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Machine Learning Based - Data Analytics For Iot-Enabled Healthcare Systems

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Abstract- One of the cutting-edge technologies that is gaining traction throughout the world is the Internet of Things. We can connect at anytime, anywhere, and with any network or service because to the enormous power and capacity of IoT. The Internet of Things (IoT) is growing to be a powerhouse for next-generation machines, and its effects may be seen in the present corporate landscape. IoT is assisting businesses or researchers in the development of solutions. By integrating the current internet infrastructure for the efficient use of resources, they communicate with smart devices and smart objects. Additionally, it has the ability to expand services and advantages for intelligent systems. Beyond M2M (machine-to-machine) situations, the interests at stake include serial communication between the network and devices for delivering extreme services. An intelligent hybrid classification algorithm for an unbalanced ECG dataset based on the Internet of Things has been discussed in this study. The AD8232 heart rate sensor, the NodeMCU ESP8266, and an intelligent hybrid classification algorithm for data categorization have been presented for an IoT-based ECG monitoring system.

Keywords- CVD,ECG,BP,RFI,WSN.

I. INTRODUCTION

One of the biggest threats to civilisation in the globe is cardiovascular disease (CVD). The bulk of fatalities caused by CVD are reported annually on a global scale. The majority of CVD deaths are sudden, depriving the patients of any chance to receive timely medical attention. A real-time smart system that can continuously monitor the cardiac-related activities of heart patients is thus overwhelmingly necessary. Real-time data monitoring is possible with the help of Internet of Things (IoT) enabled technologies. One of the largest advancements in the smart healthcare concepts is the statistical analysis of real-time data, which could soon provide doctors with quicker, more accurate, and more intelligent methods of diagnosis.

This study looked at medical IoT advancements in terms of supporting technology, healthcare services, and implementations to deal with a range of healthcare issues. The Health Care IoT system's potential drawbacks and worries are also investigated. Future academics will thus have a reliable resource for learning about the technology's various applications if they are interested in researching and discovering new applications for health care IoT**[1]**. The purpose of this research is to examine several machine learning techniques for predictive analysis. It comprises a number of machine learning applications, but primarily emphasizes the function that machine learning plays in the health care industry **[2]**. The input dataset used in this study is made up of samples, each of which is an input data without a clear output value. Clustering is the technique most researched and frequently used in unsupervised learning challenges. In order to achieve semi-supervised classification, unlabeled data must be included to the supervised classification algorithm **[3]**. This article focuses on the deployment of various health care architectures that leverage real-time data obtained from numerous sources throughout the world **[4]**. This system uses a variety of classification algorithms to determine a user's risk for diabetes based on the user's input **[5]**. In this study, we first discussed how machine learning techniques will be made available for a wide range of applications. We then discussed the previous author's work in the healthcare industry and highlighted certain significant ailments using their effective feature extraction methods [6].

The project's goal is to make construction sites safer and more secure for workers, which will decrease the frequency of fatal accidents there. The created prototype performed with high accuracy under various testing situations [7]. This paper explains the safety idea that will evolve along with the development of manufacturing sites and proposes a new safety concept that, for the first time in history, realizes human and robot collaboration safety as well as a general description of its safety level [8]. The safety theorem, its constituent parts, and the typical implementation procedure were all covered in the paper [9]. The Internet of Things is heavily utilized in this article to track the safety of the construction workers. To improve the working environment for employees, the IoT has helped to widen the area of safety considerations[10].

1.Internet Of Thinks

The Internet of Things (IoT) is a network of interconnected computing devices, mechanical and digital machinery, items, animals, or people who can exchange data across a network without requiring human-to-human or human-to-computer interaction. An IoT ecosystem consists of web-

enabled smart devices that use embedded processors, sensors and communication hardware to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally.

2.Benefits of IOT

Monitor their overall business processes, improve the customer experience, save time and money, enhance employee productivity, integrate and adapt business models, make better business decisions.

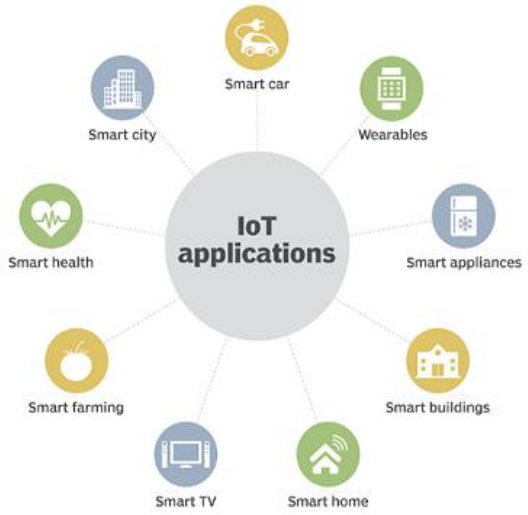

Fig.1 IOT Application.

3.IOT Security

The phrase "IoT security" refers to a broad range of tactics, instruments, systems, and procedures employed to safeguard the entire internet of things. IoT ecosystem availability, integrity, and confidentiality are all ensured by protecting the physical elements, software applications, data, and network connections.

4.Iot devices in arduino

When developing IoT projects, you must have some form of connectivity module or component that enables remote device monitoring and control.

5.NodeMCU

Making small IoT projects that don't need many components is possible with the NodeMCU board because it is so easy to use. Projects that primarily focus on one or two functions.

II. IOT SMART HEALTHCARE

Despite the Type surrounding the smart applications of eHealth and mHealth in IoT, big data is still a challenging issue. Sensors and various medical devices attached to the patients' bodies generate massive volumes of heterogeneous data, also called Big Data

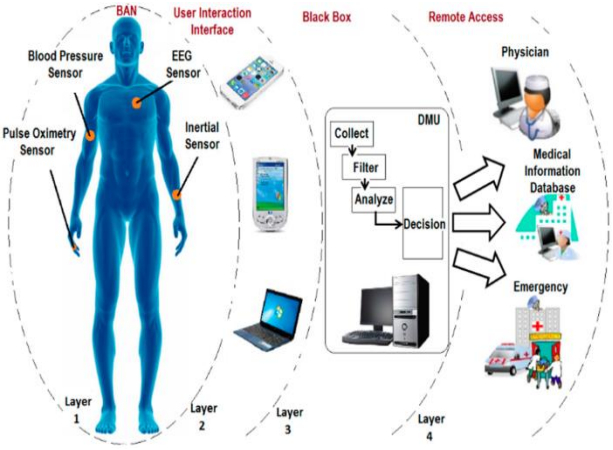

Fig.2 highly correlated and redundant patterns

This huge volume of data contains highly correlated and redundant patterns. It is imperative to mine these data for providing continuous, efficient, and seamless healthcare facilities around the clock.

1.Machine learning for IoT

Millions of gadgets connected to the Internet of Things produce enormous amounts of data. Data fuels IoT machine learning, which draws knowledge from it. Machine learning creates models that help anticipate future behavior and events by using past behavior to detect trends.

2.Big data analytics for IoT

IoT devices produce a large amount of unstructured data, which is then stored in a big data system. An enormous volume of data is saved in a shared, distributed database called a big data system.

3.Big data challenges in IoT smart healthcare

Big data remains a difficult problem despite the buzz surrounding the intelligent eHealth and mHealth applications in IoT. Massive amounts of heterogeneous data, often known as Big Data, are produced by sensors and other medical devices attached to patients' bodies.

4.ML-based recommendation system

Machine learning-based systems known as recommender systems are used to forecast a user's ratings or item preferences. Collaborative filtering, content-based systems, and hybrid systems are the three primary categories of recommender systems.

5.ML-based prediction system

Machine learning (ML) is increasingly used for the development of predictive models in health care, although implementation into clinical care has been limited.

6.ML-based secured analysis

In the field of security, machine learning constantly learns by dissecting data in order to spot patterns that help us recognize malware in encrypted traffic, identify insider threats, forecast where "bad neighborhoods" online are to keep users safe while browsing, or safeguard cloud data by spotting suspicious user behavior.

IV.CONCLUSION

In this project, we have provided a comprehensive big data analytics design for the Internet of Things health care industry. In order to identify areas for future research, we carefully reviewed the existing literature and chose the most pertinent and recent surveys. Also included was a thorough and up-to-date literature review on ML-based methods for big data analytics in IoT smart health. Cardiovascular disease (CVD) is one of the biggest risks to human civilization on a worldwide scale. Therefore, there is an urgent requirement for ongoing heart state analysis. Finding the right model for IoT-based smart healthcare concepts is a difficult but possibly productive next step. A few of the many applications for Internet of Things (IoT) in smart healthcare include monitoring electrocardiography (ECG), heart rate (HR), blood pressure (BP), etc. In order to create the data (using the heart rate sensor AD8232 and NodeMCU ESP32), this study offers an IoT based ECG monitoring system, and to classify the data, an intelligent hybrid classification model is proposed. In order to more accurately address the class imbalance issue, this research aims to provide a smart hybrid categorization model that will be crucial in developing a Machine Learning based answer to improving medical service.

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