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# An Intelligent Neural Network based Diabetes Diagnosis

**Gopi Reddy Ranabothu[1], P.Madhuri[2],Ashish Kumar Tamrakar[3],K.S.Guruprakash[4], Rakesh Rajendran[5]**

**1.**Assistant Professor, Department of Electrical and Computer Engineering, Wachemo university, Hosanna, Ethiopia.
**2**.Associate Professor, Department of Computer Science and Engineering , Hyderabad Institute of Technology and Management, Gowdavelly(V),Medchal(M), Hyderabad, Telangana 501401.
**3**. Associate Professor, School of Information Technology, ISBM University, Chhura, Gariyaband (Chhattisgarh).
**4.**Assistant Professor, Department of Computer Science and Engineering, K.Ramakrishnan College of Engineering,Trichy.
**5.**Assistant Professor, Department of Electronics and Communication, Periyar Maniammai Institute of Science and Technology,Vallam Thanjavur 613403.
Correspondence e-mail: gopireddyves@gmail.com

**ABSTRACT**

*Most diabetic patients will be affected by two different types. According to the type variation, the cause of the disease would vary, and the infections may increase for type 2 patients. In such a case, if both types of diabetes had been identified earlier, it would be easier to cure the disease of the human body; when the patients do not take care of their cause, it leads to enough problems in the end. Here in this paper, the author has proposed an AI model based on Neural Network models and used it to diagnose diabetes mellitus, a kind of chronic disease that is considered one of the globally affected infections. This proposed model is a set of combinations that analyzes fundus photography related to the psychological features of the patients, which focuses on the tongue image, pulse rate, and other requirements noted for the manufacturing of traditional medicines. As for the different spectrum here, the author has involved the Random Forest algorithm used to analyze the data, precision, and additional scoring, which helps in data collection according to the diabetes range. Some of the proposed models will not identify the earlier cause. Still, these neural networking models analyze and predict the presence of diabetes within the patient's body in the early stage.*

***Keywords:*** *Artificial Intelligence, Neural Networking models, Deep Learning, Diabetes detection, random forest.*

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## INTRODUCTION

As we have seen above, diabetes cause is differentiated into two parts: type 1 & type 2 diabetes causing. Here, the conditions may differ, but the actual cause significantly impacts the human body. Both the type 1 and type 2 diabetic causes are not the only affection apart from this; there is a primary sector that is most severe and rarer types of diabetic cause. But the leading cause is the rise of glucose in people's blood circulation; in such case, if the machine identifies the blood circulation level, it would be easier to determine the status of diabetes and its type how the patients can be treated. By this time, patients cannot avoid the secretion of glucose in their bodies because it is what gives the actual energy for the human body. Primarily the human body earns glucose during the breakdown of carbohydrates, and that occurs while having food and drinking energy drinks and fresh juices. Apart from this, our human body consists of enough insulin content, which is made by the pancreas, and its insulin allows the amount of glucose in our body to pass the glucose our cells and fuel the human body. If a human body is not affected by diabetes, then the pancreas senses the glucose entering the bloodstream and tries to free out the necessary insulin; through this, the glucose level can be maintained in the right way. From ancient days china has become one of the popular medicine manufacturing countries for diabetes causes; in such case, various studies have been proved the effectiveness of those tablets. This study primarily deals with the physical and psychological features of the sick person and diagnosing according to that. The most significant advantage of this model is that this system can be accessed by any person who does not have enough medical knowledge with them; simultaneously, it analyzes suitable diabetes under various situations.

If there is a better photography vision and AI models, the techniques of measuring eyesight and other symptoms can be identified easier; image processing in the medical field is not a more straightforward thing; for example, the requirement is excellent enough just using a single image it is hard to predict the presence of disease and its level. So the screening process should be adjustable according to the doctor's efficiency.

In this paper [1], the author has analyzed diabetes due to the rise of diabetic patients in China, and due to this impact and severe disease spread, the national health cannot avoid the sweep. Therefore, they have decided to make some intelligent medicine systems to protect the remaining people from getting affected. Finally, they have prepared a proposed model using the AI mechanism and sorted out the diagnosis of diabetes. Mainly the DL models would permit the making of some computational models that involve multiple processing layers to innovate the intricate data forms; this paper [2] primarily deals with the Bayesian convolutional neural network, which is used to manage the photographic image to a valuable data that caries enough information about patients. BP neural network and the data about the probabilistic neural network can be used for evaluating the diabetic disease in a human body, according to this paper [3] is prepared with PNN network model and that are used for data training and testing about the identification of diabetics in a person's body, after the comparative analysis, the proposed model scores the output of BP neural network and that increases the performance and effectiveness. With the rise of diabetic patient counts here, the author of the paper [4] has clearly explained the machine learning models trained for performing numerical operations and increasing the rapprochement of Chinese Electronic and Medical Records with the help of the Recursive Neural Knowledge Network. Face recognition and other biometric processes are improved the most in recent days; according to the authentication of security should also be developed; this research paper [5] has addressed the image processing concept of the Artificial Neural Network, which is capable of the extraction of data from the images.

The acute disease prevailing in our society is skin cancer; in this case, early detection is much more important. This paper explains the early detection of skin cancer by utilizing the algorithm of CNN, which is abbreviated as Centralized Neural Network. It has also been compared with different methods based on two or more datasets. The results show the superiority of this method when compared to other methods [6]. Alternative energy would install facilities such as wind, solar, geothermal, and biomass. The idea is to implement the classification of methods by Artificial Intelligence and the Quantum theory, which is used to automatically carry the category of areas. The Artificial Neural Network is improved through a Hybrid algorithm, and as well the Quantum is enhanced by the Quantum behaved Particle Swarm Optimization [7-10]. The GDM is abbreviated as Gestational Diabetes Mellitus is defined as carbohydrates that may vary in degrees with first or onset recognition during pregnancy. The diagnosis of the GDM can be assessed in the risk of women, used to develop postpartum diabetes. This proceeded as a result of confusion among the clinicians and the standardization in diagnosis. This may result in better outcomes in obstetrics [11-13]. In the paper [14,15] the author have pointed out the product unit neural networking concept that are used and helped to diagnosis the presence of diabetes in the human body, according to the patient's body capability the testing was done successful and results in 80 percent of accuracy [16].

## MATERIAL AND METHODS

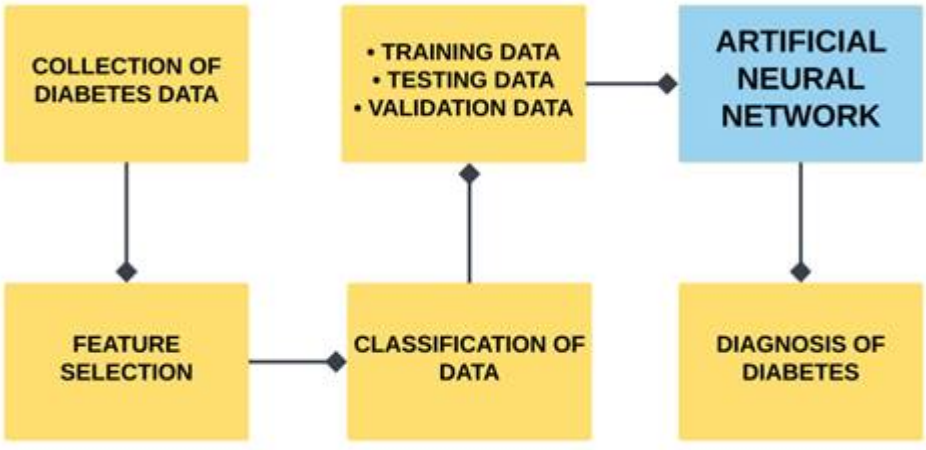


**Figure 1: Proposed Model for Diagnosing Diabetes**

Diabetes mellitus is a disease that affects the blood sugar level (glucose). In other words, it can be said to be a disease that results in too much sugar in the blood (high blood glucose. There is no age restriction for this disease, thus it can affect people of any age group. Artificial intelligence technology has already been in use in the diagnosis of Diabetes. The proposed methodology deploys ANNs for the diagnosis of diabetes is represented in Figure 1. Artificial neural networks (ANNs) a referred to as computing systems that work based on biological neural networks. ANN works based on a number of nodes called artificial neurons that were inspired by the neurons in a biological brain. The diabetes dataset is collected for the diagnosis. The main motto of this method is to find whether a person has diabetes or not. Feature selection is a process of collecting relevant features. This process is an essential one since it simplifies the model by reducing the training time. In the given dataset, the data are classified into training data, testing data, and validation data. The Artificial Neural Networks (ANN) compares the input data with the dataset and diagnose whether the patient has diabetes or not. The diagnosis of diabetes with the help of Artificial Neural Networks (ANN) is an efficient process.

To evaluate the results of a ANN with those of the diabetes diagnosis depending on the PIDD provided, we built the very same ANN using four levels, involving eight input neurons, one number of neurons, with 2 hidden layers. Because we've already gotten the greatest efficiency of the existing ANN with 9 synapses in the hidden units $N$, the traditional ANN is designed with two hidden layers, every with 9 neurons, as shown. To build ANN, we have to determine the $d_{ij}$ quantity of maximum allowable $EL$ rewirings. We've already computed it to be 89 with 9 neurons with in buried layers.

$$DG = \frac{1}{\frac{1}{N(N-1)}\sum_{i\neq j\in N}\frac{1}{d_{ij}}} = DL\frac{1}{EL} \qquad (1)$$

We begin by building the ANN and also the algorithms given in the Ingredients and techniques section. For every rewiring phase, (DGlobal as well as DLocal) DG but also DL attributes for each subtype of ANN are determined. DL drops as the rewiring number (RN) grows, however DG grows for such ANN.

$$EL = \frac{1}{N}\sum_{x\in N} E \in (G_x) \qquad (2)$$

From$E \in (G_x)$ the other extreme, as the reconstruction number for such ANN increases, both DL as well as DG drop. Because the system exhibits a slight feature when both DL as well as DG are smaller, the quantity of rewirings necessary to get a small plot of land again for ANN ought to be larger than 8 again for ANN as well as higher then 16 for such ANN.

$$E(D_x) = \frac{1}{N_x(N_x-1)}\sum_{m\neq n\in N}\frac{1}{d_{mn}} \qquad (3)$$

Second, we used the $N_x(N_x-1)$ training and testing procedures for every ANN in accordance with the reconstruction methods. For every rewiring frequency, we measured the MSE, MAE, as well as RMSE of a $d_{mn}$ both network topologies. The results obtained of$\delta_o(t)$ were reconfigured from simulation of 20 alternative realisations of every network$y_o$ for just any specific amount of RN.

$$\delta_o(t) = y_o(1-y_o)(d_o-y_o) \qquad (4)$$

$$\Delta W_{no}(t) = \alpha y_n \delta_o(x) \qquad (5)$$

**RESULTS AND DISCUSSIONS**

The observed $d_o$results reveal that such rewiring frequencies that result in superior efficiency with both types of networks are within range of $\Delta W_{no}(t)$ all ANNs. Its greatest result is found again for ANN with such an optimal reconnecting $\alpha y_n \delta_o(x)$ quantity of 65 and also for the ANN with an ideal rewiring quantity of 64.

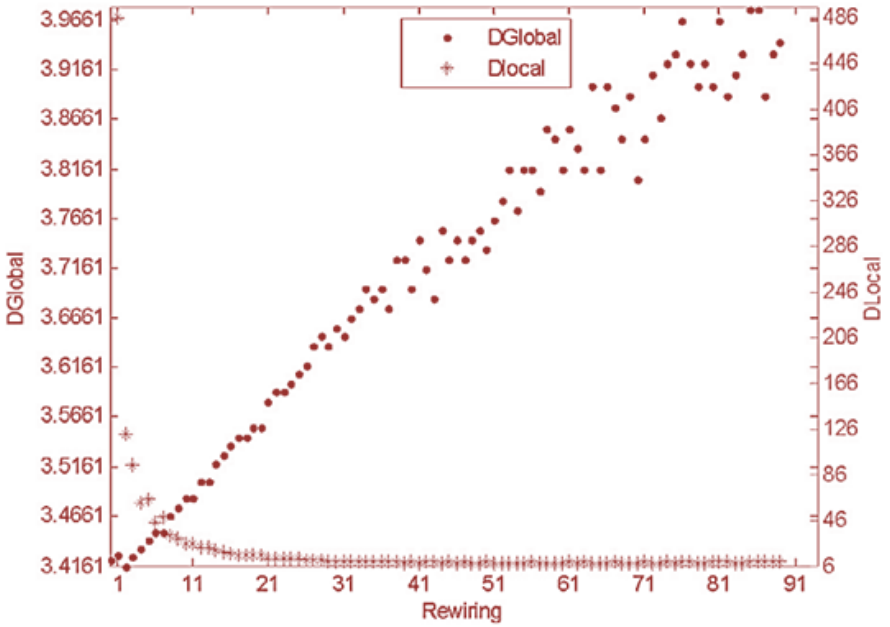


**Figure 1 depicts the increase in DG but also DL also with rewiring quantity (RN) for such created FFANN after the re-wirings**

A revolutionary informed decision method for diabetes diagnosis that is built also on conventional ANN and generates a non-traditional ANN using SW connectivity rewiring methods. In a previous research, they generated the ANN using the rewiring technique and demonstrated that the ANN provides the greatest efficiency for diabetes diagnosis depending also on PIDD. We reviewed it in this study and built an ANN predicated also on rewiring procedure (figure 1).

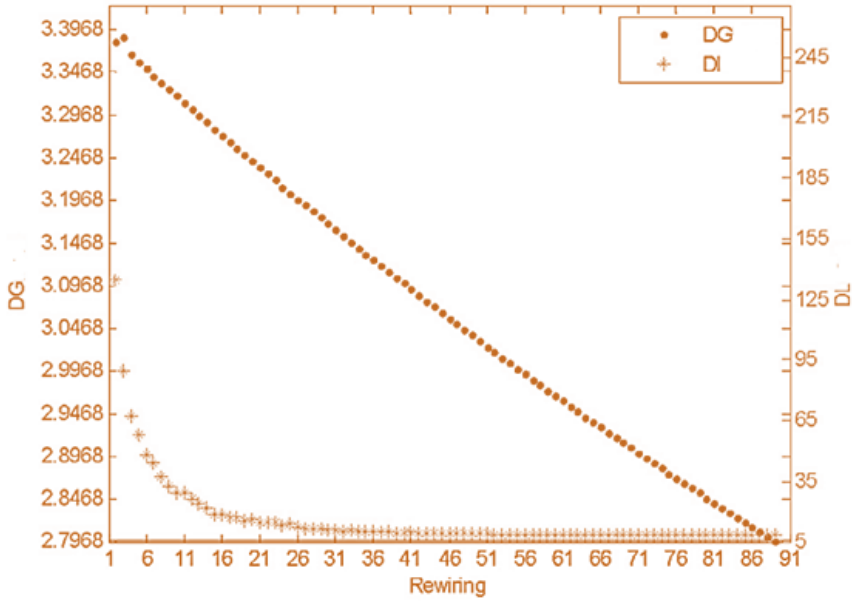


**Figure 2: Analyzed the performance of such a Technology- Neural Network towards Diabetes Diagnosis**

These results show that both outperform the traditional ANN in classification results. They may argue there is an ideal rewiring frequency inside the behaviour that results in greater performance. From the other hand, researchers demonstrated that its ANN outperforms the ANN in terms of performance. Because a hyperlink is formed between arbitrarily drawn individual neurons exclusively if they are not previously linked, both DL as well as DG drop as the wiring frequency for ANN increases. This reconstruction method optimizes the ANNs' behaviour. As a consequence, we suggest also that Prediction accuracy provides the greatest efficiency on diabetes diagnosis depending also on PIDD. The suggested model presents a clear advantages regarding diabetes diagnosis, that is critical for ongoing efforts to successfully mitigate pandemic (figure 2).

## CONCLUSION

Hospitals are one of the critical places to have enough security and guidelines for the patients; it is all about health care and providing enough treatments for the patients who are admitted in the hospital, most particularly for the diabetes patients. Moreover, the nurses are instructed to check the patient's body conditions repeatedly. This paper consists of enough feasibility of using the automatic monitoring system to monitor the patients admitted for diabetes as they are prone to get infected easily. One of the essential things required here is proper and active sensor management. First, the sensor data are stored in the database and using the collected information it analyses by getting the exact result of patients' face conditions, breathing level, pulse maintenance, etc. At the end of this paper, the final output will be granular. They would be a regulatory monitoring system for the patient who feels sick and cannot connect the doctors at the right time.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest for this study

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