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Ensemble Framework-based Diabetes Detection and Diet Plan Suggestion for Healthcare Big Data Clouds Big Data-AI

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Abstract:

With today's 5G technology, diabetes patients' status may be monitored for no cost. Many individuals nowadays have diabetes as a result of demanding employment or unhealthy lives, but they are completely ignorant of their illness until symptoms appear or they are identified by a doctor. The illness will have progressed by then, and there will be no way to predict it before then. There are two forms of diabetes: type 1 and type 2. A patient with diabetes-1 can be monitored and kept informed of his present state by his doctors, whereas a patient with diabetes-2 must be hospitalized.

1.0 Introduction

Diabetes is a chronic disease that affects 422 million individuals globally and affects over 8.5 percent of the world's population. It's critical to remember that type 2 diabetes accounts for the great majority of occurrences (about 90%) [1]. More importantly, as noted in, the situation will worsen as more teenagers and young people develop diabetes. It is essential to enhance diabetes preventative and treatment techniques given the considerable detrimental consequences diabetes has on the global economy and well-being. In addition, the condition may be influenced by a variety of variables, such as an unhealthy lifestyle, a weak emotional state, and stress from the workplace and society at large. But the difficulties with the existing diabetes detection techniques are as follows: • Collecting real-time data is difficult, and the system is unpleasant. Additionally, it does not continuously monitor the many physiological signs of diabetes patients. • The diabetes detection model [2] does not include continuing suggestions for the prevention and treatment of diabetes and attendant monitoring mechanisms, nor does it include tailored analysis of significant amounts of data from several sources, such as lifestyle, sports, diet, and so forth. To solve the aforementioned challenges, we first propose a state-of-the-art 5G-Smart Diabetes system in this paper. This system combines cutting-edge technology including social networking, smart clothing, machine learning, big data from the medical industry, and fifth generation (5G) mobile

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networks. Then, for 5G-Smart Diabetes, we provide the data sharing method and customised data analysis model. Finally, using smart clothing, smart phones, and big data healthcare clouds, we build a 5G-Smart Diabetes test bed and present the experiment outcomes. The "5G" in 5G-Smart Diabetes also has two different meanings. It relates, on the one hand, to 5G technology, which will be utilized as the communication infrastructure to achieve high-quality and continuous monitoring of the physiological states of diabetic patients, as well as to supply treatment services to such patients without limiting their mobility. The term "5G" stands for the "5 goals" of comfort, customisation, sustainability, and smartness. Cost-effectiveness: It is done thus using two different strategies. In the beginning, 5G-Smart Diabetes urges users to lead a healthy lifestyle to prevent catching the illness in its early stages. If sickness risk were decreased, diabetes treatment expenses would be decreased. Second, 5G-Smart Diabetes enables out-of-hospital therapy, which is less expensive than immediate treatment, especially long-term inpatient care for the patient.

1.1 Existing System

"The word "5G" relates to the "5 objectives" of affordability, comfort, customization, sustainability, and intelligence. Effectiveness in terms of price: There are two methods to do it. In order to prevent developing the disease early on, 5G- Smart Diabetes first exhorts individuals to keep a healthy lifestyle. Diabetes treatment expenditures would be decreased if the risk of disease were minimized. Second, 5G-Smart Diabetes enables out-of-hospital therapy, which reduces expenses as compared to on-the-spot treatment, especially long-term hospitalization of the patient. Rather of relying on a single decision tree, the random forest aggregates forecasts from each tree and anticipates the final output based on the majority vote of projections. The more trees in the forest, the greater the accuracy and the smaller the risk of overfitting.

3.0 Proposed System

In the proposed study, we use Python Decision Tree, SVM, and Artificial Neural Network techniques to predict the patient's status from his data. The dataset for diabetes was used to train these algorithms. To forecast data effectively, the author employs the Ensemble Algorithm, which combines the Decision Tree, SVM, and ANN algorithms. In order to improve prediction and accuracy, the Ensemble Algorithm will combine the training models from each of the three approaches. 1) Personalization: Depending on the distance between the cloud servers being utilized to store the data, this technology allows one patient to share his data with another. Sharing is not feasible because we are utilizing a dataset in this case, but I have made all projected test data values public so that anybody may access or share them. 2) Smartness: This method will be regarded as clever since it can tell the patient of their condition without the need for human intervention.

3.0 Architecture

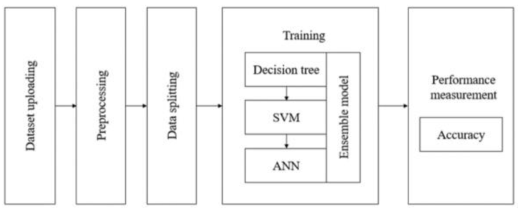

Fig 3.1 Block diagram of cloud application

To use the aforementioned method, we have created two programs. 1) Cloud application: In this application, we will upload some test data that will be regarded as user sense data. This data will be sent to a cloud server, which will use it to anticipate patient condition using decision, SVM, and ANN models before transmitting the findings to this application. We regard provided test data as sense data since we lack data collection sensors. Because no personal information is available here, I am making all projected data openly available for everybody to read and share.

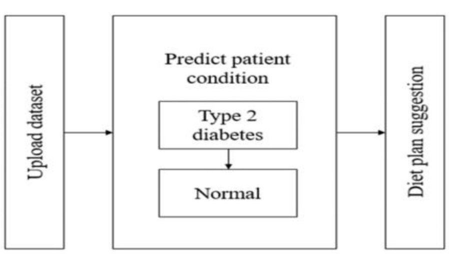

Fig. 3.2: Block diagram of user application

Multi-drug therapies have widely been used to treat diseases, especially complex diseases such as cancer to improve the treatment effect and reduce the burden of patients. However, it has also been noted that multi-drug therapy might have negative side effects, which could result in some very significant consequences or even death. Here, we have created two programs to use the aforementioned method.: This program functions as a cloud app or a system and trains dataset models using a variety of techniques, including ensemble, decision tree, SVM, and ANN algorithms. 2) User Application: In this application, some test data will be uploaded and treated as user sense data. This data will then be transmitted to a cloud server, which will use the test data to forecast patient condition using decision and SVM and ANN models. The cloud server will then provide the resulting data to this application. Since we lack sensors to collect data, we treat submitted test data as collected data. Since there are no individual information available here, I'm making all planned data open for everyone to see and share. The dataset specifications for diabetes data are presented below. Pregnancy, Blood Pressure, Glucose, Insulin, Skin Thickness, BMI, Diabetes Pedigree Function, Age, and Outcome are all factors to consider.

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

The first record in the dataset values above contains the dataset column names, while the subsequent records contain the dataset values. The last column of all dataset records has class values of 0 and 1.. 1valueindicates patient values show diabetes 1 symptoms and 0 value indicates patient

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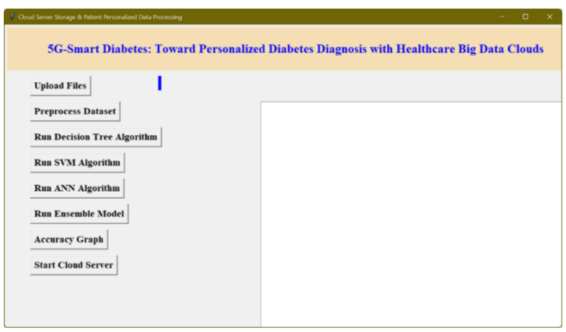
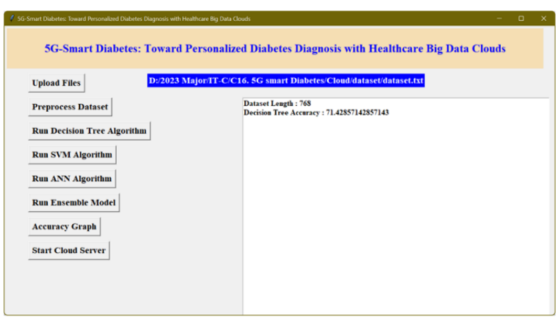
has normal values but identifies the signs of type 1 diabetes. Includes patient information and not outcome values like 0 or 1. To predict whether the test data is 0 or 1, the train model will be used. Here are some test settings that may be found in the 'users.txt' file within User/data folder

6,148,72,35,0,33.6,0.627,50
1,85,66,29,0,26.6,0.351,31
8,183,64,0,0,23.3,0.672,32
1,89,66,23,94,28.1,0.167,21

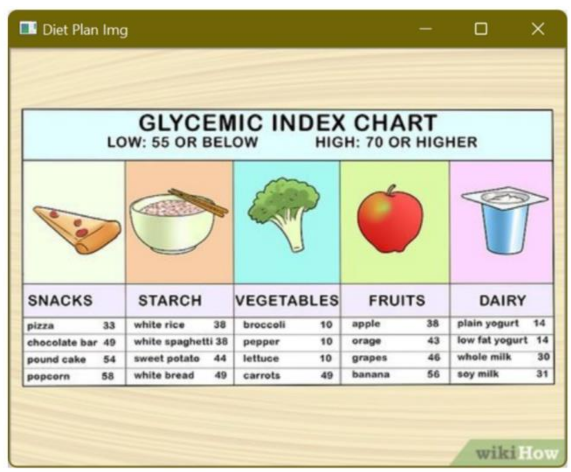
In the above test records we can see there is no 0 and 1 values and cloud server will receive and predict values for above test records.





Similarly run other buttons to build models with algorithms

Now, click the 'Start Cloud Server' button to launch the server, which will receive input from the user and anticipate illness specifics. and now double-clicks on the 'run.bat' file in the User folder to launch the User sensing application, and then clicks on the 'Upload Files' button to upload the test file and anticipate the patient's state. After uploading users' data, the following prediction results will be obtained.



In the above screen for each user data, we predicted 0 and 1 values and also indicates patient values as normal or abnormal. Further, it also suggests the diet plan.

5.0 Conclusions

We first suggest a framework for the 5G-Smart Diabetes system that combines a data-sharing layer, an altered end layer, and a differentiating layer. This system, which appears differently from Diabetes 1.0 and Diabetes 2.0, may produce understandable, feasible, and supportable diabetes assurance. By that time, both in the social and digital domains, we will have put forth a very profitable data sharing model. In addition, we provide a modified AI-based data examination model for 5G-Smart Diabetes. Finally, we put up a 5G-Smart Diabetes testbed while considering wi-fi, server farms, and smart clothes. The preliminary findings indicate that our structure is capable of providing patients with personalised diagnosis and therapy suggestions. This research was advanced by incorporating machine learning techniques to develop an intelligent architecture for monitoring diabetic patientsSeveral machine learning approaches were employed to evaluate the proposed prediction system, and simulation results revealed that the sequential minimum optimization (SMO) strategy outperforms other strategies in terms of classification accuracy, sensitivity, and precision.

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