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IDENTIFICATION OF DISEASES BY APPLICATION OF IoT:

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ABSTRACT:
Diagnosis of diseases is a challenging issue today throughout the globe. Individuals aged 20 years and over are considered to be affected by this disease now a days. Participants are identified as having diabetes if they had a HbA1c level greater than 6.5 %. People, with diabetes who say they do not take care, are deemed to be untreated for the purposes of this research. In this research, we used IoT to assess risk factors which were correlated with untreated diabetes. The aim of using Machine learning (ML) is to diagnose, cure, and prevent different diseases. While a number of ML models have been created, they are not relevant to real-world scenarios yet. There has been a significant disconnect between ML architects, health care researchers, physicians, and patients in their technologies. Our aim is to perform an in-depth analysis on ML to recognize the potential and shortcomings of the technology. Recent advances in the development of insulin delivery devices, diabetes retinopathy diagnostic methods, and other medical studies have significantly helped people diagnosed with diabetes. Compared with these, the usage of statistical methods for treatment of different diseases is only helpful at an early level. The Food and Drug Administration (FDA) employs several highly creative ideas to get their drugs to the consumer. Artificial Neural Network offers a fantastic chance to handle diabetes with improved strategies and technology.
Keywords: IoT, Machine Learning, GPS, Human to Machine Interaction

1. INTRODUCTION

IoT is shaping the way we live our lives, Today IoT is being used extensively to lessen the burden on humans. It is a vision to connect all device with the power of internet always learning and always growing. It is a non-standard computing device connected wirelessly to network and has ability to transmit data. We use it in several sectors like health sector, farming home automation, industry etc. Example in healthcare industry it helps to detect the equipment and also patient asset such as wheelchairs, available of ventilators etc. any equipment with IoT sensor then it can track easily. Mainly two types of IoT devices are planted inside the physical objects they are either switch (that sends command to things) or a sensor (that collect and send data elsewhere). It transmits and receive data over wireless network with limited human intervention, real time data collect and analysis, no need of Human to Human (H2H) [1] and Human to Machine (H2M)[1] interaction.
IoT collect data using gateway or other edge devices. IoT connected devices communicate via network on cloud-based platforms [2] connected to the Internet of Things. In a forecast nearly 10 billion IoT devices are used till 2020 that increase up to 30 billion by 2030.

2. LITERATURE REVIEW

IoT consist of resources constrained smart devices capable to sense and process data. It connects huge number of smart sensing devices. IoT technology categorized into three group namely Identification Technology, Communication Technology, Location Technology in [1]. Identification technology identify the nodes that present in healthcare network, the devices communicate in limited are network and establish wide communication using Zigbee, wi-fi, RFID among different entity and track location

using Global Positioning System (GPS) in [2,9] Some sensor either embedded or wearable on human body are used to collect physiological information such as temperature, pressure rate and so on from patient body. It helps healthcare professions and patients deals with various health issues at a reduce cost. Health monitoring of patient with chronic disease such as cardiovascular disease using wearable ECG. For analysis discretewavelet transform (DWT) are used [3,10]to store and retrieve data built an analog based framework to categorized general purpose data to medical domain [4]Data storage and accelerate plays an important role in the IoT system as a large amount of data are acquired from variety of sources. if due to any cause the data hub is slow at that time a FOG computing work which acts like a cache memory [5]hold temporally used and needed data. Data processed and cache in that many consumers can retrieve data easily. To access that data from cloud IoT device have to authenticate, it authenticate by edge service [6,11] provide light weight authentication scheme. It also improving the communication and computation speed of the devices and load balancing achieved and also extend cloud computing. For storage purpose collected data by devices are send to edge server, Edge server are connected with SDN (Software Define Network) controller which performs load balancing, network optimization and efficient resource utilized. SDN helps to simplify the control and management of next generation data. At the time of processing data there is chance of data lose for that Backchain based system provide powerful security in [7,14]Secure storage by using backchain it securely stored not only human data but also the vital inter and intra control signaling and other crucial information including task-respective information and decisionmaking result should also be secured to ensure to the security of entire system.any wearable device are used in human body basicallyin that there are two types of protocol used one is CoAP which establish connection between many to many models. And another is MQTT [8,13]it is a technology that based on an asynchronous messaging protocol, which decouple the message sender and receiver in both space and time.
When it used in a personal health device it sends alert message to the caretaker. By which immediate action can take if any abnormal behavior detected by device.

3. ARCHITECTURE

Internet of Things is wide variety of applications and use IoT increase rapidly growing. Due to different types of application used for different devices so there is no fixed standard define architecture [3,12]. Architecture are designed based on functionality and implementation of required sector. Here with fig.1 we will discuss about some basic architecture i.e. 4 stage architectures in below image 4 layer clearly present and divided as follows.

1. Application layer
2. Data processing layer
3. Network layer
4. Sensing layer

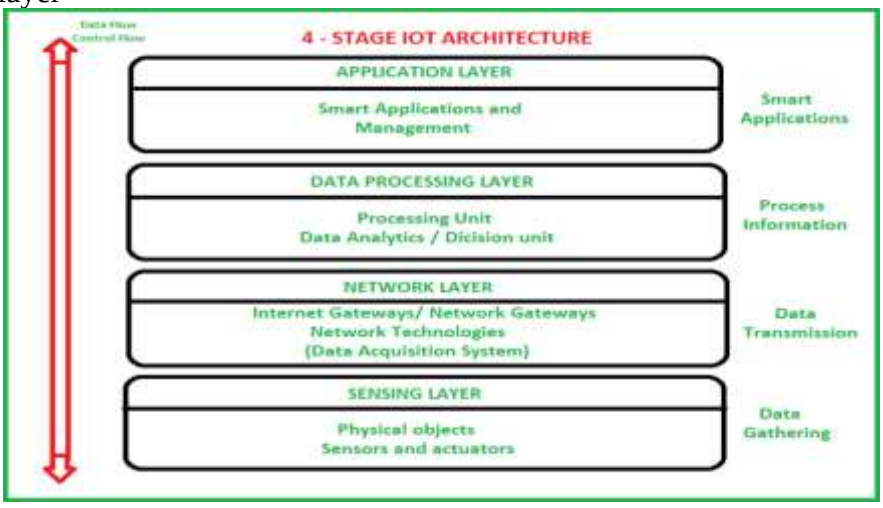

Fig.1 IoT architecture

a. Sensing layer: It collect data and process them and emit data over Network.
b. Network layer: Here DAS (Data Acquisition System) are present which work is collecting data and aggregating data then converting analog data of sensor to digital data. It is basically connection between sensor network and internet perform many basic gateways function like malware protection and filtering some time decision making and data management service.
c. Data processing layer: In data processing layer data are analyze and preprocess before sending to the data center / cloud where data are access by software application for data monitoring and manage and further use.
d. Application layer: It is the 4th stage of IoT architecture where storage data in data center or cloud are used by end user application like agriculture, health care, defense, industry, etc.

3.1. Common IoT Devices for Health Care Application:

Healthcare sector represent one of the fastest growing sector of the IoT market. In-fact the value of this sector which is sometime called the Internet of Medical Things (IoMT). To understand how IoT devices are work and monitor in healthcare industry, there are multiple way IoT devices are worked in healthcare example remote patient monitoring i.e Smart device like sensors in IoT collect data from patient like body temperature, heartbeat, sugar level etc.

Healthcare Monitoring Devices:

There are several types of sensor implant devices in which IoT collects actual data which helps in to monitor patient health status and treatment . In bellow we will discuss some IoT sensor devices.
i. Mood Supervision: In last few decades there is more emphasis given to mental health. Mood tracking device are used to track the mood or emotion of individual person. The device supervise that the mood is good or in stress and give possible suggestion for take good decision.
ii. Smart watch monitoring: Now days, It is commonly used device by peoples. In smart watch there are several applications are stored by which it can monitor pulse rate, showing heartbeat, echocardiogram and many more reminder given. All these things are shown in connected phones in form of graphs and tables.
iii. Robotic surgery: These devices must be small enough to perform surgery with minimal disruption. Less blood lose, shorter hospital stay and quicker hospital recovery. There are several robotic surgeries like Prostate Surgery, robotic kidney surgery, robotic colorectal surgery, single site robotic gallbladder surgery and many more.
iv. Ingestible Sensor: The main work of this device is to collect data from human body for example it collects information from digestive and other systems in a much less invasive way. It provides picture of stomach that (we called laparoscopy), measure PH level of stomach and also help to find the internal bleed point.

Similarly many healthcare devices are remote patient monitoring, Hand hygiene monitoring, Parkinson's disease monitoring, connected inhalers, connected control lasers and many more which helps IoT health care system.

3.2 IoT Applications in Medical Sector

IoT architecture may over comes bottleneck based on the foundation of data oriented approach. IoT devices with high efficiency and reliability operate for data exchange. There are several middleware are present for exchanging and secure data but some data are accepted and rejected at time of accessing from data hub. Some technology such as Representative State Transfer [REST], Application Programming Interface [API], Message Queuing Telemetry Transport service [MQTT], Constrained Application Protocols [CoAP], Data Distribution Services [DDS] For Real Time system, Advanced Message Queuing Protocol [AMQP], Extensible Message and Presence Protocols

[XMPPs], The Java Message Service [JMS], Simple Object Access Protocols [SOAPs] are popular and easy deployable.

3.3 Performance Evaluation

Data collect and stored in data hub, a IoT device used by a human, that collect the data and send to hub using edge computing which collect and analyze data by the help of SDN and store in cloud. in between data collect and send to cloud there is a chance of data miss or data lose so for security purpose backchain protocol are work. It authenticates data and help to store appropriate data. After analyze and decision taken by SDN device have to retrieve data from cloud to perform, if there any issue in cloud for server down are connection lose a fog computing is used. Which store the cached data for that device don't wait for server reply and perform work. Inside device two major IoT plant one is switch which command and another is sensor which perform task. In sensor section 2 type of protocol used one is MQTT that send and receive message and alert the user and another is CoAP which work is communication established between nodes.

3.4 Cloud service and it's various benefits in healthcare

By integrating cloud computing in health care service can significantly improve and can lead to numerous opportunities for medical field. Many medical services can be enhanced through integration of cloud of IoT for example collection of patient data through sensor transferring sensed data to cloud for processing and storing. Analyzing the stored data at cloud and perform action.

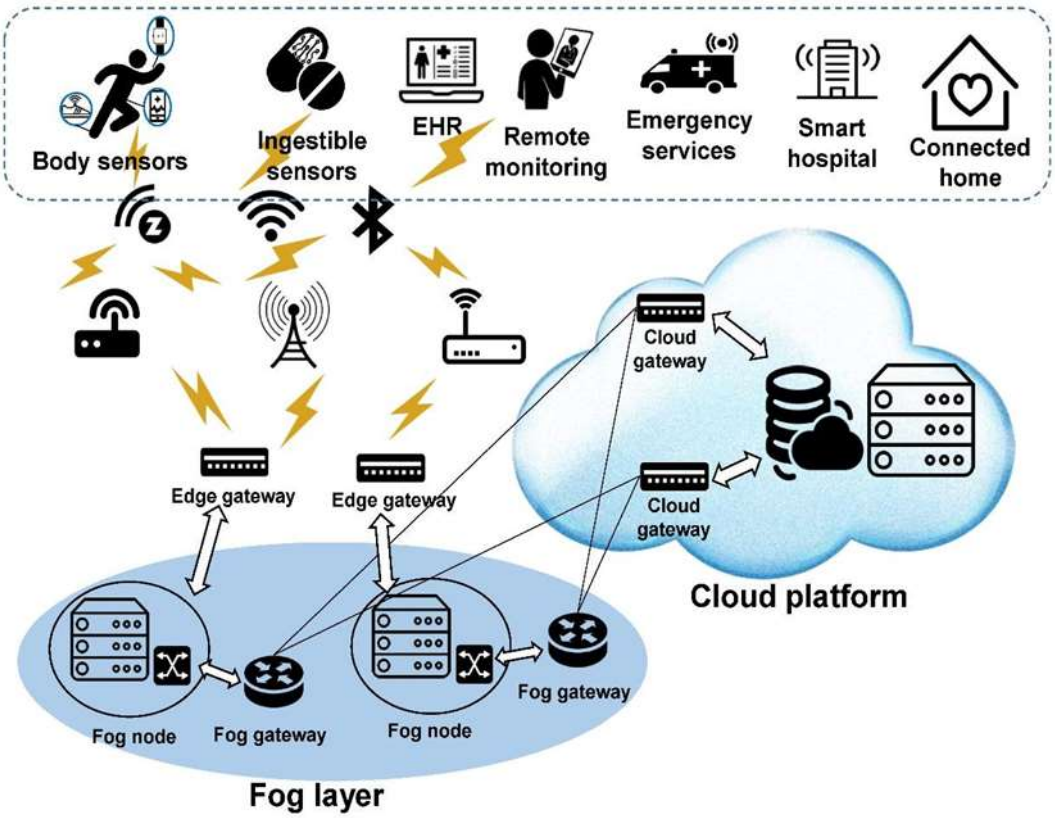

Figure – 2 Cloud Service in Health Care

Computation capabilities- Due to limited processing capabilities IoT device does not processing sensed data at device site. So it transferred data to cloud for processing and analysis. The cloud provide infrastructure as per requirements or demand. If connection between devices are unreliable MQTT in IoT uses QoS (Quality of Service) level to ensure guarantee delivery of message to receiver. Storage capabilities- Every time large amount of unstructured data are continuously produce IoT device can't store the big data due to limited storage capacity. It takes advantages of cloud. Edge computing and storage is the best example in current interest. Edge computing is the simple enough to store and

process close to where they are produced and needed data. Implementing this system requires that processing capacity be put in place close to the edge, but also storage infrastructure.
Communication- Communication among these devices required hard ware that may be very expansive. Cloud can provide a costs effective solution to manage and connect these IoT devices from anywhere and anytime using various application programs. In healthcare basically Zigbee is used for collecting and transferring various monitoring information about patient. Rather than Bluetooth and RFID, Zigbee device can transmit data over long distance by passing data through a mess network of intermediate device to reach more distance one.
Scope- Day by Day functionality in the IoT device are added in healthcare application that increases new type of information, opportunities and risk. So cloud is very cost effective and most appropriate solution to handle the big data generated by IoT that further creates the opportunity for data integration, share and analysis. Therefore there are many motivating factor encourage the integration of IoT and cloud computing in health application.

4. ANALYSIS

The proposed model uses the implant devices inside various of human body to collect the time series data of different parameters for the diseases inside the human body. The collected data will be stored in cloud to be used for analysis by different machine learning techniques to predict the diseases in advance so that optimum care of human body can be taken. The parameter selection will be done as per the requirement in different machine learning models so that the prediction of diseases can be done with more accuracy and less error.
The prediction in different models like Naïve Bayes, Fuzzy Inference System and Support Vector Machine are compared on the basis of the different error parameters and it is found that Support Vector Machine performs the best. So, Support Vector Machine is used to predict the most of the diseases in human body with better accuracy.

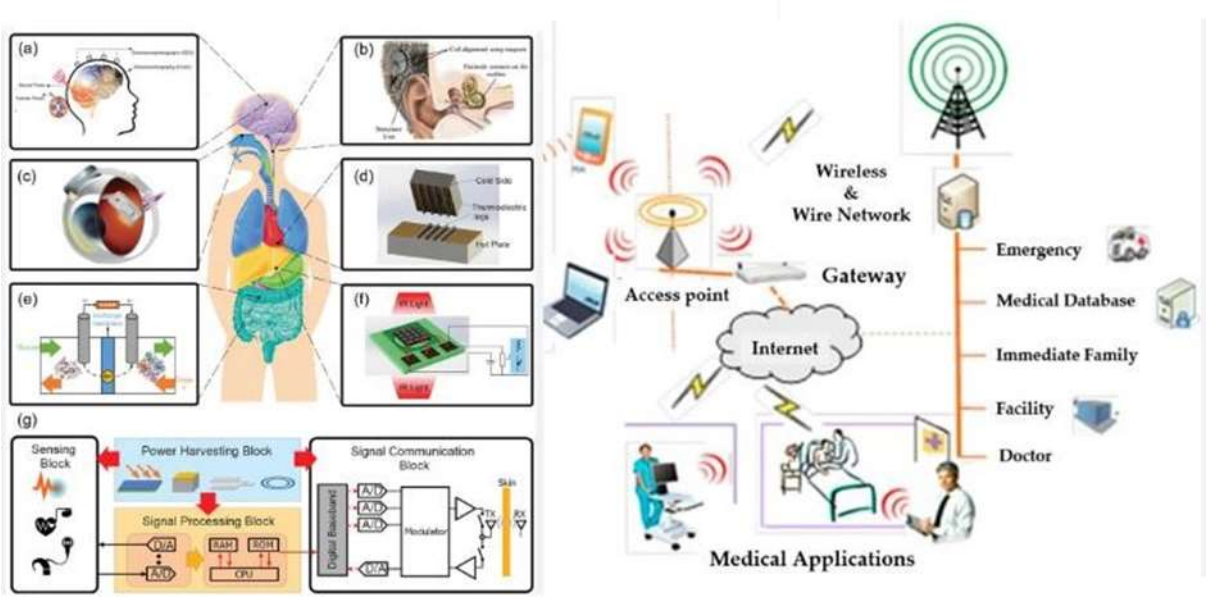

Figure – 3 Proposed Model for IoT in Health Care

5. CONCLUSION

To make the appropriate diagnosis of diseases, the proposed model will help us in predicting with little prediction error and better accuracy. The new model uses the usefulness of the artificial neural network models which may learn in better way to diagnose and help for treatment.

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