Patient Categorization System Based On ANFIS

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Abstract: Ayurveda, also known as "Life Knowledge" is considered one of the traditional Hindu systems of medicine. It is believed that Dhanvantari, the Hindu God of Ayurveda embodied in human form as the king of Varanasi and taught medicine to a group of physicians. Ayurveda classifies Human Beings based on three elemental substances or doshas called Vatta, Pitta and, Kapha. If these three elemental substances are balanced then the person is healthy else the person is considered unhealthy. In this paper a patient is been classified based on scores against ayurvedic questionnaire. An Adaptive Neuro Fuzzy Interference System (ANFIS) is used which is a kind of artificial neural network which integrates both neural networks and fuzzy logic principles which captures the benefits of both in a single framework. We use the trained datasets to classify the patients based on different doshas. ANFIS will work best in limited datasets and we are expected to get more accurate results.
Keywords: Ayurveda, Vatta, Pitta, Kapha, ANFIS.

I.   INTRODUCTION

The field of Data Mining is an interdisciplinary domain in which the data which is important is been fetched out from the large data sets. In his research paper, we have stored different ayurvedic questionnaires and when a patient approaches us regarding the health issues which he is facing, we will face him to answer the different questions and based on the scores he obtained, the patient is being classified into the heading of either of the one elemental doshas. According to the ancient traditional system, a person is considered to be healthy if the three elemental substances namely vatta, pitta, kapha are balanced. If these elemental substances are not balanced then it leads to the imbalance of the body system leading to diseases. In the research paper we use the concept of data mining to fetch the patient's data and classify the patients based on different doshas so that it will be easy for the doctor who is examining the patient to start the medication according to which dosha the patient belongs.

Existing system used the J48 decision tree to classify the test samples. Having stored the patient's data, listing is done according to the samples and the doctor predicts the disease of the patient according to the data. So, we get the predicted dataset. We apply the J48 decision tree to get the target dataset. The decision tree used is developed by implementing the algorithm ID3 (Iterative Dichotomiser 3). The main disadvantage of ID3 algorithm is that target attribute will have discrete values. Another major disadvantage is the greedy characteristic which is its over-sensitivity to the training set which includes noise and unreal attributes. Keeping all these disadvantages in mind we are using the Adaptive Neuro Fuzzy Interference Systems also called Adaptive Network Based Fuzzy Interference system (ANFIS) which works in case of limited dataset to provide the highest accuracy.

Artificial Neural Network (ANN) is a non-linear combination means that the datasets depends on one or more independent parameters that are used by the doctor to analyze the health issue of the patient. Fuzzy Logic on the other hand deals with whether the predicted data is completely true or false. Means that whether the scores obtained from the patient which was based on different ayurvedic questionnaire matches the trained datasets and the doctor is able to classify the patient based on the tridoshas.
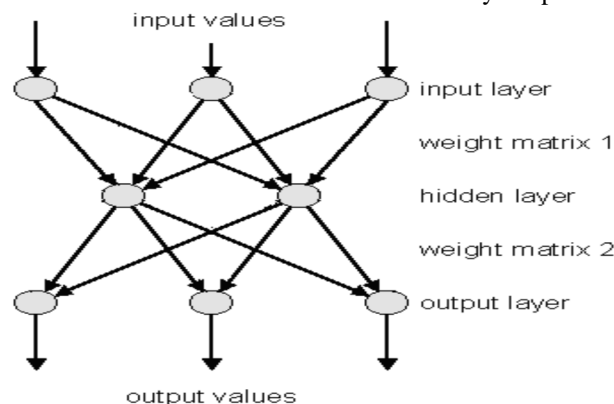

Fig.1 A typical Neural Network

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II.   LITERATURE SURVEY

Most of the research papers that are been used for this discovery of patient depends on our long term continuous research done on so many papers that are published by experts all over. The below mentioned are the different papers that are been referred for improved quality assessment.

A.   "The Human constitution types based on medicines used and its relation with the contemporary science of ayurveda"
In this paper, the way in which the human body is defined based on different prakrithi is explained. The Body Mass Index (BMI) of an individual is taken into consideration and the ayurvedic prakrithi is determined. Kappa statistical tool and Chi-square, CramersV test is done to determine the dominant prakrithi of various individual.

B.   "System Analysis to determine the scientific theory of Tridosha"
This paper basically deals with the Traditional Ayurvedic methods to determine the features of elements that constitute the basic ayurvedic principals. The main feature of tridoshas and the working principle. The history pertaining to Vatta, Pitta, Kapha and the historical background of how these came into picture.

C.   "Identification of temperament based on Tibbi fundamentals"
This paper depicts the fact that the temperature of a human body has lot to deal with the overall health of an individual. So, in this research paper the author explains of the different measures that are used to measure the overall health condition of an individual by using temperature as the main source.

D.   "Expert clinical system for Diagnosing Diabetes"
In this paper the experts have explained on how using the results of ayurveda and using the doshas, the possibility of curing the highly deadly disease. In this research paper the author has clearly mentioned with the ability to cure the disease using the herbs that are present in nature.

E.   "Parkinson disease, identification and classification using data mining techniques"
This research paper mainly deals with the identification of the disease followed by curing it using the data mining concepts. This deadliest disease which can be identified by using the technique of data mining. The experts have explained thoroughly about the different methods that are been undertaken to identify and classify this disease.

III.   DESIGN

The design of the system is simple when compared to other ayurvedic system which uses chi-square, J48 decision tree for the classification of the patient based on different doshas. The following Functional requirement takes place in this system:
A.   Load the trained data set into the database for future understanding of the patient's health.
B.   The ANFIS classifier is trained by using the trained datasets because to make sure that the system will predict the patient into the proper dosha.
C.   We can also able to test the patients according to the class which the patient belong by using the test data set.
D.   And finally we also have the option to test the accuracy of the results by crosschecking the data assigned by the system with the manual data.
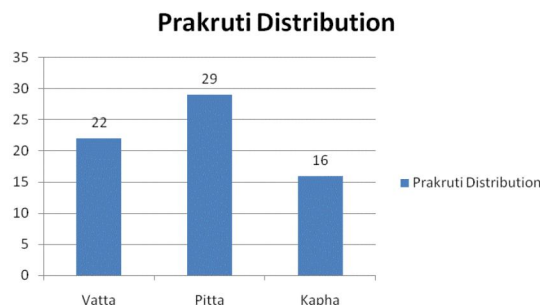

Fig: Prakruthi Distribution

The above figure shows the design of the doshas and the way it is been designed so that the user will identify it easily.

OOPS methodology is used for the designing purpose of this software.MATLAB 2013 is used for numerical computing and also it provides access to symbolic computing which is very needed for this project. The functions and subroutines are written in C programming language which is an advantage for the developers to understand the command well and to trace the errors.

IV. ANFIS

Platform which is selected for the execution of the project plays a very important role in determining the results of the system. Likewise the algorithms used for the execution also play a vital role in determining the outcome of the project. In the same way, the nature of algorithm used also is very important. In this research, we have used ANFIS which used data mining concepts to increase the accuracy of the result expected. In this project Windows XP is used which also includes side by side DLL support, Windows file protection, Encrypting file system (EFS) with multi user support and IPSec.

ANFIS works in the following manner

A. Initialization
1) Define the number and type of input and output which is given to the system.
2) Define number of rules, objective functions and also the start and stop conditions which are used in the project.

B. Collect data
1) The proper data set from the patients is been collected which gives the clear understanding of the health condition of the patient.

C. Normalize inputs
1) The main reason for normalizing the inputs is because we can make training of the data in a faster rate and it reduces the chances of getting stuck in a particular time of execution.

D. Determine Initial Rules
1) The rules which are given out initially to the project should be accepted by the system to improve the accuracy of the project.

E. Initialize Network
1) We initialize the network with user defined data which is used by a computer program.

F. train
1) And the final step is to train the datasets that is been collected from the patient to diagnose the health condition.

V. DATA ANALYSIS

The foremost important thing to get accurate results is to analyze the data collected. Symptoms, images and the medical reports that are collected from the patient are thoroughly diagnozied and we will come to a final conclusion stating to which dosha the patient belongs. So analyzing the data plays a very important role in the overall performance of the system and also to get the most accurate results.

VI. EXPERIMENTAL RESULTS

The results that are formulated from the above said methods gives us the most accurate results as when compared to other research which is being carried on which uses the decision trees and chi-square distribution. The method which we have used in this research paper is the Adaptive Neuro Fuzzy Interference System (ANFIS) which categorize the human being according to three ayurvedic elements. The results shown below give us the way in which the algorithm is used in this research work. The snapshots define the step by step execution of the modules in the system.
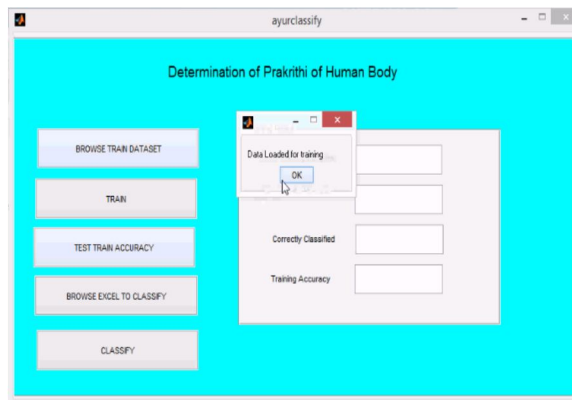
VII. SNAPSHOTS

Results which are taken out from the system are been shown below in the form of step by step execution.
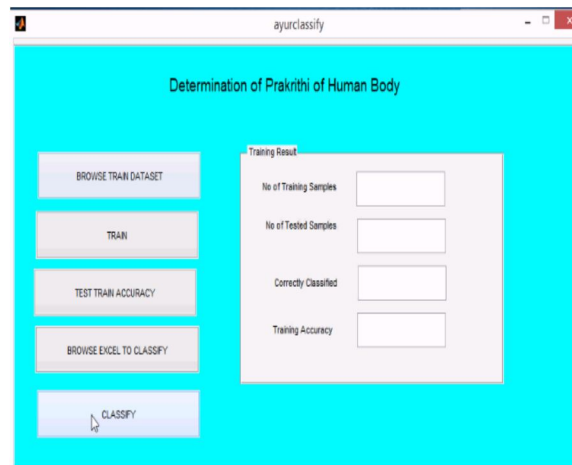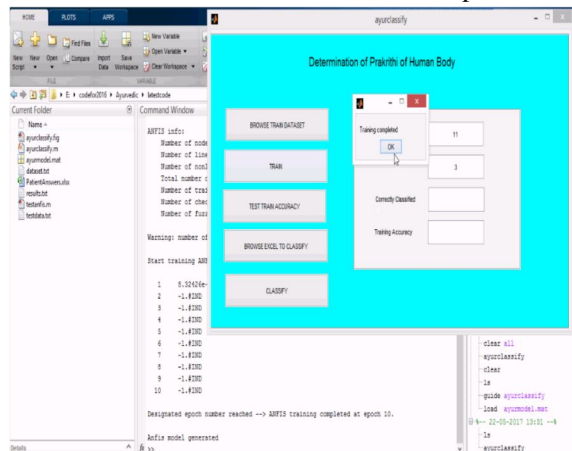
Snapshot.1 GUI of the System.

The above snapshot gives the graphical user interface of the system and the different interfaces through which the user can know the different options available.


Snapshot.2 Dataset is loaded

The above snapshot shows the option of uploading the trained dataset into the database of the system. After dataset is being uploaded, we can analyze it with the patient data and find the health status of that patient.


Snapshot.3 Dataset is being trained

The above snapshot deals with the training of the dataset according to the symptoms of the disease shown by the patient. The system will ask with different questionnaire and proper answer pertaining to it is been saved in the database.
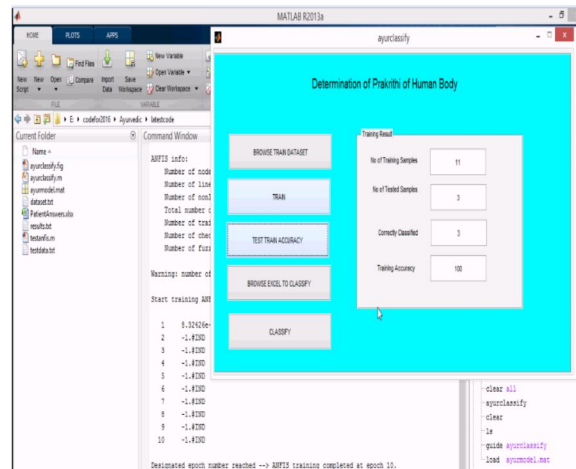
Snapshot.4 Training is completed

The above snapshot depicts of how the software shows after training all the datasets. When the training is completed it shows the total number of training samples that is been uploaded and the samples that are tested. It also shows the accuracy of the datasets that are been trained and that which are been uploaded in the database.
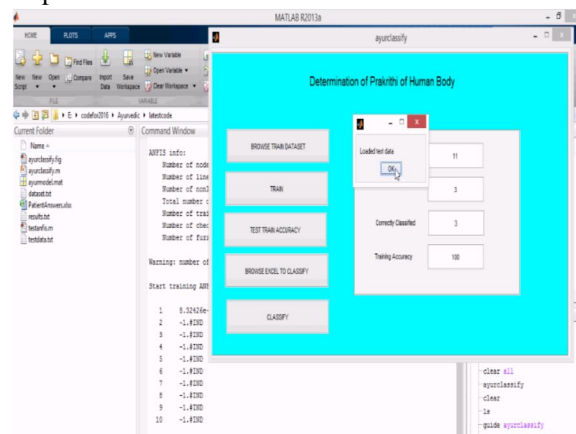
Snapshot.5 Test data is been loaded

After training the datasets, the patients data or the symptoms of the patient are been uploaded and is compared with the trained datasets. After comparing the system will give out the accurate results pertaining to the data given by the patient.
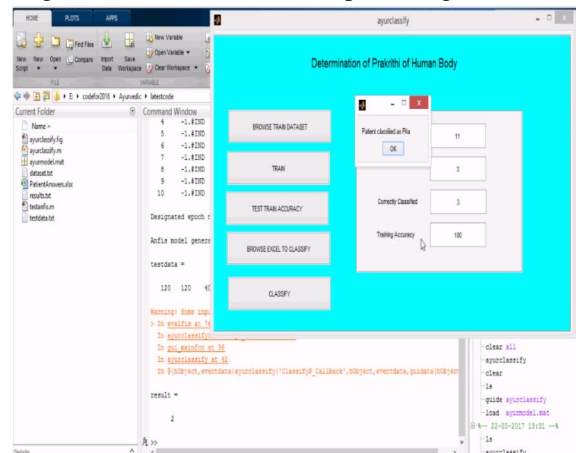
Snapshot.6 The patient is classified based on the prakruthi

The above screen shot classifies the patient based on the three elemental doshas present and makes a way for the doctor to determine the imbalance caused in the patient and followed by the specific treatment for the same.

VIII. CONCLUSION

The main objective of this research paper is that the patient can be present in his home or workplace and easily find the dosha present in his body. If the patient is in some critical condition or if the patient is an aged person then he can easily get the doctors assistance by sitting in his residence. The research is done mostly using ANFIS algorithm and the resultant contains most accurate results when compared to other online health websites.

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