means that implementing a model that outputs correct data as long as we've got provided input file. We can consider a model as a black box: data get in at the start, and a few alternative information exit at the top — however the processes in between are advanced. for instance, if we wish to form a model that predicts what the house worth in some region next year are going to be, supported scenario on the marketplace for the last 3 years, we'd feed the model metrics like house costs on the market

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in last 3 years, interest rates and wage rates. The output would be the house worth prediction for ensuing year. The method through which a model learns the way to be of input file is termed "model training". Training may be a key concept in machine learning.The major area of machine learning is in two fields are Faculty centered applications and Student centered applications.On student centered applications,the main applications are in adaptive learning environment and personalized learning methods. Considering faculty oriented applications, the main few applications are:

i. Student Result Prediction

There are different approaches for students result prediction. Data mining could be a process methodology of processing knowledge that is with success applied in several areas that aim to get helpful information from the data. Data processing technique is classed with 2 varieties of algorithms namely: unsupervised algorithms and supervised algorithms. Predictive analytics in education is all concerning knowing the mental attitude and needs of the scholars. It helps to find the decisions that concerning the matter that may appear within the future. With the category tests and half-yearly results, it can be understood that students are reaching to perform well within the test and that students can have a tricky time. This helps the faculty and therefore the parents to induce alert and take applicable measures. Through this, a student will be helped in a very higher approach and might work on his weak subjects.

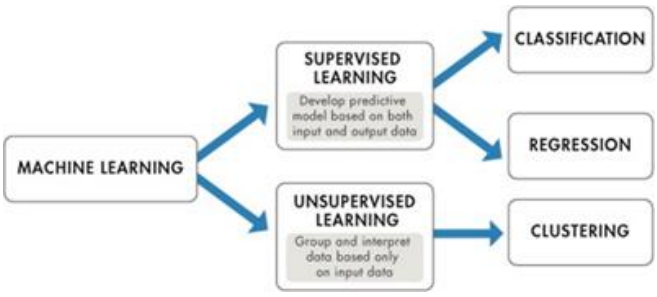

Fig 1 Machine Learning Algorithm Categories

Supervised learning is a mechanism that can be done with in the presence of a inspector as an trainer. First and foremost supervised learning is a learning mechanism that within which we have a propensity to instruct or coach the machine using sample information which is well tagged which means some information is already tagged with the correct answer. After that, the machine is given a new set of labelled data so supervised learning formula scrutinized the training information set and produces an right outcome from tagged data. In unsupervised learning, the task of machine is to cluster unsorted data in line with similarities, patterns and variations with none previous training of data. Unlike supervised learning, no teacher is means that suggests that no coaching are given to the machine. So machine is restricted to search out the hidden structure in unlabelled knowledge by our-self.

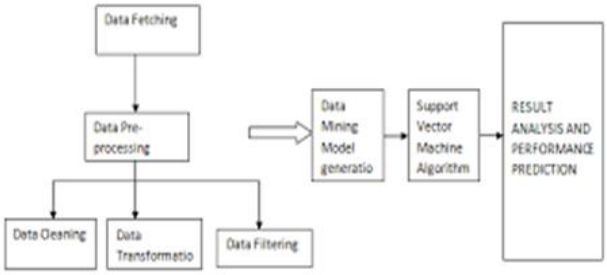

Fig 2 Student Result Prediction

Tests were conducted using the following metrics: name of the attribute, Merit, benefit deviation, Rank, Rank and deviation. Comparison of the 3 algorithms are done based on the following analysis criteria: kappa statistic, Mean absolute error, Root mean square error, Relative absolute error, and Root relative square error. additionally the algorithms are compared for prediction accuracy, learning time of tree classifiers, properly and incorrectly classified instances [6]. The steps to be followed for the scholars result prediction are given as follows:

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a. Data set preparation: An information set is prepared within the variety of csv file to allow coaching to the machine and testing it.

b. Data splitting: The given data needs to be split for data transformation. Initial 70% of the information is used for training the model and therefore the remaining half of the information is employed for testing the model.

c. Train the machine model based on the data set. The train model has 2 inputs: ML formula and 70% of the information split provided by the user.

d. Scoring model: This model has two inputs of data: train model and 30% of the data split provided by the user.

e. Evaluation model: This model evaluates the score results and calculates the machine learning parameters: true positive, true negative, false positive, false negative, receiver operating characteristic (ROC), precision, recall, accuracy, and F1 score.

f. Web service deployment and publishing: The whole model is deployed within the variety of web service in order that anyone can access this method. For that, Cortana Intelligence gallery is employed here [1]

ii. Sentiment Analysis

Feedback prediction is known as subjectivity analysis, opinion mining and appraisal extraction is an application of natural language processing(NLP),computational linguistics, and text analytics to identify and extract opinions.[3]Reviews are affected by students emotions and so have to study whether they dislike the course or they are struggling with the course.A few types of emotions of learners are depicted in table[1]. Analysing the text can help the teacher to have better understanding of their emotions such as Joy,Frustration,Anger,Neutral. [2]

Event Set	Emotion	Sentiment Adjustment Strategy
Blamed by teacher	Frustration and Anxiety	Think about the best thing you have done, Don't blame yourself
Criticized by teacher	Frustration	Suggest to communicate Suggest to communicate with teacher
Yelled by teacher	Frustration	Tell him to do better job next time

Table 1:Examples of learner emotions

III . ML ALGORITHMS USED IN EDUCATION AREA

i. Linear Regression

Predictive modeling primarily reduces the bugs of a model or attains the approximate predictions, at the expense of accountable. We can adopt ,revise and purloin algorithms from multiple areas, as well as statistics and use them on the way to these conclusions. The linear regression equation depicts a line closely fits the connection between the input variables (x) and therefore the output variables (y), by finding specific weightings for the input variables referred to as coefficients (B)[7].

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Fig 3 Linear regression

ii. Logistic Regression

Like linear regression in logistic regression all the values for each coefficient that weight each input variable will be searched. In disparity to regression, each predicted output is reconstructed or remodeled to perform nonlinear function is called as logistic function. The logistical function can alter the values ranges from zero to one and also function sounds like big S .This will helps to find the result and the output of the logistical operation to snap values to zero and one (e.g. IF less than 0.5 then output 1) and predict a category value.

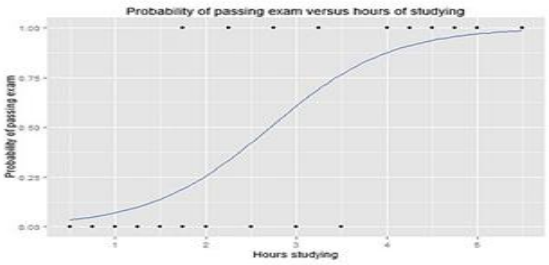

Fig 4 Logistic regression

iii Naive Bayes

Naive Bayes is the simplest and stronger algorithm that is commonly used for predictive modeling. From our training data it is easier to find the probability of each sample class and the conditional probability of each X value that are given in each class. Using this theorem, we can make predictions for new data after calculation using the probability model . The final probabilities can be easily assess the values are in real time and Gaussian distribution(bell curve) is assumed.

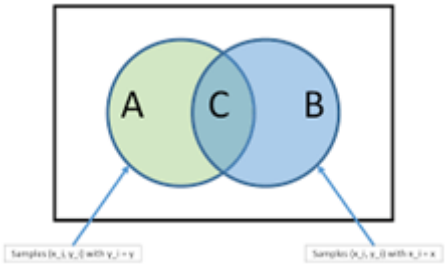

Fig 5 Naive Bayes

iv . K-Nearest Neighbors

The whole training set for the K most similar instances are analyzed and consolidating the output variable for those K instances ,we predict a brand new information . For regression issues, this can be the mean output variable.For classification issues this can be the most common class price.

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The method to verify the similarity between the information instances, if your attributes are all of a similar scale is to use the Euclidean distance, a number you can calculate directly based on the variations between every input variable.

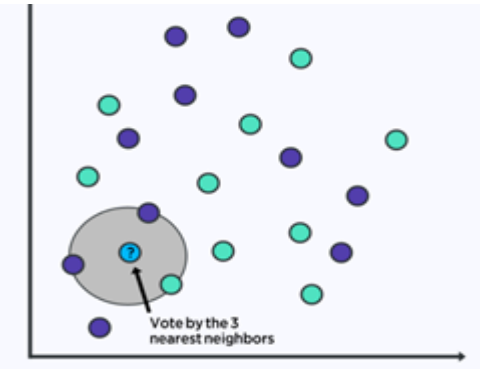

Fig 6 K-Nearest Neighbors

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IV. FUTURE SCOPE

In the near future ,teachers can easily use ML algorithms to check how much of the contents can be grasped by each students, identify the coping skills and find how much they consume Also, prevent the at-risk students from falling behind or even worst, dropping out. We can also expect a robotic learning feature in coming years.

V. FINDINGS AND CONCLUSION

Our study is concerned only in the major two areas of teaching. From this study it is clear that machine learning is one of the emerging area which capture the good set of data and will provide better decisions accordingly in educational sector. In future lot of machine learning techniques are available that can be introduced for improving teachers and student relations and learning mechanism in educational sector. The major finding is that teachers can adopt machine learning in both classroom and non-classroom activities for save the time. As of this pandemic era more importance is given to adaptive and personalized learning of students, the teachers have to give more importance to their mental development and emotional quotient. There are many more areas to be dig out to apply the rapid changes in education sector.

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A holistic review of security aspects in IoT applications

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***Abstract*—** In the area of research,IoT plays a remarkable role over the last decade.IoT is becoming a part of day-to-day life as it is very easy to use.This smart and brilliant technique brings down the human effort and provides easy access to physical device. IoT is smart in the way that it can control other systems without any manual interventions .This control feature of IoT makes our life much better. All these interesting factors of IoT raise its usage but it also increases the challenges faced by IoT. IoT intends to set up a world of digitally connected systems where all connected devices are communicating over networks. The system offers minimal security measures. This may cause users bared to different sort of invaders. One of the important feature of IoT network is Security and Privacy which involves features like authorization, access control, authentication, data protection, and network security. This paper highlights the threats and challenges of IoTnetworks.

Index Terms— Internet of Things, network attacks, security, wireless sensor network, challenges.

I.INTRODUCTION

In this technological era IoT networks are used to carry off complex functions which need high intelligence, were the devices and appliances are connected together. The term, Internet of Things an interconnected system, was introduced by Kevin Ashton in 1999. In 2010, approximately 12.5 billion devices were connected to the internet and the number increased drastically to reach 25 billion in 2015. These interconnected mechanisms include various devices like health and fitness devices, automobile black boxes, home and electricity sensors, smart phones, smart cars, smart glasses and such like. As a matter of fact, IoT is a real world truth which cannot be ignored because it assures outstanding gains but at the same time offers many challenges. To identify a component in the massive IoT system itself is a basic challenge as it can cause severe issues like privacy attacks, governance of the system, access control and overall architecture. Hence in an IoTnetwork, security and privacy plays an important role.

In IoT security importance should be given to maintain privacy, confidentiality, security of the users, data and devices of the IoT, and make sure the availability of the services offered by an IoTinfrastructure.The main three aspects of the system are confidentiality, integrity, and availability. In order to accomplish the security facets,IoTneeds to achieve these three requirements. In the IoT network design elements can communicate with each other and can share data among themselves. The important information like credentials can be stolen by the network attackers, if there is no filtering techniques are available. This may cause harm to the users. To meet the higher demands in terms of security, reliability and privacy advanced technologies and methodologies should be developed.

II.SECURITY IN IOT

Internet of Things (IoT) became commonplace entities in all the aspects of life. Across the past many years significance of IoT has essentially modified the practices and procedures of nearly all varieties of endeavor among business and governance [2]. Considering the security, the major challenge faced by IoT that the IoT extends the ‘internet’ through the traditional internet, mobile network and sensor network, wireless network and so on. So everything in the IoTare connected to the internet and they are communicating each other. Hence this may cause security and privacy issues.

The huge data volumes created by IoT expand between 50 and 60 percent every year as it collect data from sensors, mobile phones, chips etc. This includes svery valuable and sensitive data [3] .More over these IoT devices are prone to security violations and may become a threat to the entire IoT world. Major challenge is that the privacy law is

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unprepared to restrict the threats created by the Internet of Things.

I. GENERIC ARCHITECTURE FORIOT

Generally IoT can be divided into different four key levels such as perception layer, network layer, support layer and application layer.

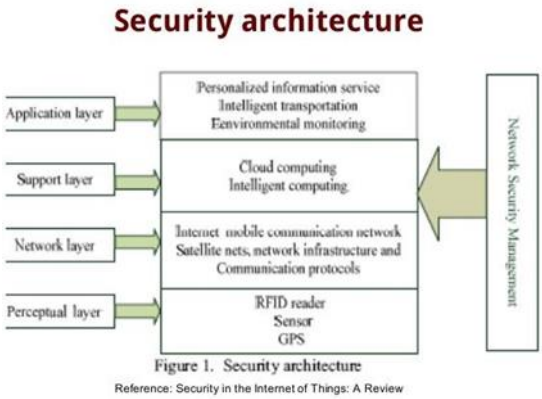

Figure 1. Security architecture

Reference: Security in the Internet of Things: A Review

Fig. 1 shows the security architecture of the IoT.

A. Perception Layer:

The perception layer consists of physical devices such as sensors and actuators which communicate with other devices and the real world to both send and receive data using wireless technology. [4]This layer's objective is to gather all information from its sensors and actuators which to be sent to the network layer.

B. Network Layer:

To get connected with the other smart things, network devices and servers IoT uses network layer. This layer also responsible for transmitting and processing the sensor data.

C. Support Layer:

Support layer is in need of more application security architecture. This layer includes cloud computing and secure multiparty computation. It needs the strong encryption algorithm and encryption protocol, stronger system security technology and anti-virus [5].

D. ApplicationLayer:

The application layer is top most layer of IoT. This layer is responsible for delivering the specific services to the users. It also receives the data from the sensors/actuators from the perception layer after being translated into a readable format by the network layer. Based on these data, the application layer is providing services to the users [6].The received data can be analyzed and stored by the application to create predications or see trends which could be invaluable for a company to see the current and future states of their products/devices.

III.SECURITY CHALLENGES

The real objective of IoT security is to make sure the legitimate character confirmation instruments and give confidentiality about the data and so forth. Model called CIA Triad was introduced for the security systems. This model executes the security by making utilization of the three regions which are Data confidentiality, integrity and availability as figured in the Fig. 2. A break in any of this area will make a serious hazard to the system and is necessary to be represented. One of the key challenges faced by the Internet of Things is Security Threat.This issue is common in the areaofprivacy and confidentiality among heterogeneous network.So to provide confidentiality, integrity, authentication and access control in IoT network the essential features like reliability, efficiency and effectiveness of the security and privacy are needed. The Internet of Things is the domain where research is constantly fluctuating. Hence while designing IoT system, its operating system and components it is necessary to follow certain standards [7].

The threats that are to be taken care in Internet of Things areSecurity, privacy andconfidentiality

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Security challengesinclude:

a) IoT'sarchitecture security.

b) Active detection and protection of IoTagainstattackssuchas Dos andDDos.

c) Tools, methods and standards for managinguser identities andobjects.

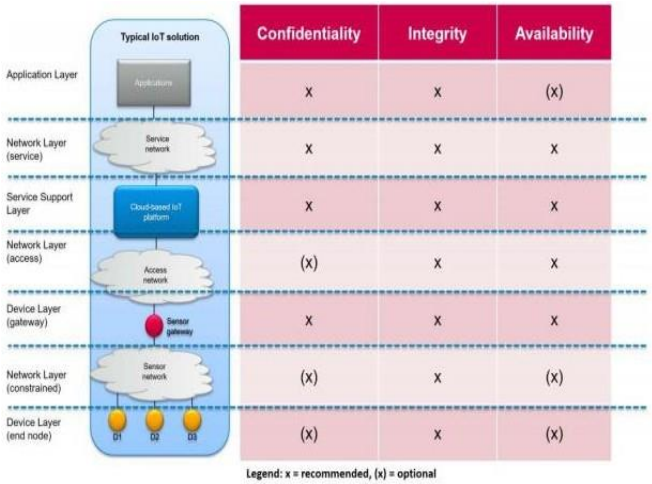

Table A-1: CIA triad for a typical IoT solution

Figure 2 CIA Triad

In the domain of confidentiality:

a) Main challenge is to design simple methods for information exchange, protection of the data and the confidentiality of the information[8].

b) The major component of IoTisconfidentiality

Data Confidentiality:

Data confidentiality is identical to giving flexibility to client from the outside obstruction. It is the capacity to give conviction to client about the privacy of the delicate data by utilizing different systems to such an extent that its disclosure to the unauthorized party is obsolete and can be gotten to by the allowed users as it were. There are multiple security measures to give confidentiality of the data. This includes, Data Encryption in which the data is changed over into cipher text frame which makes it hard to access for the invalid or not legitimate users. Another technique is Two-advance verification, which gives validation by two ward parts and permits the entrance just if both the segments pass through theconfirmation test and the most generally recognized Biometric verification with in which each individual is exceptionally identifiable.

Data Integrity:

In the midst of correspondence, data could be modified by several reasons. This includes the cyber-attacks or could be influenced by different elements that are beyond human ability to control including the crash of server or an electromagnetic exacerbation. Data Integrity refers to the assurance of keeping valuable data from the cyber criminals or the outside impedance amid transmission and gathering with some basic following strategies. So the data can't be altered without the system getting the risk [9]. The techniques used to guarantee the data integrity incorporates strategies like Checksum and Cyclic Redundancy Check (CRC) which are basic mistake finder components for a segment of data.

Data Availability:

The last part of the CIA Triad references the availability. Availability make sure who is accessing data as well as devices, who all can access it and also to check whether the system is working properly. It also ensures reliability by doing necessary updates of the system and devices.A network administrator focuses on data availability to his users even in the case of power outage. He can back up data in cloud in such cases.

Each IoT layer is prone to security issues but they have measures to overcome these security threats and attacks.

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These steps can be categorized as active and passive.In active attack it stops the service while the other one informs IoT network withoutstopping its service.

In each layer of IoT a threat called Denial of Service (DoS) attack may be there. It makes the resources unavailable to approved users. Table 2 shows security threats at each layer.IoT is very much common and also have much importance in the field of research a detailed analysis of security threats need to be done.Some common threats are discussed below.

Data privacy is one of the important factor that should be taken care. Users must ensure who is collecting their information, what data is collected and when this data is needed. Also they must ensure these data is used only for authorized purposes by authorized people when it is needed.

Data transfer by the devices must be taken care from vulnerabilities. Safe data delivery should be ensured.Some of the threats related to IoT infrastructure is listed below:

1) Hardwarecause challenges because it has been expanding
2) Network connection to sensors in IoT devices which is used to analyze data
3) New challenges may occur due to the architecture of internet when single-domain systems become multi-domain [11].
4) Software and Algorithm which are implemented in devices and so it should be considered.
5) Compatibility should be considered since the IoT architecture and devices get updated
6) Cloud computing and the Internet ofThings are very much related since there is much more importance to data collection and storage .So security threat like unauthorized access must take care.[12].

IoT requirements can be summarized as:

- Lightweight and symmetrical solutions are needed to support devices with limited resources.
- To ensure reliability effective key management system and encryption standards with minimal number of resources are needed.
- Authentication, identification, confidentiality need to be ensured.
- Effective key management with good storage.

IV.CONCLUSION

IoT is having both professional and personal influence in our day to day life.IoT is offering an outstanding and efficient control that no industry can ignore. IoT's flexibility makes it more attractive to so many businesses, organizations and government departments that no one can ignore it. IoT is having many advantages. But even if it is growing rapidly some devices are adhere to outdated security issues leaving them unsafe to attack. Also they are having devices processing & power consumptionlimitations.

As we have seen security is an important issue with IoT and with IoT paying out a lot to industries and services and security is having a key role in protecting sensitive information and devices from damage. In this paper, we compare IoT with other technological trends and pointed out the specific properties of the IoT. We tried to discuss a list of security and privacy requirements from these properties and to establish a standard set of security requirements for the IoT technologies.

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Various Image Segmentation Techniques: A survey

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Abstract-- The Image segmentation is referred to as one of the most important processes of image processing. Segmentation plays a very important role in the medical field in the modern scenario. Image segmentation may be defined as a critical process of dividing and partitioning images into set of segments to analyze the images. It is mostly useful for applications like image compression or object recognition, because for these types of applications, it is inefficient to process the whole image.. It can be used in variety of fields such as medical imaging, machine learning, research, robotics etc.A lot of research has been done now a day in this area. The main aim of segmentation is simplification i.e. representing an image into meaningful and easily analyzable way. This paper presents a comparative study of various classical image segmentation methods like thresholding, edge detection with machine learning segmentation methods like Convolutional Neural Networks, Ensemble learning etc.

I. INTRODUCTION:

Image segmentation is a first step in the processing of an image. The segmentation of images will be vital and crucial one. Segmentation refers to process of identifying and extracting the regions of the image [1]. Regions may be defined as collection of pixels having border and shape. Segmentation depends upon various features like color, shape, texture that are contained in the image. There are three levels of image analysis [2].

- Classification
- Detection
- Segmentation

Classification means categorizing the complete image into a class like peoples, animal's etc.Detection refers to finding objects in the image and marks around them. Segmentation is identifying the parts of the image and understands what they belong to.

Fig 1: Classification, Detection and Segmentation

Within the segmentation there are two levels of granularity. Semantic SegmentationInstance Segmentation
In Semantic Segmentation, classifies objects features in the image and comprised of sets of pixels into meaningful classes that correspond with real-world categories [3].
Here in the figure there are five persons, so the semantic segmentation classifies all the peoples as a single instance. Each people belongs to particular class and hence they are represented by same colour But Instance segmentation identifies each instance of each object featured in the image instead of categorizing each pixel like in semantic segmentation. There is no categorization of the pixel. Here the five persons are treated individually so that they are represented with different colours.

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II.NEED OF SEGMENTATION

Cancer has long been a deadly illness. Even in today's age of technological advancements, cancer can be fatal if we don't identify it at an early stage. Detecting cancerous cell(s) as quickly as possible can potentially save millions of lives.

The shape of the cancerous cells plays a vital role in determining the severity of the cancer. You might have put the pieces together – object detection will not be very useful here. We will only generate bounding boxes which will not help us in identifying the shape of the cells.Image Segmentation techniques make an impact here.

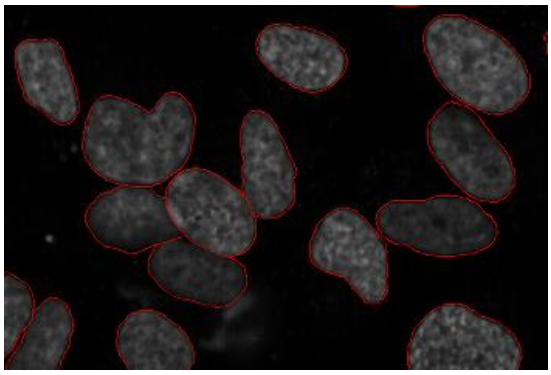

Fig 2: Identify boundaries of cells

III.SEGMENTATION ALGORITHMS

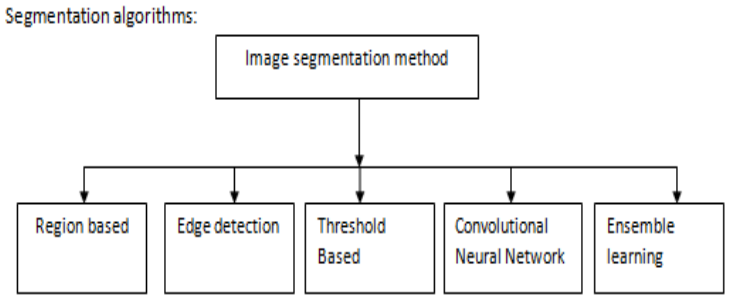

Figure 3: Various image segmentation algorithms.

i.Segmentation by Region based

In this technique pixel representing the same object are grouped together. The region that is identified for segmentation can be closed. It is also known as similarity based segmentation. There will not be any gap exist due to the absence of edge pixels. Here boundaries are identified first and the identification of change in color and texture causes the edge flow to be restructured into vector and edges are detected [4].

Segmentation by Edge detection

It is an important technique which divides an image into object and its background. It is based on change in intensity or pixels of an image. Edge detection operators are of two types first order derivative and second order derivative, of these second order derivative results are more consistent. The results are produced in the form of binary image and are based on discontinuity detection [5]. In edge based technique it will detect all the edges of the images and combine them together of object boundaries of required regions.

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Segmentation by threshold based
This can be the simple approach to segment an image. It is based on intensity levels. Here we divide an image into foreground and background. This can be of two types global and local. In global, identifies the object and its background pixels compare the chosen threshold value and binary partition to segment the image. In local, there can be a variation in the threshold value of image that depends upon the local characteristic [6]. Thresholding converts grayscale images into binary images or distinguishes the lighter and darker pixels of a colour image.

ii.Segmentation by Convolutional Neural Networks (CNNs)

It is the most successful and widely used architectures in the field of medical image analysis. Image segmentation with CNN involves feeding segments of an image as input to a convolutional neural network, which labels thepixels. The CNN cannot process the whole image at once. It scans the image, looking at a small "filter" of several pixels each time until it has mapped the entire image [7].

iii.Segmentation by Ensemble learning

This method produces the output of 2 or more models into a single one. In ensemble learning accuracy can be improved with less number of errors as it is the combined form of models. This will generate a set of weak base-learners which classify parts of the image, and combine their output, instead of trying to create one single optimal learner.

IV.CONCLUSION

This paper describes various types of segmentation techniques with its pros and cons. We can apply segmentation to any kind images and it can be one of the important steps also. The accurate result obtained after applying the segmentation techniques depends upon many factors like colour, texture, intensity, a similarity of images, image content, and problem domain. We can't apply a single method to all types of images. By comparing others it is notified that ensemble learning provides high accuracy.

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A Comparative Study of Training Algorithms for Supervised Machine Learning

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Abstract-- Classification in data mining has gained a lot of importance in literature and it has a great deal of application areas from medicine to astronomy, from banking to text classification.It can be described as supervised learning algorithm as it assigns class labels to data objects based on the relationship between the data items with a pre-defined class label. The classification techniques are help to learn a model from a set of training data and to classify a test data well into one of the classes. This research is related to the study of the existing classification algorithm and their comparative in terms of speed, accuracy, scalability and other issues which in turn would help other researchers in studying the existing algorithms as well as developing innovative algorithms for applications or requirements which are not available. Keywords - classification, decision tree, nearest neighbour, neural network, SVM, Supervised learning.

I.INTRODUCTION

The tremendous amount of information stored in databases cannot simply be used for further processing. Data mining involves the use of sophisticated data analysis tools to discover previously unknown, valid patterns and relationships in large data set. These tools can include statistical models, mathematical algorithm and machine learning methods. Consequently, data mining consists of more than collection and managing data, it also includes analysis and prediction [18].

Classification and prediction are two forms of data analysis that can be used to extract models describing important data classes or to predict future data trends. Such analysis can help us to provide with a better understanding of the large data.

Classification predicts categorical (discrete, unordered) labels, while prediction models continuous valued functions. Classification technique is capable of processing a wider variety of data than regression and is growing in popularity. Classification is also called supervised learning, as the instances are given with known labels, contrast to unsupervised learning in which labels are not known. Each instance in the dataset used by supervised or unsupervised learning method is represented by set of features or attributes which may be categorical or continuous [9] [17].

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II.DECISION TREE INDUCTION

Decision tree classifies data into discrete ones using tree structure algorithms[11]. The main purpose of decision trees are to expose the structural information contained in the data. The decision tree method is a supervised machine learning technique that builds a decision tree from a set of class labelled training samplesduring the machine learning process[9]. The algorithm of Decision trees start with the training samples and their associated class labels. This training set is recursively partitioned base on feature value into subset so that the data in each of the subset is purer that the data in the parent set. Each internal node in a decision tree represent a test on attribute (feature) each branch represent an outcome of the test and each leaf node represents the class label. As a classifier decision tree is used to identify the class label of an unknown sample, tracing path from root to the leaf node, which holds the class label for that sample[9][17].

The root node of the tree is the feature that best divides the training data. There are several measures for finding the feature that best divides the training data, like Information gain , Gain ratio, Gini index , myopic measures estimate each attribute independently, Relief algorithm, Chi square, CSEP, G-statistics, Minimum Description Length (MDL)

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measure which is least bias toward multivalued attribute, Multivariate split – based on combination of attributes [9][11][17][18].
No one measure is significantly superior than others [9].Decision tree complexity increase with tree height. Therefore, measures that tends to produce tree with multiway and that favour more balanced splits may be preferred, may depend on the dataset.
Tree pruning is used to improve the prediction and classification accuracy of the algorithm by minimizing overfitting. Over-fitting in decision tree algorithm results in misclassification error. Tree pruning is done in bottom-up manner and is less tasking compared to the tree growth phase as the training data set is scanned only once.
There are two approaches to tree pruning: 1) Prepruning, which prune the tree by halting its construction early based on the value of prespicified threshold and2) postpruning, which remove the subtree from the fully grown tree. Though, Post pruning required more computation effort but it leads to a more reliable trees. Repetition and replication problem can occurred in pruned trees, which can be solved with multivariant split based on a combination of attribute[9].

Advantages:

- Decision Trees are very simple and fast.
- It does not require any domain knowledge or parameter setting and it is able to handle high dimensional data.
- Representation is easy to understand i.e. comprehensible.
- Have good accuracy (may depend on data at hand).
- It Support incremental learning.
- Decision trees are unvaried since they use based on a single feature at each internal node

Disadvantages:

It has long training time, as it requires one pass over the training tuples in D for each level of tree.

- Lack of available memory, when dealing with large databases.
- The division of the instance space is orthogonal to the axis of one variable and parallel to all other axes. The resulting regions after partitioning are all hyper rectangles.
- Most decision tree algorithms cannot perform well with problems that require diagonal partitioning.
- Decision trees can be significantly more complex representation for some concepts due to the replication problem.
- Orders of attributes in tree nodes have adverse effect on performance.

Research Issues:

- Can a complex decision tree be broken down to a small collection of simple trees that, when voted to gather, give the same result as the complex tree?
- Can we develop a non-trivial tree-construction algorithm that would hardly affected by omitting a single case?

III.BAYESIAN NETWORK

Bayesian Classifiers are statistical classifiers. They predict the class membership probabilitythat is the probability that a given sample belongs to a particular class. Bayesian belief networks are graphical models, showing the relationship between the subset of attributes. Bayesian classifier havethe machine learning process [9]. The algorithm of Decision trees start with the training samples and their associated class labels. This training set is recursively partitioned base on feature value into subset so that the data in each of the subset is purer that the data in the parent set. Each internal node in a decision tree represent a test on attribute (feature) each branch represent an outcome of the test and each leaf node represents the class label. As a classifier decision tree is used to identify the class label of an unknown sample, tracing path from root to the leaf node, which holds the class label for that sample[9][17].
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Tree pruning is used to improve the prediction and classification accuracy of the algorithm by minimizing overfitting. Over-fitting in decision tree algorithm results in misclassification error. Tree pruning is done in bottom-up manner and is less tasking compared to the tree growth phase as the training data set is scanned only once.
There are two approaches to tree pruning: 1) Prepruning, which prune the tree by halting its construction early based on the value of prespicified threshold and2) postpruning, which remove the subtree from the fully grown tree. Though, Post pruning required more computation effort but it leads to a more reliable trees. Repetition and replication problem can occurred in pruned trees, which can be solved with multivariant split based on a combination of attribute[9].

Advantages:

- Decision Trees are very simple and fast.
- It does not require any domain knowledge or parameter setting and it is able to handle high dimensional data.
- Representation is easy to understand i.e. comprehensible.
- Have good accuracy (may depend on data at hand).
- It Support incremental learning.
- Decision trees are unvaried since they use based on a single feature at each internal node

Disadvantages:

It has long training time, as it requires one pass over the training tuples in D for each level of tree. Lack of available memory, when dealing with large databases.

- The division of the instance space is orthogonal to the axis of one variable and parallel to all other axes. The resulting regions after partitioning are all hyper rectangles.
- Most decision tree algorithms cannot perform well with problems that require diagonal partitioning.
- Decision trees can be significantly more complex representation for some concepts due to the replication problem.
- Orders of attributes in tree nodes have adverse effect on performance.

Research Issues:

- Can a complex decision tree be broken down to a small collection of simple trees that, when voted to gather, give the same result as the complex tree?
- Can we develop a non-trivial tree-construction algorithm that would hardly affected by omitting a
- Extracting the knowledge embedded in trained neural networks and representing that knowledge symbolically is the challenging issue of neural network.

IV. K-NEAREST NEIGHBOR CLASSIFICATION

K-nearest neighbor is non-parametric, instance based leaning method. Instance based classifiers are also called lazy learners as they store all of the training samples and do not build a classifier until a new, unlabeled sample needs to be classified. Lazy-learning algorithms require less computation time during the training phase than eager-learning algorithms (such as decision trees, neural networks and Bayes networks) but more computation time during the classification process[9][14][17].
The k-nearest neighbors' algorithm is amongst the simplest of all machine learning algorithms. It is based on the principal that the samples that are similar are lies in close proximity [3]. Given an unlabeled sample, K-nearest neighbor classifier searches the pattern space for the k-objects that are closest to it and assigned the class by identifying the most frequent class label. If the value of k=1 then assign the class of the training sample that is the closest to the unknown sample in the pattern space.
The advantages, disadvantages and research issues of KNN are as follows [9][14][17][20].

Advantages:

- Easy to understand and easy to implement classification technique.

An expected lazy learning methods are faster at a training than eager methods.
Perform well on application in which a sample can have many class labels.

Disadvantages:

- Lazy learners incur expensive computational costs when the number of potential neighbourswhich to compare a given unlabelled sample is large.
- Slower at classification since all computation is delayed to that time

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- Nearest neighbour classifiers assign equal weight to each attribute. This may cause confusion when there are many irrelevant attributes in the data and results into poor accuracy. Solution: Assign weight to the attributes and prune noisy data samples.
- Sensitive to the local structure of the data.
- They have large storage requirements.
- They are sensitive to the choice of the similarity function that is used to compare instances.
- They lack a principled way to choose k, except through cross-validation or similar, computationally-expensive technique.

Research Issues:

- Retaining the classification accuracy of the KNN classifier by eliminating many of the stored data objects. This is known as 'condensing' and can greatly speed up the classification of new objects
- Large amount of work on the application of proximity graphs to the KNN problem.

V. SUPPORT VECTOR MACHINE

SVM have attracted a great deal of attention in the last decade and actively applied to various domains applications. SVMs are typically used for learning classification, regression or ranking function. SVM are based on statistical learning theory and structural risk minimization principal and have the aim of determining the location of decision boundaries also known as hyperplane that produce the optimal separation of classes [2][9][19].
Support Vector Classification (SVC) is the algorithm that revolve around the notion of a ―marginǁ—either side of a hyperplane that separates two data classes. Maximizing the margin and thereby creating the largest possible distance between the separating hyperplane and the instances on either side of it has been proven to reduce an upper bound on the expected generalisation error. SVM is outlined first for the linearly separable case. It then uses kernel functions for nonlinear mapping to transform the original training data into a higher dimension, within which it searches for linear optimal separating hyperplane. Finally, slack variables are introduced for noisy data to allow training errors [1].

SVM searches for the optimal separating hyperplane that correctly classifies the data as shown in fig. 1. This is equivalent to maximizing the distance, normal to the hyperplane, between the convex hull of two classes and this distance is called the margin.

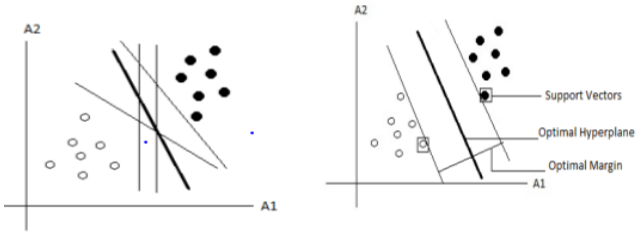

Figure 1. Optimal Separating Hyperplane

Any training tuples that fall on margin are called support vectors. The support vectors are the most difficult tuples to classify and give the most information regarding classification. Other data points are ignored. Since the complexity of SVM is depends only on support vectors, which are very less in numbers, they are well suited for the data sets where the number of features is large compared to number of training instances[2][9][16][19].
The advantages, disadvantages and research issues of SVM are as follows [9][14][17][20].

Advantages:

- One of the most robust and accurate methods among all well-known algorithms.
- It has a sound theoretical foundation, requires only a dozen examples for training, insensitive to the number of dimensions.
- Find the best classification function to distinguish between members of the two classes in the training data
- SVM is less prone to overfitting than other methods.

Disadvantages:

- It is computationally expensive, as solving QP methods require large matrix operations as well as time consuming numerical computations.
- SVMs are extremely slow in learning, requiring large amount of training time.

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- The memory requirement grows with the square of the number of training examples.
- Poor interpretability of results

Research Issues:

- The underlying model implemented in SVMs is determined by the choice of the kernel. Deciding which kernel is the most suitable for a given application is obviously an important (and open) issue.
- The statistical learning theory developed by Vapnik and Chervonenkis provides necessary and sufficient conditions in terms of the VapnikChervonenkis (VC) dimension (a capacity measure for functions). However, the estimation of the VC dimension for SVMs is often not possible and the relationship between both approaches is still an open issue.
- From a statistical point of view an important subject remains open: the interpretability of the SVM outputs.
- Regarding the finite sample performance of SVMs, where bias and variability computations for linear inversion algorithms (a particular case of regularization methods) are studied. The way to extend these ideas to the SVM nonlinear case is an interesting open problem.
- Expansion to very large database includes a large proportion of the training data, which leads to a model that is expensive both to store and to evaluate. Alleviating this problem is one area of ongoing research in SVMs.

VI. COMPARATIVE ANALYSIS

Supervised classification is one of the tasks most frequently carried out by intelligent techniques. The large number of techniques have been developed, some of which have been discussed in the previous sections. The table II shows the comparative studies of some commonly used classification techniques from the existing evidence and theoretical studies [9] [3] [4]. This comparison shows that not a single learning algorithm outperform other algorithm all over the other datasets.

VII.CONCLUSION

In this paper the comparison of the most well-known classification algorithms like decision trees, neural network, and Bayesian network, nearest neighbour and support vector machine has been done in detail. The aim behind this study was to learn their key ideas and find the current research issues, which can help other researchers as well as students who are doing an advanced course on classification. The comparative study had shown that each algorithm has its own set of advantages and disadvantages as well as its own area of implementation. None of the algorithm can satisfy all the criteria. One can investigate a classifier which can be built by an integration of two or more classifier by combining their strength.

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Multi Agent Systems in Securing IoT Healthcare

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Abstract--. The Internet of things (IoT) is becoming an increasingly growing topic of conversation both in the workplace and outside of it. It is a giant network of connected things and people which collect and share data about the way they are used The applications of IoT technologies are multiple, because it is adjustable to almost any technology that is capable of providing relevant information about it. IoT initiatives in healthcare revolved around the improvement of patient care such as remote monitoring and telemonitoring. IoT is being used to track the progression and treatment of diseases, to monitor patients' health conditions and accordingly alter their medication. Because of the heterogeneous nature of IoT, it has raised various privacy and security concerns. This paper gives an introduction to IoT healthcare systems, its security and privacy challenges and a multi agent paradigm to prevent session medjacking attacks.

I.INTRODUCTION

The Internet of Things (IoT) is a wireless network that configures itself and allows the Internet to access the real world of physical objects. The interconnection between day-to-day interacting appliances like a smart phone with internet connectivity was made possible through IoT [11]. The interrelated computing devices in IoT are provided with unique identifiers (UIDs). They are able to transfer data over a network without requiring human-to-human or human-to-computer interaction. Medical IoT devices have new ways of tracking patients and facilities while optimizing treatment and reducing costs. But many of these smart devices are at a security risk and they need to be secured [5]. The connected medical devices like Wi-Fi-enabled infusion pumps,CT scan machines and smart MRI machines increase the attack surface of devices by sharing information which create security and privacy risks and the potential violation of privacy regulations[3].

Other than that, most hospitals do not have IoT segmentation of the network from other devices. As a result, any device implemented locally can have a global organizational impact, particularly because of the lateral movement of medical and sensitive patient information through devices and departments. Due to the procurement processes of medical equipment, the security issue becomes more threatening. In the system acquisition or deployment processes, protection is not always included, and it is typically an add-on feature. The lack of embedded security features raises the risk of human error, ranging from poor system configuration to the absence of audit logs, unauthorized control of access, or even a lack of processes involving the use of the computer.

II.IOT IN HEALTHCARE SYSTEMS

Healthcare means taking preventive or appropriate measures to enhance the well-being of an individual. This includes surgery, prescribing medication, or giving other tips/advices in the routine life of an individual. Normally, these programmes are provided by a health care system made up of hospitals and doctors. IoT plays an important role in many fields of healthcare [1].This includes:
-Tele/online consultation and remote patient monitoring system where the patients are allowed to consult the doctor through online interface or telephone and get prescription from doctor. This was much common during this COVID pandemic stage.
-Laboratory facilities in distant areas and the results are delivered to the hospital network at the time of consultation.
-Palliative care for bed ridden patients and their remote monitoring
-Special care clinic for senior citizen which includes nursing home and residency facility for the needed patients.
-Real time data collection from the IP patients like blood pressure monitoring, pulse rate, blood oxygen level etc.

To strengthen the healthcare system, the advancement of health technology provides new opportunities and services. Healthcare services use sensors and mobile devices these days. All facets of healthcare systems use Internet of Things

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(IoT) devices. If the IoT presence in the healthcare sector grows, both patients and healthcare providers will benefit from it. IoT can play a significant role in remote monitoring and interaction areas which can boost the treatments that patients receive. IoT healthcare also includes mobile medical apps or wearable devices to capture health data of patients. All of this can be attributed to the data revolution that empowers us using smart devices such as smartphones, wearables, and hand-held devices to live a healthier life. The study of data collected through electronic medical records, diagnostic data collected through imaging equipment, and hand-held personal devices would increase the capacity of decision-making. This will allow patients to take a more active role in their personal health management. Fig 1 shows an overview of IoT healthcare system.

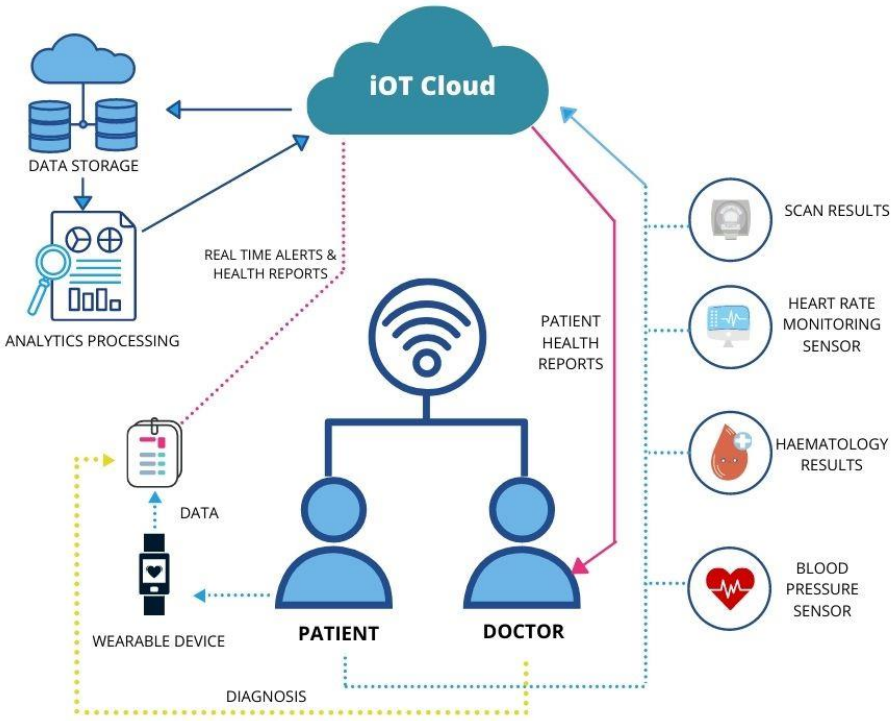

Fig 1.Overview of an IoT Healthcare system

III.VULNERABILITY OF IOT DEVICES

IoT devices are connected to centralized management platforms and legacy systems, where users are prone to security vulnerabilities at the application layer [14]. An intruder attempts to gain unauthorized access to the system because IoT activated devices are used and controlled by humans. The hacker tries to capture confidential information by making unauthorized access to wireless IoT devices. As IoT devices require low power and have less computational capacity, they cannot afford to have complicated protocols. This makes it an easy target for intruders. The vulnerability and security patches of an IoT device is the easiest way to place a threat. There can be vulnerabilities from both hardware and software side. Hardware vulnerability is the complicated one and is hard to detect. Software vulnerability occurs as a result of poor coding practices and it leads to some secret entry points in the program that can be a back door for attackers. IoT threats can be a natural threat, or an unnatural threat. Natural threat includes any danger that arises from natural calamities, like earthquakes, hurricanes, and floods. They can cause severe damage to IoT devices. In such situations, to safeguard data, a backup is made. But it's not possible to repair any damage to these machines. The unnatural threats can be a deliberate one from attackers. These type of threats are malicious which may focus on data acquisition or defaming in an unauthorized way.

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IV.THREATS OF IOT IN HEALTHCARE

IoT devices are important for health applications. They deal with collecting measurable and analyzable data for healthcare applications. Security of IoT healthcare applications is important as it may contain confidential information. Nowadays, IoT devices are prone to many security vulnerabilities [4][7]. Some of the common security challenges are given in Fig 2.

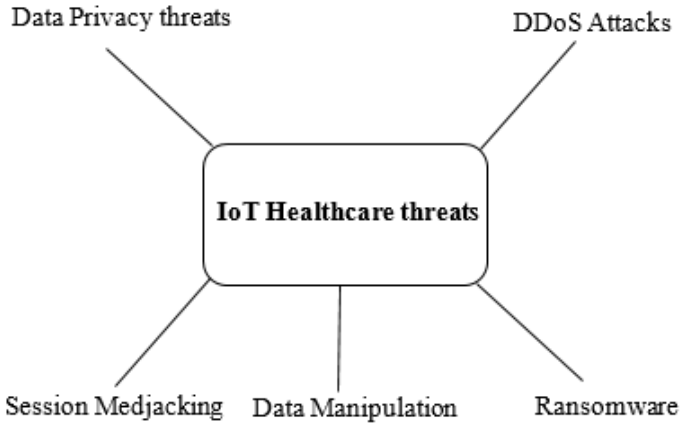

Fig 2.IoT Healthcare Threats

A.Data Privacy Threats

Privacy is important issue for data in a healthcare system [10] . Healthcare data may be collected from IoT devices. These devices gather data by remote access mechanisms which have some challenges in privacy and security [8]. Data collected by the sensor is transmitted to the database or cloud over internet. In addition, IoT devices connect to the internet and communicate with each other through the net. Security vulnerabilities on Internet and IoT devices threaten health data. Additionally, healthcare data is collected from different health units and is shared by various health units. Every unit must provide security for data as healthcare data includes essential and significant information. All the world's attackers want to capture health data. Thereof, privacy of data must be protected

B.Data Manipulation

Data is an important entity in IoT healthcare applications. As data is used in all dimensions of healthcare systems, attacks are aimed at data security and privacy [9]. Attackers involve in stealing, manipulating and damaging data. In IoT systems, multiple devices/networks are involved in dealing with the data, it is not uncommon that some will deviate from the expected norms. Accurate and upto date data is a requirement in a connected system. Data integrity problems arise when the data is stored in a node or it travels through the communication network.Modification of data can be performed by active or passive attacks to the security system.In the case of an IoT healthcare system,a number of smart devices are involved to store medical data. Intruders can intercept, interrupt or interrogate the system to modify the data. Attackers steal health data for malicious use and they manipulate or change data in order to coerce victims in to what attackers want. Doctors could take wrong decision about diagnosis and treatment because of data manipulation. In addition, data loss is serious problem for IoT health application. Integrity protection includes both preservation of data and protection form counterfeit attempts.

C.Session Medjacking

Session medjacking [12] is an application layer IoT healthcare threat which gains access to a medical device by hijacking the sessions used by the authorities.Here, the attackers create backdoors in hospital networks by utilizing the security patches in outdated medical devices.medical devices have no such threat detection mechanism thus giving

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them no visibility or control. Medical devices such as X-ray systems, CT scanners, MRI, ventilators and medical refrigerators are directly connected to computers and attackers utilize this chance to get hold of the devices for gaining access to the vital electronic health records. Hacking medical devices has serious consequences which can lead to the display of defective results giving incorrect diagnosis and thereby endangering the life of patient.

D.Ransomware

Ransomware [13] is a serious threat to IoT healthcare systems which gains access to medical system and encrypts victim's files.A ransom amount is demanded from the victim to restore the system.The payments are asked in terms of cryptocurrency like bitcoin. The attackers use social engineering tools to fool the users to get entry into the system and encrypt the users' files. They can also use security patches to infect the systems. When the user tries to access the system, they see a message that the files are inaccessible and will be decrypted only if the user makes a bitcoin payment to the hacker. The attack has also another dimension where the attacker threatens to expose sensitive data on the users' system unless a ransom is paid.

E.DDoS Attacks

Denial-of-service attacks (DoS) [6] [15] are volumetric attacks which make IoT devices and IoT applications disabled by interrupting the system functionality. IoT devices are connected to a network, transfer data and communicate with each other. The type of DDoS attacks used in IoT device is a botnet attack. A botnet is a set of connected computers that work together to perform repetitive tasks, and it doesn't necessarily have a malicious purpose. An attacker can exploit this networked system by getting control of a botnet by infecting a vulnerable device with malware. Then they can use the network as a group of devices to perform DDoS attacks to incapacitate a network or online resource, typically with an excessive surplus of the kind of activity. It can be more like a massive attack by overwhelming a server or cluster with requests/messages, thereby disrupting the normal functionality of the system.

V.INTELLIGENT AGENTS IN IOT HEALTHCARE ATTACK DETECTION

The use of intelligent agents in the attack detection of IoT healthcare is a new concept. Agent technology [2] is embraced by the distributed systems due to its autonomy, collaborative behaviour, scalability, and flexibility. As number of devices are connected to healthcare system using IoT increases, it is required to be concerned about the security challenges of these heterogeneous devices. Intelligent agents are already tried in a number of e-health applications, such as diagnostics, smart emergency applications, tele monitoring and eldercare.The proposed work explains about the application of intelligent agents in session medjacking attack detection.

Session medjacking occurs when a session is hijacked in medical devices connected to IoT network.It relies on the use of a valid session of a doctor,nurse,patients or other health workers to gain unauthorized access into the system to steal important patient data.A session refers to the time interval of communication between two parties in a single system. When a user logins to the system using a password, a session is created. The session will be valid up to the end of the communication between both parties. Every session is associated with a session id. This id will be often stored in cookies.

Before starting a session, there is an authentication check to verify the credentials of the user. In a password authentication system, the user is asked to enter a predefined username and password. When the user submits his credentials, the system will check the entered details with already stored one. If there is a match with the stored details, the required access is granted to the user. Authentication can also be enforced in various ways. There two factor and three factor authentication techniques to improve security. When the initial authentication check is completed successfully, the session starts and continues up to the end of the communication. The session hijacking attack takes place when a session is active in such a way that the attacker intrudes at the same time and takes advantage of the active session.Establishing a session between the two parties is more like a client server communication model. The session ids are created at the client side and are stored in cookies.

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VI.ANATOMY OF SESSION MEDJACKING

The different stages in session medjacking attack are:

1.The attacker identifies the target hospital network.Then he finds the medical device/equipment connected to the network to gain access. The medical device is selected in such a way that it contain a lot of important patient information. Alternately, they can also target the most vulnerable machine which has easy access to a device that holds important patient information.

2.Attacker gains access to the system by a backdoor entrance and searching for patient information to steal or modify it. If the required information is not in the current device, effort is done to connect to other devices.

3.Attacker hijacks the valid session of the user and steal sensitive patient information and financial management details.

4.Attacker forwards the private details of patients to money making frauds, mafias behind organ transplantation or any other persons who makes money through identity theft.

5. In some cases, attacker demands money from the hospital officials to give back the hospital records which is already blocked by the attacker.

Intelligent agents can be deployed at the client side to monitor the unauthorized access/intrusion to the sessions of an authorized party.It is easy for the attackers to get into the session if sessions are long. Because attackers utilize long sessions to hijack it. When both parties want to create a session, they can agree upon a common secret key to exchange information and it should be refreshed after each session. Intelligent agents can be used to monitor the exchange of session keys between parties.If a session prolongs for long, these agents can refresh the sessions by updating it with a new session key to avoid man in the middle attack. So the authentication procedure is repeated in frequent intervals using fresh credentials and thus reducing the invasion of attacker to steal patient details.

VIII.CONCLUSION

The Internet of Things is an intelligent connection of physical devices embedded with Internet connectivity, sensors and other hardware that allow communication and real time working of devices which can be controlled through the web. In healthcare industry, IoT provides the provisions for remote patient monitoring, elder care, online/tele consultation to patients, timely data collection from IP patients. IoT based healthcare infrastructures are prone to several security threats which causes malevolent actions to the devices connected. IoT threats can lead to identify theft and financial losses for the parties concerned. This chapter has provided an introduction to IoT healthcare systems, the various challenges involved in IoT healthcare systems and a novel approach using artificial intelligent agents to prevent session medjacking attacks. Session medjacking is the most venomous form of attack in IoT systems. It causes a serious threat to the session key establishment schemes inside a healthcare networked system. The agent based paradigm is used to monitor session duration and the hijacking of sessions by stealing session ids.This is an ongoing research work and is expected to give better results with good accuracy.

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A deep study on Recent ICT Tools and Techniques for Outcome Based Education

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***Abstract*—** Outcome based mostly education (OBE) focuses on talents procured by the learners. It assists the progress of learners by making talents, impacting qualities, states of mind and determination and increasing experience. Quality education that empowers the society is often achieved through data and communication Technologies (ICT) in teaching learning method. This Paper is meant to present AN insight into varied Productivity tools, Learning management systems, on- line white boards which might be used for OBE. The paper conjointly specialize in ICT tools for Assessments, Video conferencing, conducting Quizzes, Vocabulary learning ,Digital Notes and Mind maps.

Index Terms— Outcome based education, ICT, Video conferencing, conducting Quizzes, Vocabulary learning ,Digital Notes ,Mind maps, Productivity tools

I.INTRODUCTION

In this digital era ,ICT use within the school room is very important for giving students opportunities to betoldand apply the specified twenty first century skills. Information and communication technologies (ICT) became a typical place entity in all aspects of life. Across the past twenty years the employment of ICT has essentially modified the practices and procedures of nearly all varieties of business and governance. The employment of ICT in education moves itself to a lot of student-centered learning settings. However with the globe moving quickly into digital media and data, the role of ICT in education is changing into more and more necessary and this importance can still grow with in the coming years. In this paper, a literature review relating to the employment of ICTs in education was provided. Effective use of ICT for Education , alongside ICT helps in teaching learning and evaluation method and also quality of education. With the current need and demands of thesociety,the requirement to develop twenty first century skillsamong students becomes imperative so as to reply tothecurrent trends and problems. This will be materialized by the outcome based education approach. This approach focuses on the action taken by the scholars once being learned. It's more involved with what the scholars do in the acquiredideas, theories and principles. In crafting the use of latest approaches, methodologies and methods in teaching, one among the foremost importance is that the students or the learners. Nowadays, students still follow the same pattern of learning as they forever have; they compare new data with their existing mode of information. However, these days students preferences information based mostly on their experiences with engineering technology particularly on however data is presented.

The significance of ICT in education has been given recognition not only in India, but in different countries of the globe also. The intensive use of ICT has rendered a major contribution in raising the educational environmental conditions. Analysis has indicated that before the appearance of technology, once students accustomed build use of pens and pencils to organize their assignments, and then they find issues in doing corrections. ICT is transferrable regarding changes within the processes of teaching and learning by adding the things of liveliness to the educational environments. ICT is thought to be the doubtless powerful tool for giving instructional opportunities

ICTs like videos, television, radio and multimedia system computer software system that mixes text, sound and vibrant moving pictures may be used to build provision of stimulating and reliable content that might encourage the participation of scholars inside the teaching-learning processes.

Teaching occupies an honorable position within the society. ICT helps the teacher to update the new data, skills to use the new digital tools and resources. By exploitation and acquire the data of ICT, university student can become effective academicians. ICT is one amongst the foremost factors for creating the fast

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changes in our society. It will modify the character of education and roles of scholars and teacher in teaching learning method. Academics in India currently started exploiting technology within the category space. Laptops, LCD projector, Desktop, EDUCOM, smart classes, Memory sticks are getting the common media for teacher education institution. Therefore we must always use data & communication Technology in Teacher Education in twenty first Century as because currently academics can will produce a bright future for college students.

A numerous ICT applications are available in today's technological world which can be used in the educational institutions for providing an efficient and useful mode of outcome based education.

II. LITERATURE REVIEW

Information and communication technologies (ICT) became commonplace entities in all the aspects of life. Across the past twenty years significance of ICT has essentially modified the practices and procedures of nearly all varieties of endeavor among business and governance. Among education, education may be a very socially orienting activity and quality education has historically been related to strong academics having high degrees good contact with learners. The employment of ICT in education lends itself to a lot of student-centered learning settings. However with the globe moving quickly into digital media and data, the role of ICT in education is changing into a lot of and a lot of vital and this importance can still grow and develop within the twenty first century. In the paper, a literature review relating to the usage of ICTs in education was provided. Effective use of ICT for Education, alongside ICT use in teaching learning process; quality and accessibility of education; learning motivation. Learning atmosphere. Besides, an outline of the ICT and scholastic performance.

The Information and Communication Technology (ICT) in faculties are subsumed within the Rashtriya Madhyamik Shiksha Abhiyan (RMSA). Currently ICT in educational Institutions may be an element of the RMSA. the information and Communication Technology (ICT) in education was launched in Dec, 2004 and revised in 2010 to produce opportunities to secondary stage students to primarily build their capability on ICT skills and create them learn through computer assisted learning method. The theme may be a major catalyst to bridge the digital divide amongst students of different socio economic and different geographical barriers. The theme provides support to States/UTs to ascertain computer labs on propertybasis.

Previously, Davis, Bagozzi and Warshaw(1989) developed a theory of 'action with reference to reasons' therefore known as Technology Acceptance Model (TAM). Later supported their work, Venkatesh and Davis (2000) investigated the explanations some folks use computers and their attitudes towards them that known as TAM 2. The model shows links the perceived quality and simple use with angle towards victimization ICT and actual use (systemuse).

The Cavite State University also visualizes to give quality education and to turn out people who are globally competitive. In realizing this vision, one among many programs and projects of the university asked all faculty members to conduct researches that may facilitate improvements in the service of the institution in all areas, especially in the curriculum offerings. The study is anchored the principles of Outcome- Based Education (OBE) which were viewed in three different ways- as a theory of education, as a systematic structure for education or as classroom practice (Killen,2000).

Tucker (2004) stressed that outcome-based education is important in achieving higher order thinking skills and mastery among the learners rather than the cumulative coursecredit.

Cooperstein, S. and Weidinger, E.(2004) [3] stressed that attention, organization and repetition is impoetant in transferring information to the memory. This is important to truly employ the principles of artistic learning. There is a need for the students to show on what they have learned.

One of the foremost common models for integration is that the Substitution-Augmentation-Modification-Redefinition (SAMR) model. The primary stage is that the replacement of manual practices with information and communication technologies (ICT) based mostly ones like usage of projectors rather than ancient chalkboards. Second stage, involves substitution however with useful enhancements. This includes usage of word processors with spell checkers and different search engines. The third stage is that the vital re- designing of tasks. AN example would be the usage of Google classroom as a paperless method to produce, distribute and grade assignments. The last stage is that the creation of latest tasks that might be unimaginable while not the employment of ICT. These consist simulations, games, open education resources and on-line tutoringsystems.

III. ICT Tools for OBE

This section elaborates on a number of the normally used ICT for outcome based mostly education. Different tools can be used as Productivity tools, Learning management systems, on-line white boards. Different applications are on the market which may be used for Assessments, Video conferencing, conducting Quizzes, Vocabulary learning ,Digital Notes ,Mind maps and Video editing and creating.

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A. Assessment Tools

(i) Testmoz

Testmoz is a superb internet tool that permits you to make auto hierarchal tests and quizzes. This application is created by Matt Johnson, a collegian student at Washington State University,Vancouver.The strength of this application lies in its simplicity and user-friendliness. Testmoz supports four varieties of questions: True/false, multiple selections, multiple response, and fill within the blank. Every check you produce includes a distinctive URL that you'll be able to use to edit your check later on or to share withothers.

(ii) Bookwidgets

BookWidgets permits academics to make plenty of various varieties of interactive content. Samples of every variety of widget are offered to use as a guide to begin out,and a tutorial walks you through the steps. There are forty completely different widgets you'll be able to produce that may be shared through a link, a QR code, an email, and Google room. Easy assessments you'll be able to integrate include exit slips, quizzes, and worksheets. Youngsters will follow and review skills with flash cards, puzzles, or games like hangman or bingo

(iii) Wizer.Me

Wizer.Me is associate education platform that permits academics to make fast, simple and fun digital worksheets, to share them with fellow academics and to stay track of student performance. Wizer permits academics to make digital worksheets.. This tool permits in participating digital worksheets that permit you to load video, questions, matching, draw in, and a large sort of alternative wonderful selections. You'll be able to even prepare the worksheets in order that they are automatically ranked. You'll be able to add video, audio, pictures and a range of question varieties, assign them to students with one click, and insert them into Canvas.

(iv) Formative

Formative, that is additionally referred to as GoFormative, is a web-based tool that permits lecturers to make digital formative assessments, tasks, or assignments that are simply accessible from any electronic device:laptop, tablet, or smart phone. The web site permits educators to make original tasks or transfer pre-created documents or PDFs to insert inquiries to assess student learning. In classroom, it's extraordinarily helpful for making electronic assessments and for reading comprehension activities. the power to insert queries directly during a PDF may be a favorite feature of the tool as a result of it helps to scaffold, or "chunk" the assignment during a manner that facilitates students specialize in the world of the text or infographic within which they have to search out the knowledge that may help them answer the question. Additionally, the grading and analytical options of the program create it simple to envision students' responses and that queries were troublesome for them toanswer.

B. Learning Management System

(i) Googleclassroom

Classroom is a free web-based platform that integrates your G Suite for Education account with all of your G Suite services, together with Google Docs, Gmail, and Google Calendar. Classroom saves time and paper, and makes it simple to make categories, distribute assignments, communicate, and keep organized. Teachers will quickly see who has or hasn't completed the work, and supply direct, real-time feedback and grades right in classroom. Google classroom permits you to make a novel category for each category that you simply teach. Assignments are an excellent thanks to collect student work and supply your students with feedback and grades. Google room permits you to raise an issue inside a selected category. Like assignments you'll be able to add files to the queries you post, and may assign a day of the month thereto ifyou

would like.

(ii) Edmodo

Edmodo is an academic web site that takes the ideas of a social network and refines them and makes it applicable for a classroom. Victimization Edmodo, students and teachers will reach out to each other and connect by sharing ideas, problems, and useful tips. Edmodo brings everybody within the education community along to assist learners succeed. we tend to produce technology, content and platforms that connect teachers, students and parents to every alternative and facilitate all learners discover their passions and improve their skillsEdmodo is an academic technology company giving a communication, collaboration, and training platform to K-12 faculties and teachers. The Edmodo network allows academics to share content, distribute quizzes, assignments, and manage communication with students, colleagues, and oldsters.

(iii) Canvas

Open, intuitive, and born within the cloud, Canvas streamlines all the digital tools and content that teachers and students love, for an easier and a lot of connected learning expertise.

(iv) WizIQ

WizIQ is a straightforward method to teach and train on- line. It's a cloud-based learning delivery platform

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with a set of integrated options – together with virtual room, course management, content authoring, video streaming, tests and assessments, insights and analytics and mobile learning. WizIQ empowers instructors, education service suppliers and corporate to deliver and manage live and self-paced learning with easy-to-use, scalable and efficient technology.

(v) ClassFlow

Designed by academics for academics, Class Flow may be a cloud-based lesson delivery software package with advanced collaboration tools for student engagement. Energize the room with interactive lessons, activities, quizzes, and several immersive resources from educators round the world

(vi) LMS365

LMS365 (Microsoft teams & modern SharePoint based LMS) is that the multi-award-winning LMS - Learning Management System that permits your organization to deliver coaching on the Microsoft 365 platform through SharePoint, groups and Mobile devices providing a well-recognized setting for your employees, partners and customers. Seamlessly integrated withLMS
365 you enter well known surroundings. It's extremely customizable, easier to use, faster to deploy

(vii) Moodle

The Moodle Learning Management System (LMS) may be a versatile, open supply and liberated to transfer learning management resolution. ... In private Moodle sites, educators, trainers and employers will produce and deliver on-line courses to assist their audiences come through their learning goals. Most usually, Moodle is employed by businesses, firms, hospitals and non-profits for coaching,on-line learning and in some cases it's used for extended business processes.

C. VideoConferencing

(i) Zoom

Zoom Video Communications, Inc. is an American communications Technology Company headquartered in San Jose, California. It provides videotelephony and on-line chat services through a cloud-based peer-to-peer software package platform and is employed for teleconference, work, distance education, and social relations.

(ii) GoogleMeet

Google Meet is a video conferencing app. Google Meet integrates with G Suite versions of Google Calendar and Gmail and shows the entire list of participants and scheduled conferences. It shows a "join" button for users to attach to the meeting and provides choices to mute and switch off the video throughout themeeting.

(iii) Ciscowebex

Cisco Webex is an American company that develops and sells internet conferencing and videoconferencing applications. Its software package product include Webex conferences, Webex groups, coaching Center, Event Center, Support Center, Sales Center, MeetMeNow, PCNow, Webex AIM professional Business Edition, WebexWebOffice, and WebEx Connect.

(iv) Skype

Skype is a telecommunications application that focuses on providing video chat and voice calls between computers, tablets, mobile devices, the Xbox One console, and smart watches over the net. Skype conjointly provides instant electronic communicationservices.

(v) GoToMeeting

GoToMeeting is a web-hosted service created and marketed by LogMeIn. it's a web meeting, desktop sharing, and video conferencing software package package that allows the user to satisfy with alternative computer users, customers, shoppers or colleagues via the net in real time.

D. Quizzes

A. Quizalize

Quizalize is a classroom quiz-game web site like Kahoot!,Quizlet, and Quizizz. Produce quizzes with multiple- or two-choice question sets or single-word responses conferred as word scrambles. Students then access the quiz from the online employing a category code and see the complete quiz on their screen.

B. Kahoot

Kahoot is a game-based learning platform that produces it simple to form, share and play learning games or trivia quizzes in minutes. Unleash the fun in classrooms, offices and livingrooms

C. Mentimeter

Mentimeter is an easy-to-use presentation software package used by quite twenty five million individuals. With Mentimeter you'll be able to produce fun and interactive shows. We have a tendency to assist you build your events, shows, lectures, and workshops innovative and unforgettable.

D. Nearpod

Nearpod is a student engagement platform that may be used to wonderful impact within the classroom. The

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idea is easy. A teacher will produce presentations that may contain Quiz's, Polls, Videos, Images, Drawing-Boards, online page then on. They'll conjointly access over 7K k-12 standards- aligned lessons.

E. VocabularyLearning

(i) SnappyWords

This web site is a visual dictionary and wordbook for college students. It provides words and phrases that are connected to the word that's selected in a mind map format and also the definition for every of the terms are available once you hover over the bubbles. The connections between the words are color coated so as to demonstrate for college students however the words are connected.

(ii) WordReference

WordReference is a web translation wordbook for, among others, the language pairs English-French, English- Italian, English-Spanish, French-Spanish, Spanish- Portuguese and English-Portuguese. WordReference conjointly has Oxford unabridged and concise dictionaries accessible for asubscription.

(iii) Graphwords

It's a free English visual dictionary and wordbook that helps you discover the meanings of words and show connections among associated words. You'll be able to simply see the means of every by simply inserting the mouse pointer overit.

F. DigitalNotes

(i) OneNote

Microsoft OneNote is a note-taking program for free-form operation and multi-user collaboration. It gathers users' notes, drawings, screen clippings, and audio commentaries. Notes are often shared with alternative OneNote users over the net or a network.

(ii) EverNote

Evernote is an app designed for note taking, organizing, task management, and archiving. It's developed by the Evernote Corporation, headquartered in Redwood town, California. The app permits users to form notes, which may be text, drawings, images, or saved onlinepage.

(iii) GoogleKeep

Google Keep is a note-taking service developed by Google. Launched on March twenty, 2013, Google Keep is out there on the online, and has mobile apps for the android and iOS mobile in operation systems. Keep offers a spread of tools for taking notes, as well as text, lists, images, and audio.

G. MindMaps

(i) Mindomo

Mindomo could be a versatile premium collaborative mind mapping, idea mapping and outlining tool developed by skilled software package Applications. Mindomo's registered users will produce and collaborate period on mind maps, whereas unregistered users will read the maps shared with themPopplet

Popplet is a super straightforward internet, iPhone and iPad app that enables you to form collaborative mind maps along with your students. As well as the power to feature media from YouTube, Flickr and Vimeo, moreover because the choice to transfer your own pictures, students will produce made and reflective maps of their thoughts, concepts and work.

(ii) Ayoa

Ayoa (the new, combined product of DropTask and iMindMap) is the world's initial all in one Mind Mapping, Chat and Task Management application, permitting people and groups from round the world to realize quite ever before. In Ayoa you'll be able to produce, introduce and action concepts within the best approach doable.

(iii) Coggle

Coggle is a web tool for making and sharing mindmaps and flow charts. It works on-line in your browser: there is nothing to transfer or install. Changes you create can show up instantly in their browser, where they're within theworld.

H. Productivity tools

(i) GoogleDocs

Google Docs is a free Web-based application within which documents and spreadsheets is created, altered and keep on-line. Files are accessed from any computer with an online connection and a full-featured application program. Google Docs is a part of a comprehensive package of on-line applications offered by and related to Google. Users of Google Docs will import, create, edit and update documents and spreadsheets in varied fonts and file formats, combining text with formulas, lists, tables andpictures.

(ii) Edpuzzle

Edpuzzle is a web-based interactive video and formative assessment tool that lets user's crop existing on-line videos and add content to focus on specific learning objectives. It is a teaching tool used to place interactive

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content into pre- existing videos from a range of sources, like ted or YouTube, or into videos you have got created. It's a free assessment- centered tool that permits academics and students to form interactive on-line videos by embedding either open-ended or multiple-choice queries, audio notes, audio tracks, or comments on a video. Edpuzzle interactive videos are created with videos from variety of internet sites, as well as YouTube, TED, Vimeo, and NationalGeographic.

(iii) Educreations

Educreations is a unique interactive whiteboard and screen casting tool that is easy, powerful, and fun to use. Annotate, animate, and narrate nearly any kind of content as you justify any idea. Teachers will produce short tutorial videos and share them instantly with students, or raise students to point out what they grasp and facilitate friends learn one thingnew.

I. PresentationTools

(i) Prezi

Prezi is a presentation tool that may be used as an alternate to ancient slide creating programs like PowerPoint. Rather than slides, Prezi makes use of 1 massive canvas that permits you to pan and zoom to numerous elements of the canvas and emphasize the ideas bestowed there.

(ii) Clearslide

ClearSlide permits the foremost participating and interactive presentation experience high-powered by prime quality video conferencing, audio conferencing, screen share, high-definition video, and multimedia system shows.

(iii) Wideo

Wideo is a web video creation platform that permits users to form, edit, and share on-line videos. Wideo's platform permits people who don't have previous video creating or style expertise to form explainer videos, animated shows, video e-cards andadditional.

(iv) slidebean

Slidebean is a cloud-based platform that lets users produce stunning shows with one click. Our technology ensures that each single slide appearance as gorgeous because the next.

Tools and the URLs

Sl No	Tools	URL
1	Testmoz	https://testmoz.com/
2	Bookwidgets	https://www.bookwidgets.com/
3	Wizer.me	https://www.wizer.me/
4	Formative	https://goformative.com/
5	Classroom	https://classroom.google.com/
6	Endomo	https://www.edmodo.com/
7	Canvas	https://www.instructure.com/canvas/en-au
8	Aisiz	https://www.wiziq.com/
9	Classflow	https://classflow.com/
10	Moodle	https://moodle.org/
11	Zoom	https://zoom.us/
12	Meet	https://meet.google.com/
13	Webex	https://www.webex.com/
14	Skype	https://www.skype.com/en/
15	Gomeeting	https://www.gotomeeting.com/en-in
16	Quazalize	https://www.quizalize.com/
17	Kahoot	https://kahoot.com/
18	Mentimeter	https://www.mentimeter.com/
19	Wordreference	https://www.wordreference.com/
20	Graphwords	https://graphwords.com/
21	Evernote	https://evernote.com/
22	Keep	https://keep.google.com/
23	Mindomo	https://www.mindomo.com/

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24	Popplet	https://app.popplet.com/
25	Ayao	https://www.ayoa.com/
26	Coggle	https://coggle.it/
27	Edpuzzle	https://edpuzzle.com/
28	Educreations	https://www.educreations.com/
29	Prezi	https://prezi.com/
30	Clearslide	https://www.clearslide.com/
31	Wideo	https://wideo.co/
32	Slidebean	https://slidebean.com/

IV.CONCLUSION

The use of ICT has rendered a major contribution in transferrable concerning enhancements within the system of education in various ways that. The members of institutions establishments don't seem to be solely ready to enhance their data and understanding in terms of variety of aspects, however they are also ready to do the tasks and activities in an operative in, promoting integrative learning and remodeling program and course content. When getting an efficient understanding in terms of those aspects, one is ready to grasp that ICT has been rendering an important contribution in augmenting the general system of education. During this manner, they're even ready to send their reports and documents to their professors and fellow students. Finally, it may be explicit that use of ICT is integral in facilitating education and learning amongstudents.

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