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Review of Mobile Cloud Computing in Healthcare for Diabetics Patients Using Machine Learning Techniques

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Abstract: ***The number of chronic diseases such as diabetes, cancer, heart disease, and others is fast increasing in our daily lives. The disadvantages of the traditional healthcare system are becoming more prevalent. One of the most important is that healthcare is only offered in hospitals. No one has access to it and no one is monitoring it. Patients' information is securely acquired from the hospital, with their consent, and monitored on a regular basis using their smart phones in mobile cloud computing. On a daily basis, a real-time mobile cloud health monitoring system is used. The patient's specifics concerning various metrics for data collection, such as blood glucose level, high/low blood pressure, high cholesterol, oxygen level, and so on, are being monitored. Diabetic patients are tracked via mobile cloud-IoT and certain wearable health tracking devices and sensors. Doctors will review the individuals' medical records and make recommendations for improving their health. In the future, it will aid in the control or recovery of diabetics. To provide improved security and performance, the proposed system can leverage advanced encryption techniques in conjunction with a machine learning classifier.***

Keyword: Predictive analytics; Prediction models; Machine learning; Classifications, Healthcare, Diabetes, Blood Glucose and privacy module.

I. INTRODUCTION

In our daily lives, health is really important. Patients and physicians benefit from improved medical services thanks to the Internet of Things. The nature of a networked patient monitoring system, which entails identifying and assessing the patient's status, is the primary basis behind this forecast. It keeps track of the patient's medical history and assists the doctor in diagnosing the patient's condition. Diabetic is a severe condition that can afflict individuals and necessitates a great deal of care in order to keep them healthy. This disease has become one of the leading causes of death worldwide, and the majority of people are still unaware of the importance of diabetic health. Diabetes is produced by an increase or drop in the blood glucose level, which must be maintained at a particular interval - a condition in which the glucose level exceeds a normal level. To avoid a worsening, certain individuals with anomalies require extensive care and surveillance. The usage of continuous glucose monitoring devices (CGM), which are becoming the new way of continuous monitoring, has expanded as the number of diabetic patients has increased. They deliver real-time glucose level information that is updated every five minutes. As a result, patients and doctors must treat around 9000 readings and analyse massive amounts of data in order to alter insulin doses and keep blood glucose levels as close to normal as feasible.

Hypoglycemia is defined as a glucose concentration of less than 70 mg/dl, whereas hyperglycemia is defined as a glucose concentration of more than 180 mg/dl. As a result, diabetes individuals must be checked on a regular basis. However, due to the patient's hectic schedule, certain tasks, such as check-ups and consultations, can be difficult to complete. A mobile blood glycaemic gadget is necessary for consultation purposes in order to convey the glucose value to medical specialists. To put it another way, the problem can only be solved by using a Tele-monitoring application. SMS services over the widely available GSM network are one of the communication media for telemonitoring applications.

One of the challenges that a health-care data analytics system can help with is focusing on the expense of patients for personalised treatment. Various big data talents load up and explore more than health care together through good organisation cost investments in superior healthcare are explained. [5]. Using diverse data mining techniques, several researchers have designed and implemented numerous analysis and prediction models. The authors of [6] proposed a Hadoop and MapReduce-based strategy for diabetes data processing. The authors of[6] employ a classification algorithm to extract patterns from diabetic data sets. Using the Weka tool, they used naive Bayes and Decision Tree algorithms. For the classification, rules development, pattern recognition, and other aspects of diabetic data analysis, many authors used the decision tree. From diabetic data, we used Nave Bayes, Random Tree, ZeroR, and J48 classification algorithms in this study.

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II. DIABETES DETECTION WITH AI TECHNIQUES

AI approaches are suggested here as a profound manner of comprehending and interpreting data. This paper[4] gives a detailed look at the strategies that have been employed to improve diabetes early diagnosis. The use of Artificial Intelligence in conjunction with cutting-edge technology such as medical devices, sensory technologies, and mobile computing can help in design and implementation of chronic disease management services. Diabetes mellitus, which is defined by a lack of glucose stability, is one of the most prevalent chronic disorders.

A. Artificial Neural Network (ANN)

Because it has neurons that are similar to brain functions, the ANN replicates/resembles the human mind. This may be able to give reliable findings depending on the dataset's experiences. The system's accuracy will be high depending on the number of layers. When paired with the back propagation method, the methodology [10] can be used to detect feature extraction. This will also use fuzzy logic to address the modelled system's uncertainty. To understand the system, the ANN requires a vast dataset.

B. Principal Component Analysis

Principal Component Analysis is a mathematical process for condensing a huge dataset of variables into a smaller collection of variables that still contains the majority of the information. This strategy will be really beneficial in terms of minimising attribute space. In the paper[5,] the data compression method is a non-dependent procedure. The principal component can be calculated using the eigen values and vectors, which aids feature extraction. By lowering the dimension, the dataset's randomness is preserved. However, this technique does not work well for diabetic detection because it takes longer to produce Eigen values and vectors.

C. Decision Tress

This method of decision analysis can be used to depict decisions and the decision-making process explicitly. It analyses the data by employing tree-like structures to drill down to the greatest depth possible. Based on the criteria, the tree is explored from root to leaf. This gini index represents a node's split, which helps to separate better nodes. This technique aids in diabetes diagnosis. Because the problem can be solved through deep analysis, decision trees produce the best prediction model, and Random Forest classifiers work well with large datasets and missing values. These trees, however, will become unstable if the input values alter slightly.

D. Support Vector Machines (SVM)

SVM supports supervised learning and so produces pre-defined results. The data is subcategorized into multiple groups using this technique. The classification and mining of data can be applied to a specific set of data. SVM separates the data into specific segments and eliminates outliers or overfits from the sample data. However, because this method takes a long time to perform, it is not ideal for huge datasets.

E. Navies Bayesian Classifier

The Bayesian classifier works based on supervised learning technique. It presumes that one parameter is unique from another feature. This technique is entirely based on the likelihood of an actions that takes place provided that any of the actions takes placed already[1]. The main advantage of this technique is the noise reduction because of advantage of this technique is the noise reduction because of the average value and also, we can get the accurate results

III. MOBILE CLOUD COMPUTING

The advancements in cloud computing have resulted in the launch of a number of cloud-based health-care services. However, there hasn't been much work done to use Cloud computing to provide ubiquitous healthcare information management services on mobile devices. This study focuses on the use of Mobile Cloud Computing in Care Pathways, a set of tools enabling medical institutions to manage the quality of care they give to patients. In the 1980s, paper-based or form-based versions of care pathways were introduced. Hospitals can now employ the electronic version, which provides more flexibility and interaction with other hospital systems, as well as decreasing medical errors. In this direction, mobile cloud computing has a lot of potential for facilitating care paths. Mobility can be used to facilitate communication between users at different stages of the Care pathway, as well as provide easy and secure access to medical information and data. Furthermore, cloud computing enables for the offloading of workloads.

Mobile devices are now part of the cloud domain, increasing the use of cloud apps and services. Users can easily connect to the cloud because mobile providers offer internal services over mobile networks. More and more applications, including as email, e-health, and social networking apps, are being installed on mobile as a result of cloud availability.

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Because the network is available 24 hours a day, 7 days a week, mobile applications can run on an independent platform. Any service can be easily monitored, controlled, or regulated across the network. In the event that medical facilities and health monitoring applications are required. It is the most crucial tool, i.e. Mobile cloud computing, medical facilities such as hospitals network, ambulance facility patient monitoring becomes easy for doctors. In case optical scenario easy and fast service is important. Lack of investment in networks, fragmented digital market makes e-health clouds unavailable. Availability of digital signal database, platform independent applications for e-health monitoring and control and integration of medical facilities

Rich software devices are supposed to be able to run on a variety of mobile devices thanks to Mobile Cloud Computing. Data processing and storage take place outside of mobile devices under this technology. The following are some of the benefits: Battery life has been extended. Data storage capacity and computing power have both improved. Due to the platform theme of "store in one place, accessible from everywhere," data synchronisation has improved. Reliability and scalability have both improved. Integration is simple Fig 1.

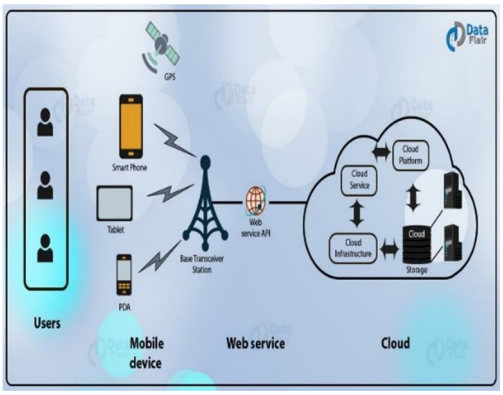


Fig1 Mobile cloud Computing

A. Internet Of Things

The Internet of Things is frequently utilised to connect medical resources and provide patients with simple, efficient, and relevant health care. We proposed a web-based patient management platform for health care applications in this project. The basic purpose of this project is to develop a health monitoring system that can be made available using readily available sensors by discussing the many works that are now available on the market.

The first step is to read and put the content of the Patient wellness analysis system employing the Internet of Things is an applied science that allows for patient observation outside of a typical clinical setting (e.g., at home), potentially increasing access to care and lowering healthcare costs[2].

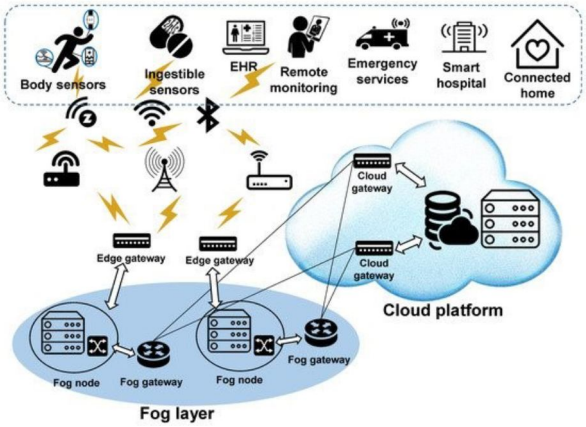


Fig. 2. IoT based services for pat ient Monitoring system

This significantly improves a person's quality of life. This allows the patient to live independently, avoid difficulties, and save money. All of these system aims are met by providing care to patients while they are at home. Furthermore, patients and their families may relax knowing that the doctor is watching them and would assist them if they have any concerns in Fig 2

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B. Hybrid Cryptographic Algorithm

It is possible to accomplish confidentiality, integrity, and authentication. Hybrid algorithms improve the encryption level of encrypted mobile data while also reducing the time it takes to encrypt and decrypt it. This new security protocol using combination of both symmetric and asymmetric cryptographic techniques to provide high security for data going to transfer to doctor.

IV. LITERATURE REVIEW

S.No	Year	Title of the paper	Authors	Methods or Technique Used
1.	2020	A Rule-Based Monitoring System for Accurate Prediction of Diabetes Monitoring System for Diabetes	Anand Kumar Srivastava, Yugal Kumar, Pradeep Kumar Singh	Applied various Machine learning techniques Artificial neural network (ANN), decision tree (DT), support vector machine (SVM), logistic regression (LR) and RBF-SVM and produced Accuracy as 90.4%
2.	2019	Real-Time Remote-Health Monitoring Systems: a Review on Patients Prioritisation for Multiple-Chronic Diseases, Taxonomy Analysis, Concerns and Solution Procedure.	K. I. Mohammed & A. A. Zaidan & B. B. Zaidan & O. S. Albahri & M. A. Alsalem & A. S. Albahri3& Ali Hadi & M. Hashim	Proposed Multiple criteria decision-making (MCDM) techniques, Sensor based, Gateway based, Server Based.
3.	2019	Integrating TTF and IDT to evaluate user intention of big data analytics in mobile cloud healthcare system	Shu Lin Wang & Hsin I Lin	Proposed integrating Task-Technology Fit (TTF) and Innovation Diffusion Theory (IDT) models to evaluate user intentions to use the system, and tests this model using data collected . Apriori association rule mining algorithm.

S.no	Year	Title of the paper	Authors	Methods or Technique Used
4.	2018	Multi-user Multi-task Offloading and Resource Allocation in Mobile Cloud Systems	Meng-Hsi Chen, Ben Liang, Min Dong	Proposed MUMTO algorithm uses SDR and binary recovery
5.	2018	Machine Learning Based Unified Framework for Diabetes Prediction	S M Hasan Mahmud Md Altab Hossin Md. Razu Ahmed Sheak Rashed Haider Noori Md Nazirul Islam Sarkar	Proposed 10-fold validation technique for evaluating performance of the six-machine learning classification techniques
6.	2017	TRAM based VM Handover with Dynamic Scheduling to improve QOS in Mobile Cloud	R.K.Nadesh and M.Aramudhan	Making decisions on the handover and scheduling of the request based on TRAM, Dynamic Scheduling

V. CONCLUSION

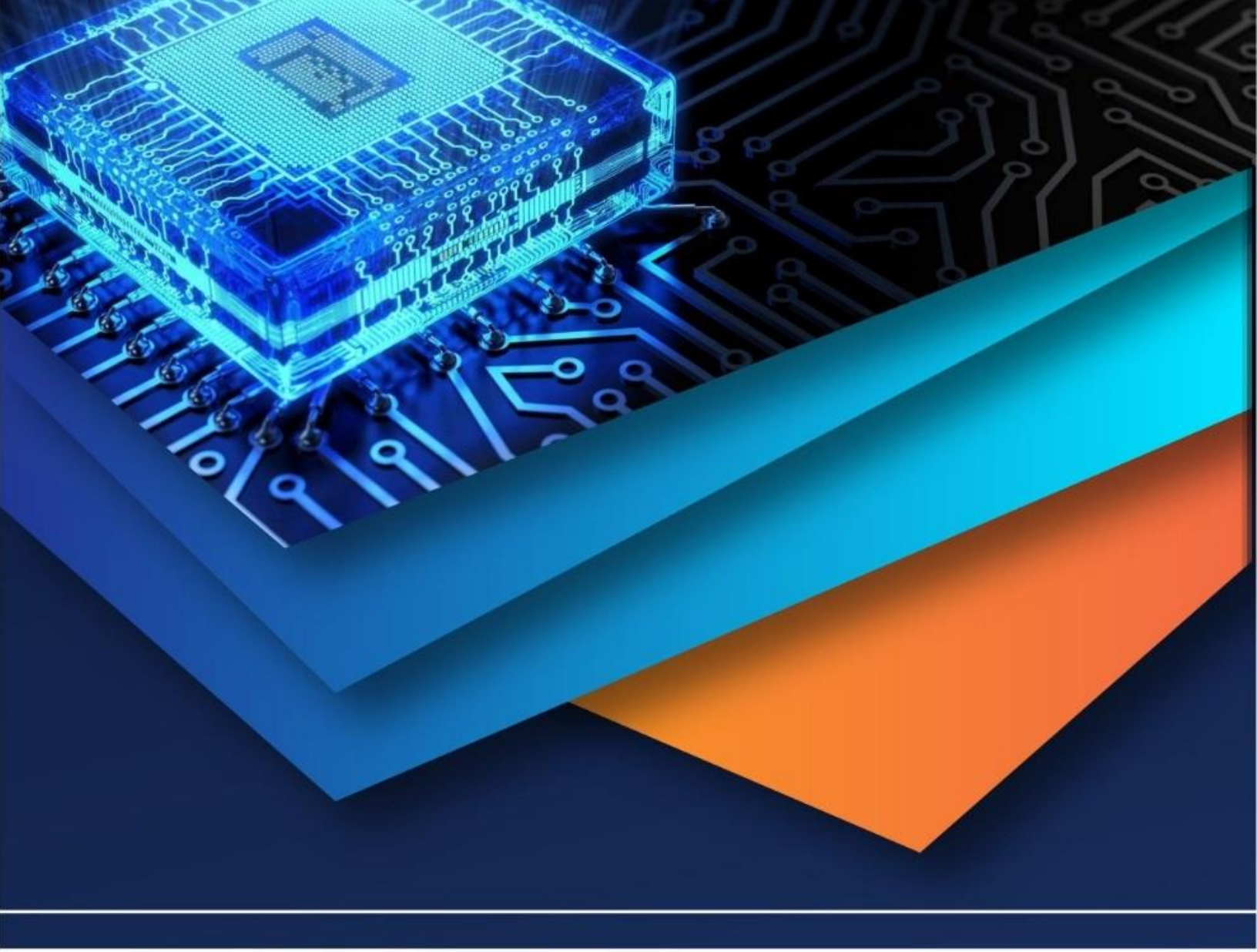
With the Hybrid cryptography method, the proposed secured, dependable connection architecture for monitoring Diabetic patients has the potential to store and secure data in an encrypted form in a short amount of time. The proposed machine learning technique can accurately anticipate vital facts in a short amount of time. It can be used to develop a health monitoring system that is cost-effective, scalable, connected, and secure.

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