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IOT and ML in Healthcare

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Abstract: Health is basic need of time. Various health models are designed to improve health services in a region. They are used to suggest various methods and medical policies in relation to the complex health problems. Internet of Things is a rapidly growing technology which if implemented properly can help in improving and taking the health system of the country a step ahead. In this paper author focused on advanced health technologies in improvement of health sector.
Keywords: IOT, Health Care, ML

I. INTRODUCTION

In today's world IOT (Internet Of Things) is the future proof technology which is extremely capable to provide the required solution in real time for everyday life, healthcare, smart city, agriculture, automation industry, disaster management etc. IOT is taking the sensors, computing and communication to next advance level collectively. Due to explosion of demand for services, IOT platform provide customizable health services [4]. IOT platform can be very well used for healthcare as self-management model for chronic diseases [1].Cost-effective interactions between patients, hospitals and healthcare organisations are important task achieved by IOT platform with security kept in mind [2]. Machine Learning (ML) for healthcare can play important role and bring improvements beyond our imagination. As we know ML is the study of tools and methods for identifying patterns in data, these patterns can be used for healthcare services and providing solutions before it's too late to control the disease or illness. According to specific need or desired requirements data can be categorised and separated with different scale levels for better results [3].

II. IOT AND ML IN HEALTHCARE

With the help of IOT at user end various devices; sensors are connected to the cloud where information is stored, hospital is also connected with it. In the time of emergency, hospital will get to know about the emergency and it will send the ambulance to bring the user/patient to hospital. And in the meantime this system will prepare Operation Theater, or other required services, like arrange or bring medicines etc. it also will get the current status of the user continuously monitored with the device user have. Hospital will also have the complete history of the patient, for managing things better. This brings a lot of transparency and reduces human effort as well. But without IOT one needs to call hospital, arrange for ambulance, lot of tests have to conduct to know about present condition, time has to be given to understand the history of patient before the treatment really starts. So IOT basically interact, contribute and collaborate between various things [5].

With high availability of data there is need of selecting right data quickly and analyze it to provide constructive result, this creates the demand for ML(Machine Learning), AI (Artificial Intelligence) like technology. In case of MRI which is difficult to analyze by human eye but with the help of ML the accuracy to analyze it increases tremendously.

At present the use of mobile health services are more popular, but with the increase in use of wearable computing devices the next level can be achieved with the IOT platform [4]. This means that even user can manage his/her own disease or illness by themselves as they access to healthcare services which are provided by IOT. In healthcare we need to process and interpret large amount of complex data, for this we can use ML as solution with which the size and complexity of data can be handled. With conventional methods the main problems faced by healthcare industry are:

1) No real time data
2) Lack of smart devices
3) Inaccurate standard analysis

A. But with the Help of IOT we Get

1) Real time data
2) Evolution of smarter devices
3) Superior analytic power

Earlier humans used to provide data to machines and after that output of that machine is then taken by human and fed to other machine and this process goes on until the result or desired output is achieved. But with the help of IOT smart interaction and analysis is performed between various machines to deliver the desired output or result, so we can say that IOT reduces human intervention in machine cycle during the process. IOT brings different fields (like sensors, communication, networking etc.) together and yields the optimum output [6]. IOT is different from World Wide Web (www) as web is a way to access information and share it, which is available on internet (which means information which is already present or exist is accessed). But in case of IOT when devices interact or communicate with other devices, when they are connected with internet, they may generate information data or use already existing data. Now with the machine learning it gets really easy to differentiate, interpret and process the data and information from large pool of unorganised complex date and bring out the relative information which is useful. In the past, a large fraction of clinical data were ignored (or not collected at all). This limitation was due to both the size and complexity of the data and the absence of techniques for collecting and storing such data. These data are frequently underused and undervalued; however, new and improved methods for data collection and storage (e.g., electronic health records) provide opportunities to tackle the issue of analysis. In particular, machine learning (ML) has begun to infiltrate the clinical literature broadly [3]. By building pattern we can then use them for building our understanding or to make prediction about the future. Machine learning is kind of like formulating optimization problem. Supervised learning with categorized information yields best result when large amount of training data is available (i.e., when there are many examples to learn from). Here, one aims to learn a model that will generalize beyond the data one has already seen. The goal is generalization not memorization.

So we can clearly say that the Internet Of Things (IOT) and the Machine Learning (ML) are steadily building the healthcare services stronger and easy for the end user with the characteristics (like early diagnose, predicting best suitable remedy, quick and automated approach between various sensors, actuators, communication system, various machines etc.) that are boon for fighting against various different illness and diseases. It means that end user can manage their own disease by themselves as access to healthcare by using next generation medical system backed by the IOT and ML.

III. ADVANTAGES OF IOT AND ML IN HEALTHCARE

Highly time saving, when devices, software, firms, organizations etc works in collaboration with each other then the important time is saved which earlier gets wasted in managing these things individually. Also the utilization of resources is much more efficient in this manner. Which in result minimize human efforts, as devices, organizations, application or software etc smartly interact and coordinate with each other. Improve security with the help of face recognition technique, various sensors and devices which forms layered shield. Now only the user can operate the devices, but in past during emergency, due to errors wrong medicine or treatment was given to different patients, that has vanished. Personalized experience through ML and AI, the nature and liking of every individual is different from each other, and everyone likes personal touch which became possible with the help of these technologies. Predicting future diseases and preparing for its prevention in time, becomes possible which is proving life saving, which is a big leap forward as every life is important and should be protected. Medical assistance provided to the user for solution of various different medical problems. For example ‘Sensely’ is a virtual nurse developed which uses speech recognition, natural language processing and wireless integration with medical devices such as blood pressure monitoring watch to provide assistance to patients. It helps in self care, clinical advice, scheduling on appointment.

ML can reduce case to case variation by intelligent decision making and even help efficiency of the best surgeons. For example Da Vinci a robot allows surgeons to perform a range of complex procedures with greater flexibility and control than conventional approach. It is equipped with highly advanced tools for surgery, it translates surgeon’s hand movement at console in real time and it provides HD magnified 3-D view of surgical area. So with the help of IOT and ML we can connect, analyze and integrate various different things, data and models.

IV. CHALLENGES FACED BY THESE TECHNOLOGIES

There is a story behind every milestone achieved, but there are various problems which are faced and solutions are find out or created by the people who achieve those milestones. Similar is the case with using these IOT and ML technology in healthcare.

Standardisation of various different formats, bringing different platform together is difficult task to attain maximum quality output, otherwise a lot of time will get wasted in changing formats and again compiling the information. Reliability is another cause of concern which means system should not stop suddenly due to any reason and it should provide good result even if it have to deal with the never before seen data and not just test data. Bidirectional interaction should be supported to confirm the status of other devices and find out any fault in the system.

Management of platform is important which include both devices and data, which is not an easy task. Security is another very important challenge faced as the personal security of the user, privacy, information and other details leakage is a really big cause of concern. Real time data analysis is very important and every millisecond count in healthcare like in operation theatre or in diagnosing a disease. Selection of contextual information i.e. data enhancement is compulsory to bring out quality relevant information from the pool of tangled data and information [7]. Bringing service providers on the platform is crucial to make things work smoothly which means tie ups and collaboration between various service providers, hospitals, organisations etc, which looks easy but is very difficult, as different entities have different problems or issues to resolve before joining in a system. Command and control are the basic and the biggest concern which leads to the failure or success of the system, suppose if a system is not listening or obeying the command of the user, then the whole idea of easiness and bringing IOT and ML into healthcare can be dangerous as it is not getting controlled by the user performing the undesired task.

V. FUTURE SCOPE

There is always scope to move further and bring out advancement, just like IOT makes smart devices even smarter, healthcare with IOT and ML also have to increase efficiency, accuracy and reliability. Like performing time in real time, there is always scope to reduce the gap or difference between machine real time and actual real time. Security is also a concern with rapidly increasing IOT and ML devices the personal security of the user, privacy, information and other details leakage is a really big cause of concern. Efficient use of energy is also very important to increase the battery backup, every small contribution counts, be it designing energy efficient algorithm for system to remain active for longer time, or to make processing units consuming lesser energy.

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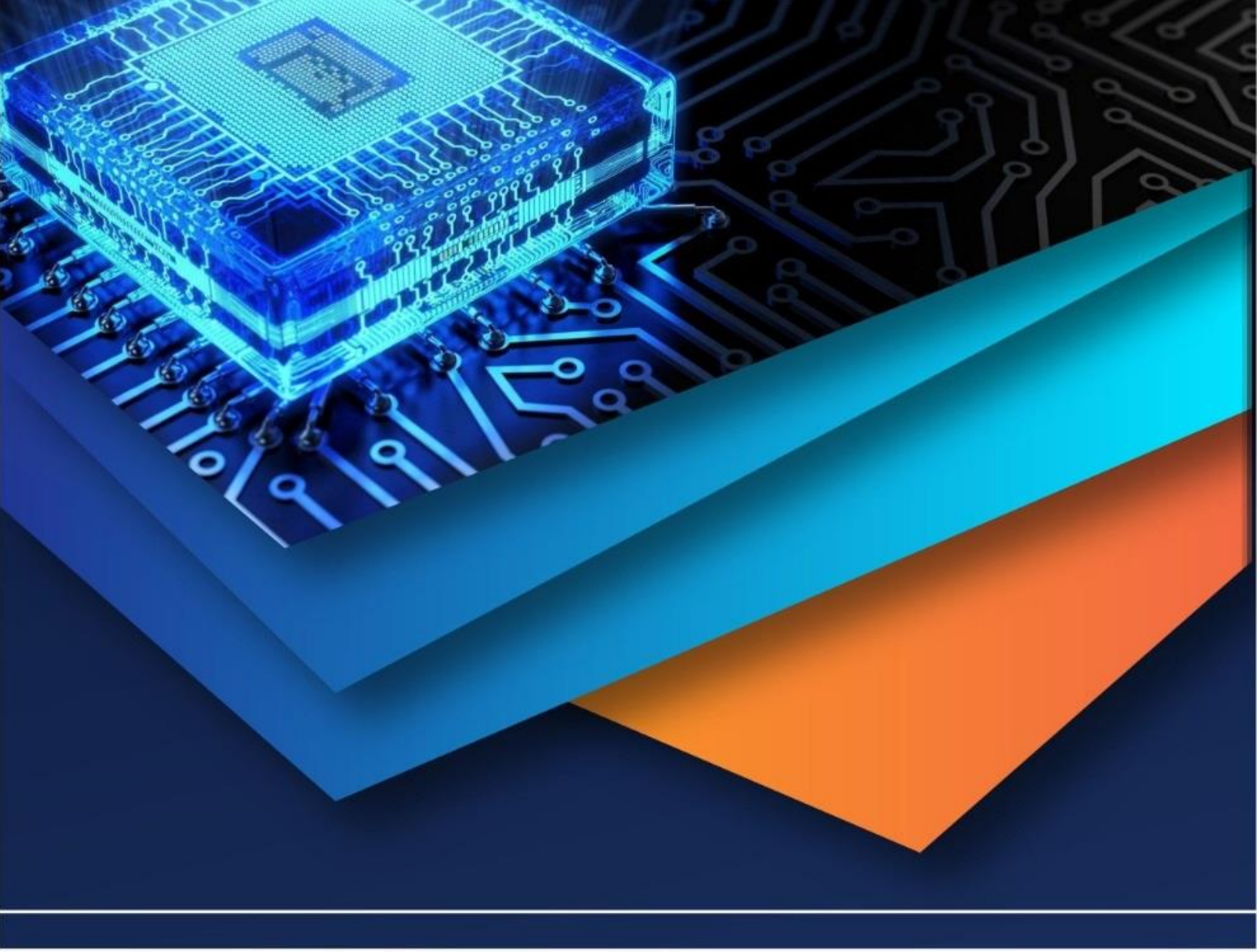

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