ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 3, Issue 1, January 2014

Prediction of the Blood Glucose Metabolism in Diabetic Patients Using a Neural Network

Pradeep Deshmukh[1], Dnyanesh Chimbalkar[2], Umesh Kolte[3], Soni Lahane[4], Mr. Sumit hirve[5]

Student, Computer Engineering, KJ College of Engineering and Management Research, Pune, India[1,2,3,4,5]

Abstract: Diabetes is a serious metabolic disorder; if the patient does not follow the proper management of the blood glucose level the patient have always risk of kidney disease, heart attack and renal failure. In this paper we can predict that the person is having diabetic or not and which level of diabetes the patient is having by using the principal of artificial neural network. The proposed system makes separate blood glucose prediction taking the blood report's data. Comparisons of the diagnostic accuracy with other neural network models, which use the same dataset, are made. The comparison of the results overall improves the accuracy which is the effectiveness of the proposed system.

Keywords: Wavelet neural network, principal component Analysis, Time-series, Diabetes Mellitus.

I. INTRODUCTION

A common manifestation of diabetes is identified by insufficient insulin production by pancreas, ineffective use of the insulin produced by the pancreas or hyperglycemia. The diabetes is the disease for which if the proper care is not taken then a person who suffering from it can go into coma.For proper care of this disease, patient have to record their blood measurements in day. But the measurements should not be taken once in a day. Patient must have to measure and check their blood-glucose concentration at least five times in day for safety of their health.

But practically the patient cannot go into hospital for many times. So we have introduced one system that takes the blood report of the patient and calculates whether that patient has diabetes or not by doing mathematical calculation. The proposed system is based artificial neural network. First it checks whether the inputs given to the system are correct or not, if correct they are processed and will be passed to KNN algorithm.KNN is K-Nearest Neighbor algorithm. After processing of KNN, that inputs are given to the fuzzy logic which gives actual result.

II. BRIEF DESCRIPTION

In the treatment program for a diabetic patient basically involves many times of insulin injection dose per day. Under the advice of a doctor, self monitoring of blood glucose level with a blood glucose measuring device is also done by the patient. Information likes previous blood glucose that measured, previous insulin injection dose, right time of the dose of insulin, meal and modification of the dietary can be determined by the patient. Now days there are so many kinds of devices are available in the market, the device works on the algorithm or can be mathematical function. After all still the measuring of blood glucose metabolism is much difficult.

In this paper, we introduced a proposed system that can provide a reliable way of predicting blood glucose level. It is a very expert system which is based on the artificial neural network algorithm. The interactions between the factors for glucose metabolism are complex, multidimensional, very nonlinear and time series data. The neural network model is more suitable predictor, it can model the input and output behaviour of the glucose metabolism, we need not to involve in the internal process. The neural network models have been widely used in predicting the data like time-series.

A. Artificial Neural network

The artificial neural network is much similar as natural neural network of a brain. In artificial neural network basically three layers are there input layer, hidden layer and output layer. In the artificial neural network it basically consists of some inputs, which are multiplied by weights, and it computed by a mathematical function which determine the activation of the neuron. And another function computes the output of the artificial neuron.

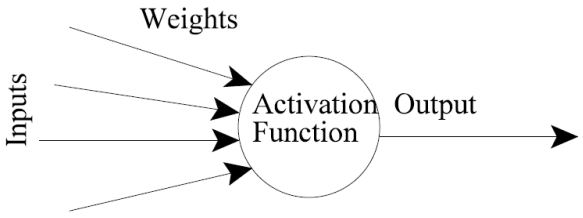

Fig. The basic flow of the system

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 3, Issue 1, January 2014

III. IMPLEMENTATION

The following table shows that different types of input variables that are applied to neural network.

TABLE I: Input Variables for Blood Glucose Level Prediction

Sr. No.	Input Variables	Interval Type
1	Glucose Level	During Interval
2	Food Intake	Start of the Interval
3	Exercise	End of the Interval
4	Short Acting Insulin	During the Interval
5	Long Acting Insulin	End of the Interval
6	Stress	After the Interval

Basically our proposed system is an android application that can install on any kind of android device like cell phone and tablets.This system is developed by three technologies artificial neural network, k- nearest neighbours algorithm and fuzzy logic.First of all user need to fill some information, there are 16 kinds of information from that information 4 to 6 information can be filled like gender, body mass index, blood pressure, plasma glucose and hour serum information. That information goes into the neural network as a input as neural network has trained by the datasets that is a parameter for the neural network called hidden layer, in the hidden layer it performs calculations and conditions and produce some result. The result is not as an understandable form. For getting the nearest value of the result we need to apply KNN algorithm on the neural network's result, after that we get some results now we can directly apply the fuzzy logic now the fuzzy logic can defined the result as understandable form and can tell to the patient result that he/she is diabetic or not and how much of percentages.

IV. TECHNOLOGIES USED IN THE SYSTEM

A. Neural Network:

The neural network is similar to our brain nervous system. Our brain consists of several neurons that are interconnected with each other. In the neural network also various neurons are there. They are split into three layers viz. Input Layer, Hidden Layer, Output Layer.

B. KNN algorithm:

This algorithm converts the output of the neural network to suitable form which is compatible with the fuzzy logic.

C. Fuzzy Logic:

This technology takes the data stream from KNN or neural network and performs operation on that which produces the actual result of the patient.

V. CONCLUSION

The continuous change in blood glucose level of diabetic patient will cause them to go into a coma. Hence, prediction of the blood glucose concentration using a neural network is important so that the patients can adjust the dose for insulin injection and they can prevent the severe complications that result from improper management of the blood glucose metabolism. The feature scope of this project is the neural network can make prediction of the 30 days. So the patient can easily know about his/her for 30 days. So patients need not go into hospital every day.

ACKNOWLEDGEMENT

First and foremost, we would like to thank our guide Prof.Sumit Hirve, for his guidance and support. We will forever remain grateful for the constant support and guidance extended by guide, for completion of project report. Through our many discussions, he helped us to form and solidify ideas. The valuable discussions we had with him, the penetrating questions he has put to me and the constant motivation, has all led to the development of this project. We are also thankful to our family members for encouragement and support in this project work.

REFERENCES

[1] Z. Zainuddin, O. Pauline and C. Ardil A Neural Network Approach in Predicting the Blood Glucose Level for Diabetic Patients International Journal of Information and Mathematical Sciences 5:1 2009.
[2] S. G. Mougiakakou, C. S. Bartsocas, E. Bozas SMARTDIAB: A Communication and Information Technology Approach for the Intelligent Monitoring, Management and Follow-up of Type 1 Diabetes Patients IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 14, NO. 3, MAY 2010.
[3] M. A. Pradhan, G.R. Bamnote, V. Tribhuvan, A Genetic Programming Approach for Detection of Diabetes, International Journal Of Computational Engineering Research (ijceronline.com) Vol. 2 Issue. 6.
[4] C. Gershenson, Artificial Neural Networks for Beginners, C.Gershenson@sussex.ac.uk.
[5] Bar-Yam, Y. (1997). Dynamics of Complex Systems. Addison-Wesley.
[6] McCulloch, W. and W. Pitts (1943), A Logical Calculus of the Ideas Immanent in Nervous Activity, Bulletin of Mathematical Biophysics, Vol. 5, pp. 115-133.
[7] McCulloch, W. and W. Pitts (1943), A Logical Calculus of the Ideas Immanent in Nervous Activity, Bulletin of Mathematical Biophysics, Vol. 5, pp. 115-133.
[8] Phee, H.K., Tung, W.L. & Quek, C. (2007). A personalized approach to insulin regulation using brain-inspired neural semantic memory in diabetic glucose control. IEEE Congress on Evolutionary Computation, Singapore, pp. 2644-2651.