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Detection of Diabetes Using 5G Network

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Abstract: ***Recent advances in wireless networking and big data technologies, such as 5G networks, medical big data analytics, and the Internet of Things, along with recent developments in wearable computing and artificial intelligence, are enabling the development and implementation of innovative diabetes monitoring systems and applications. Due to the life-long and systematic harm suffered by diabetes patients, it is critical to design effective methods for diagnosing and treating diabetes. Based on our comprehensive investigation, this article classifies those methods into Diabetes 1.0 and Diabetes 2.0, which exhibit deficiencies in terms of networking and intelligence.***

Thus, our goal is to design a sustainable, cost-effective, and intelligent diabetes diagnosis solution with personalized treatment. In this article, we first propose the 5G-Smart Diabetes system, which combines state-of-the-art technologies such as wearable 2.0, machine learning, and big data to generate comprehensive sensing and analysis for patients suffering from diabetes. Then we present the data sharing mechanism and personalized data analysis model for 5G-Smart Diabetes. Finally, we build a 5G-Smart diabetes testbed that includes smart clothing, a smartphone, and a big data cloud. These experimental results show that our system can effectively provide patients with personalized diagnoses and treatment suggestions.

Keywords: Big Data, 5G Network, Internet of Things, Diabetes, Machine Learning.

I. INTRODUCTION

Diabetes is an extremely common chronic disease from which nearly 8.5 percent of the world's population suffers; 422 million people worldwide have to struggle with diabetes.

It is crucial to note that type 2 diabetes mellitus makes up about 90 percent of the cases. More critically, the situation will be worse, as reported, with more teenagers and youth becoming susceptible to diabetes as well.

Due to the fact that diabetes has a huge impact on global well-being and the economy, it is urgent to improve methods for the prevention and treatment of diabetes.

Furthermore, various factors can cause the disease, such as improper and unhealthy lifestyle, vulnerable emotional status, along with accumulated stress from society and work.

However, the existing diabetes detection system faces the following problems:

1) The system is uncomfortable, and real-time data collection is difficult. Furthermore, it lacks continuous monitoring of multi-dimensional physiological indicators of patients suffering from diabetes.

2) The diabetes detection model lacks a data sharing mechanism and personalized analysis of big data from different sources including lifestyle, sports, diet, and so on.

3) There are no continuous suggestions for the prevention and treatment of diabetes and corresponding supervision strategies.

To solve the above problems, in this article, we first propose a next-generation diabetes solution called the 5G-Smart Diabetes system, which integrates novel technologies including fifth-generation (5G) mobile networks, machine learning, medical big data, social networking, smart clothing, and so on.

Then we present the data sharing mechanism and personalized data analysis model for 5G-Smart Diabetes.

Finally, based on the smart clothing, smartphone, and big data healthcare clouds, we build a 5G-Smart Diabetes testbed and give the experiment results.

II. LITERATURE SURVEY

Certain experiments have been Performed from past few years by different research and development groups. Here are some of the following groups:

1) S. Mendis, "Global Status Report on Noncommunicable Diseases 2016," This paper explains noncommunicable diseases kill 41 million people each year equivalent to 74% of deaths globally. Each year 17 million people die from NCD before age 70; 86% of these premature deaths occur in low and middle income countries. WHO, tech. rep.; http://www.who.int/ nmh/publications /ncd-status-report-2014/en/, accessed Jan. 2017.

2) F.Florencia et al.,IDF Diabetes Atlas, 6th ed., Int'l. Diabetes Federation , tech.rep.; This paper explained to determine the clinical and epi demiological profile of the metabolic syndrome among adults treated at the hospital.
The international diabetes federation diagnostic criteria for metabolic syndrome were used. http://www.diabetesatlas.org/, accessed Jan. 2017.

3) M. Chen et al., "Disease Prediction by Machine Learning over Big Healthcare Data,"In this paper we streamline machine learning algorithms for effective prediction of chronic diseases outbreak in disease-frequent communities use this experiment. IEEE Access, vol. 5, June 2017, pp. 8869--79.

4) O.Geman, I. Chiuchisan, and R. Toderean, "Application of Adaptive Neuro-Fuzzy Inference System for Diabetes Classification and prediction}," In this paper, we streamline machine learning algorithms for effective prediction of chronic disease outbreak in disease-frequent communities. We experiment the modified prediction models over real-life hospital data collected from central China in 2013-2015. To overcome the difficulty of incomplete data, we use a latent factor model to reconstruct the missing data.Proc. 6th IEEE Int'l. Conf. E-Health and Bioengineering, Sinaia, Romania, July 2017, pp. 639--642.

III. PROPOSED SYSTEM

The creator of this work monitors the health of diabetic patients using low-cost 5G technology. Due to their demanding professions or unhealthy lives, many people nowadays have diabetes, but they are completely unaware of it until symptoms appear or a doctor diagnoses them.

The sickness won't be able to be predicted before that point because it will already be progressed. This study employs a variety of methods, such as decision trees, SVM, ANN, and ensemble algorithms.

IV. IMPLEMENTATION

Now-a-days many people are suffering with diabetic disease due to work stress or unhealthy life styles and peoples will not know about the current health condition till symptoms appear or diagnosis through medical check-up and the condition of disease will be severe by that time and there is no possible way to get that intimation prior.

Diabetes will be of two type's diabetes 1 and diabetes 2.

Diabetes 2 require hospitalization and in diabetes 1 condition we can monitor patient and alert him or doctors about his current condition using below techniques

1) *Cloud Application:* This application act like a cloud server and storage and train dataset model with various algorithms such as decision tree, SVM and ANN and Ensemble algorithms.

2) *User Application:* In this application we will upload some test data and will be consider as user sense data and this data will be send to cloud server and cloud server will apply decision and SVM and ANN model on test data to predict patient condition and send resultant data to this application.
As we don't have sensors to sense data so we consider uploaded test data as sense data. Here we don't have user details to share data so i am keeping all predicted data to be open so all users can see and share.

Using diabetes data as dataset and below is dataset details

Pregnancies, Glucose, Blood Pressure, Skin Thickness, Insulin,BMI, Diabetes Pedigree Function, Age, Outcome
6,148,72,35,0,33.6,0.627,50,1
1,85,66,29,0,26.6,0.351,31,0
8,183,64,0,0,23.3,0.672,32,1
1,89,66,23,94,28.1,0.167,21,0

In above dataset values first record contains dataset column names and other records are the dataset values. All dataset records in last column contains class values as 0 and 1. 1 values indicates patient values show diabetes 1 symptoms and 0 value indicates patient has normal values but indicates diabetes 1 symptoms.

Above dataset is used for training and test data will have only patient data but no result values such as 0 or 1. This test data will be applied on train model to predict as 0 or 1.

The below figures shows the implementation method

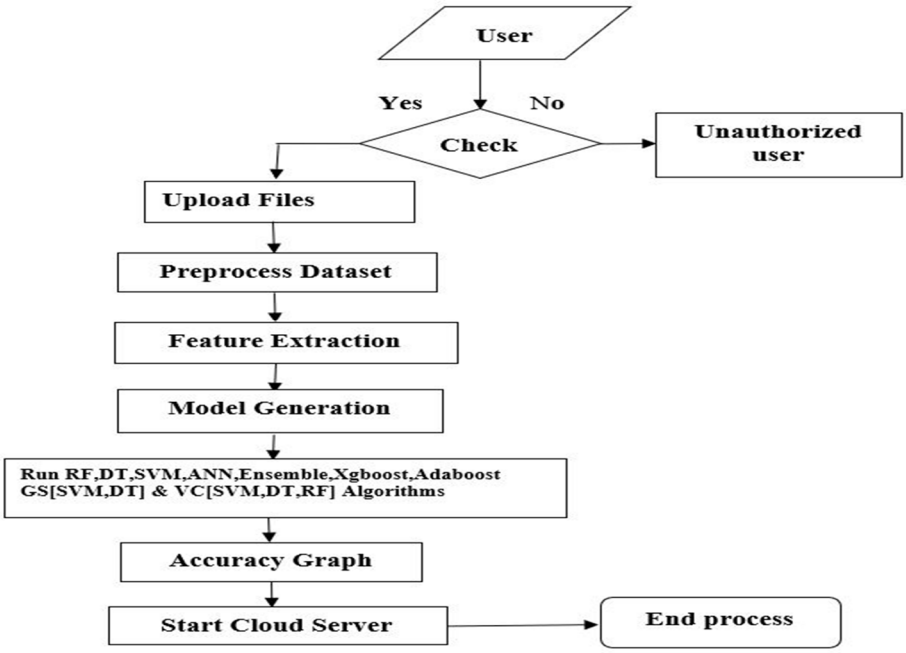


Fig. 2: Implementation at user end.

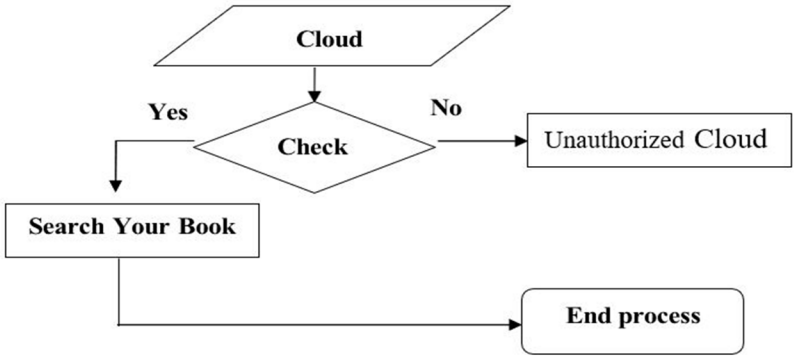
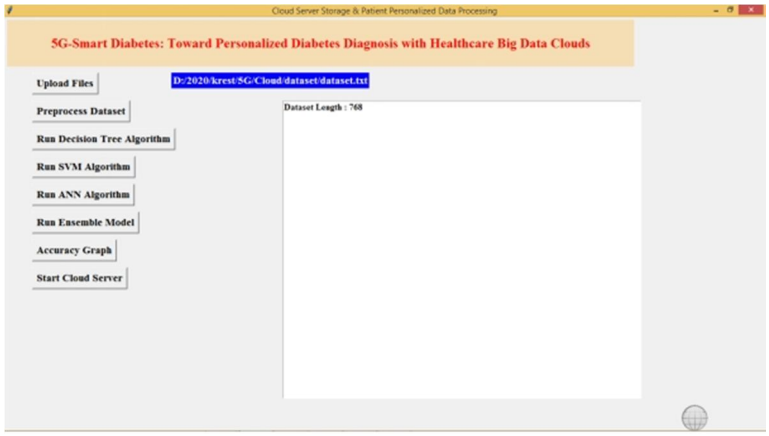
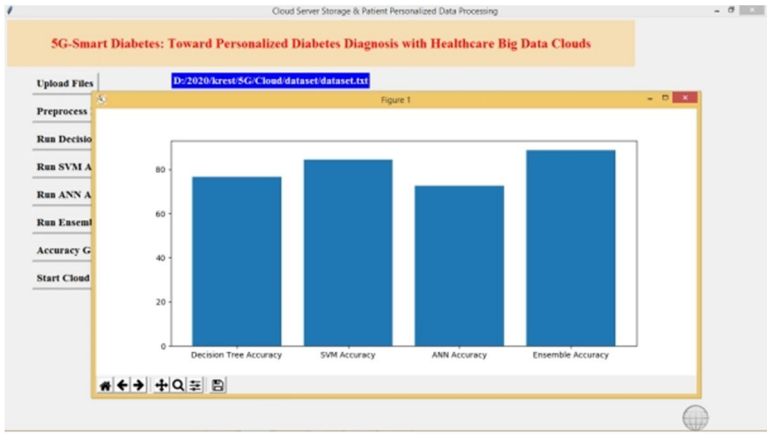
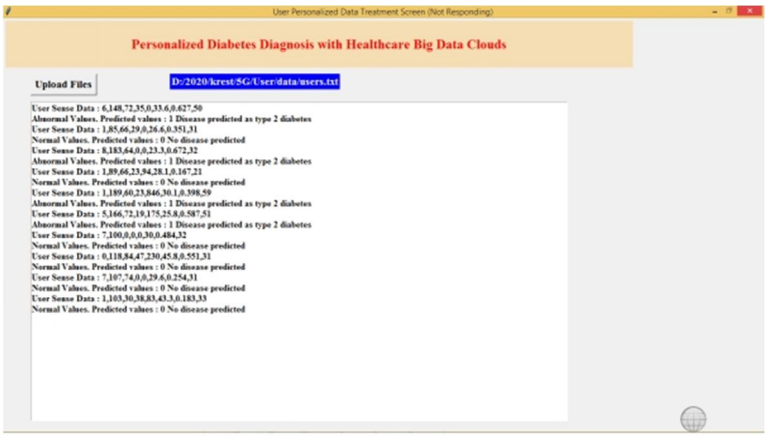


Fig. 3: Implementation at the cloud end.

V. RESULTS







VI. CONCLUSION

We first suggest a system for 5G-Smart Diabetes that consists of a sensing layer, a layer for individualised diagnosis, and a layer for data sharing. This system can deliver intelligent, cost-effective, and sustained diabetes diagnosis in comparison to Diabetes 1.0 and Diabetes 2.0. Then, in both the social and data spaces, we suggest an extremely cost-effective data sharing mechanism.

VII. FUTURE SCOPE

Diabetes isn't a hereditary disorder however heterogeneous group of disorder which could ultimately result in a boom of glucose within the blood and lack of glucose inside the urine. Diabetes is typically resulting from genetics, way of life and surroundings. Eating a dangerous weight loss plan, being overweight play role in developing the diabetes. High blood sugar tiers can also result in kidney diseases, coronary heart illnesses. The excess of sugar in the blood can harm the tiny blood vesselsin your frame.

Signs of diabetes are blurry imaginative and prescient, extreme hunger, unusual weight reduction, common urination and thirsty. In this paper, parameters used within the facts set to locate the diabetes are Glucose, Blood pressure, pores and skin thickness, Insulin, Age. Huge volumes of statistics units are generated by health care industries. By predicting the status of diabetes using the symptoms able to get inside lookat people and, ultimately, they get to know the root cause for the diabetes.

The future of diabetes prediction is going to continue to dig deeper, far past the surface of the number of symptoms, and aim to reach, and truly understand, the significance of diabetes prediction and what it tells us about the symptoms and precautions.

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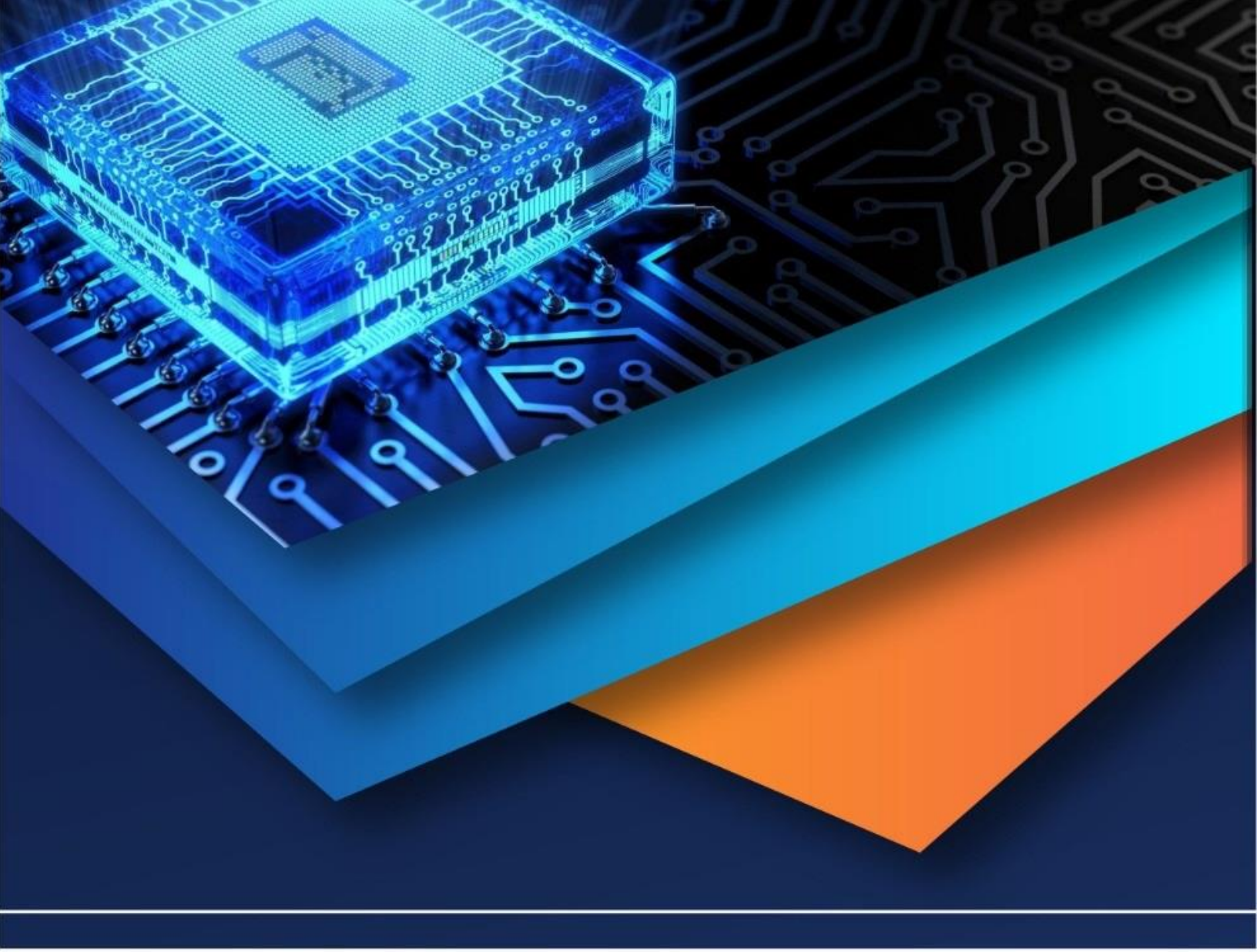

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