



DIABETES DETECTION USING ARTIFICIAL NEURAL NETWORK (ANN) AND APPOINTMENT SCHEDULER

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ABSTRACT

This document gives information about diabetes detection using Artificial Neural network (ANN), fuzzy approach and then online appointment registration. It also helps to improve the efficiency of the healthcare system by reducing the overall time and cost used to create documents and retrieve information. The main feature of this system is to detect whether the patient is suffering from diabetes or not and also to provide the browser to get appointments from a doctor through internet instead of going there and fixing an appointment. In Doctor's side they can view their appointments and prescribe medicine for their patients. This System maintains patient's prescriptions so that their medical details are always available in Internet, which will be more convenient for the patients. This will be more comfortable for the patient. Patient details and prescriptions are maintained confidentially.

Key words: Artificial Neural Networks, diabetes, fuzzy approach.

1. INTRODUCTION

To maintain and process data of large number of people is inconvenient in medical field, because of following reasons. One is to get appointment of doctor for treatment is difficult. Second is that study will vary with different people based on their medical history. In this model appointment scheduling will be easy, fast and convenient for people. This model will help people to diagnose if they are suffering from diabetes based on symptoms mentioned in the form.

A data set will be constructed by interviewing patients and by using their laboratory test results. Member functions for fuzzy relationships among data will be constructed using this data. This system will be implemented using a multi-layer ANN. A sigmoid function will be used as activation function which will transform the input values into output. The frequency of symptoms will be uncertain. It will be measured in uncertain concepts like less, very less, medium. Hence to deal with this kind of data, fuzzy approach is used in medical field. The purpose of this model is to increase the efficiency of current

system by using an efficient algorithm for diagnosis. Backward propagation algorithm will be used to process the inputs according to their assigned weights. Weights are assigned to inputs according to the severity of symptoms.

If the patient is found to be diabetic, he or she can choose the best hospital for treatment of diabetes using this system. Once the hospital is selected, appointment can be scheduled online by considering the available time slots according to patient's convenience.

1.1 Artificial Intelligence

Artificial intelligence is used for making computers that are capable of performing human work by thinking just like a human being. Computers are good at following instructions and performing work accordingly but they do not have ability to think and to take decisions dynamically based on the available information.

Artificial intelligence is widely used in medical science. A decision support system can be designed which will help doctors in diagnosis of various diseases and it has been proved scientifically that these systems are more efficient than a human doctor.

Use of such systems considerably reduces time and cost required for the diagnosis of patients. Also, it gives accurate results. In this paper, Artificial intelligence is used by training an artificial neural network which will be used for the diagnosis of diabetes. It greatly improves the accuracy of prediction.

1.2 Figures and Tables

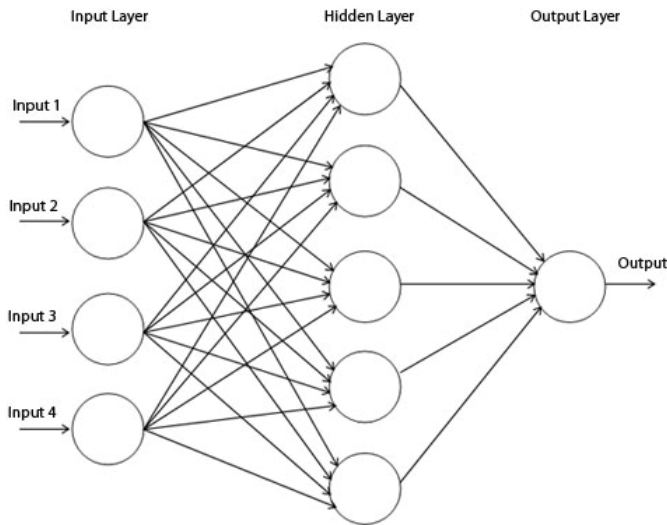


Figure 1: ANN Architecture

The above figure shows basic architecture of ANN having multiple layers. The input to ANN will be the normalized values of symptoms. Output of this layer is given as input to hidden layer. In hidden layer all the processing on data will be carried out. According to the result given by hidden layer, output layer of ANN will show either 0 or 1 as output.

Let us consider a sample data set of three patients. This data will be used as input to ANN and based on the severity of symptoms, ANN will help in diagnosis of diabetes. Some of the common symptoms may include tiredness, polydipsia, polyphagia etc.

Table 1: Patient-Symptom matrix

Patients	Symptom1	Symptom2	Symptom3
Patient1	0	6	4
Patient2	2	7	9
Patient3	0	0	5

This table represents frequency of occurrence of a particular symptom for a particular patient on a scale of 1 to 10. This data will be normalized and then it will be used as input to ANN. Number of symptoms will decide the number of input layer neurons in ANN.

2. MATHEMATICAL EQUATIONS

Net input to the model is calculated as summation of input and weight associated to each input.

$$Y = \sum I_j * W_j \quad (1)$$

Where Y is net output, I is input to system and W is weight associated with input.

Value of j ranges from 0 to n where n is number of inputs. When net input is calculated, it is given as input to activation function. The data set of patients will be processed using fuzzy approach. Patients will be interviewed to get information about the symptoms and based on the frequency of symptoms, a rating on a scale of 1 to 10 will be given after discussion with the experts in the medical field. This approach is useful here as it involves prediction of result using approximation.

Sigmoid function is used as activation function. It will produce output 1 or 0 based on inputs. Output 1 will indicate presence of diabetes and output 0 will indicate that diabetes is not present. Sigmoid function can be illustrated as follows.

$$\text{Sig}(x) = 1 / (1 + e^{-x}) \quad (2)$$

Where x is input to activation function.

The output of activation function will be between 0 and 1. The output above 0.5 will be considered as 1 and the value equal to or less than 0.5 will be considered as 0.

3.CONCLUSION

In this paper, we have combined diagnosis of diabetes and the appointment scheduler for the treatment of the same. This system will improve the accuracy of prediction of current system. Such system can be further developed in future to diagnose various other diseases so that an efficient decision support system will be available for doctors. This will be an important innovation in medical science. Improvements can be made by using efficient algorithms and appropriate mathematical models for processing of data sets.

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