DEVELOPMENT OF JAVA BASED GRAPHICAL USER INTERFACE FOR DIAGNOSIS OF HEPATITIS USING MIXTURE OF EXPERT

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ABSTRACT

Hepatitis is a deadly and fifth most death causing diseases after heart disease, stroke, chest disease and cancer. Worldwide, 1.5 million deaths have been estimated each year. Detection of hepatitis is really a big problem for general practitioners. An expert doctor commonly takes decisions by evaluating the current test results of a patient or by comparing the patient with other patients with the same condition with reference to the previous decisions. Many machine learning and data mining techniques have been designed for the automatic diagnosis of hepatitis. However, no any tool is available to the general population for the diagnosis of Hepatitis. Hence, Graphical user interface-enabled tool needs to be developed through which medical practitioners can feed patient data easily and find the hepatitis diagnose instantly and accurately. **Methods:** In this study hepatitis dataset taken from UCI machine repository database in which total 20 attributes having two classes, Affected and Not Affected . **Result and Conclusion:** The models have been generated with Mixture of experts as a classification method for the diagnosis of hepatitis. Very good accuracy has been observed in the generated models. Finally the model having least minimum square error was selected. This model was then linked with GUI for the design of tool for hepatitis prediction.

Keywords: Hepatitis Diagnosis, Problem for Practitioners, UCI, Mixture of Expert, Algorithm.

INTRODUCTION

Hepatitis is the fifth most death causing diseases after heart disease, stroke, chest disease and cancer [Mougiakakou *et al*, 2009]. The word hepatitis simply means an inflammation of the liver without pinpointing (http://kidshealth.org/parent/infections/bacterial-viral/hepatitis.html). Various risk factors for hepatitis includes blood transfusions, tattoos and piercing, drug abuse, haemodialysis, health workers and sexual contact with hepatitis carrier [http://www.angelfire.com/biz2/physician29/hepatitis.html].

Early stage diagnosis of hepatitis is very difficult in general population due to the lack of regular routine checkup and awareness. Therefore, medical diagnosis is quite difficult and totally depends on visual task done by expert doctors based on their expertise. An expert doctor commonly takes decisions by evaluating the current test results of a patient or compares the patient with other patients with the same condition by referring to the previous decisions [Sartakhti *et al*, 2011]. For this reason so many machine learning and data mining techniques have been designed for the automatic diagnosis of hepatitis. The advantages of these approaches in medical diagnosis may result in decreased cost and increased diagnosis accuracy.

METHOD

Mixture of expert (ME) models (Fig. 1) comprise of a gating network that divides the problem into smaller problems and expert networks that solve each sub problem [Titsias and Likas, 2002]. The global output of the ME system is derived as a convex combination of the outputs from a set of N experts, in which the overall predictive performance of the system is generally superior to that of any of the individual experts . The standard choices for gating and expert networks are generalized linear models and multilayer perceptrons. [Shankaracharya *et al.*, 2012]
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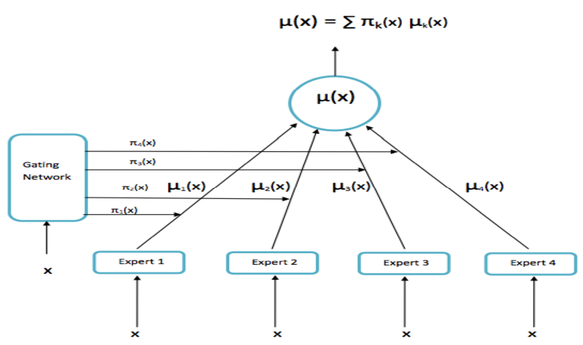

Fig 1: Mixture of Expert Architecture

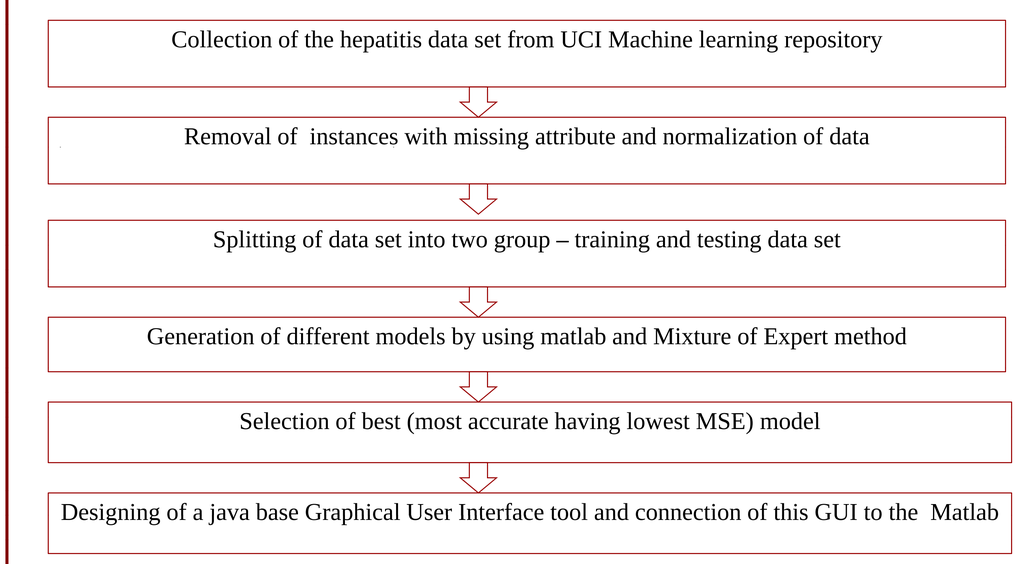

Fig 2: Overall block diagram of the methodology used

RESULTS

We get high accuracy in diagnosis of hepatitis with Mixture of Expert method. Total eight parameters were considered in the development of different models in this method. Out of which six parameters were kept constant and two were kept variable to define various cases. Following are the 8 parameters :
No. of hidden units for the expert MLPs, No. of expert, No. of hidden units for the gate Multi Layer Perceptron, Expert output activation function, Type of ME, The no. of iterations in the M-Step, Optimization in the M-step, Expectation Maximization (EM).
The highest accuracy of 98.18% was achieved while considering the following parameters (Table 1)

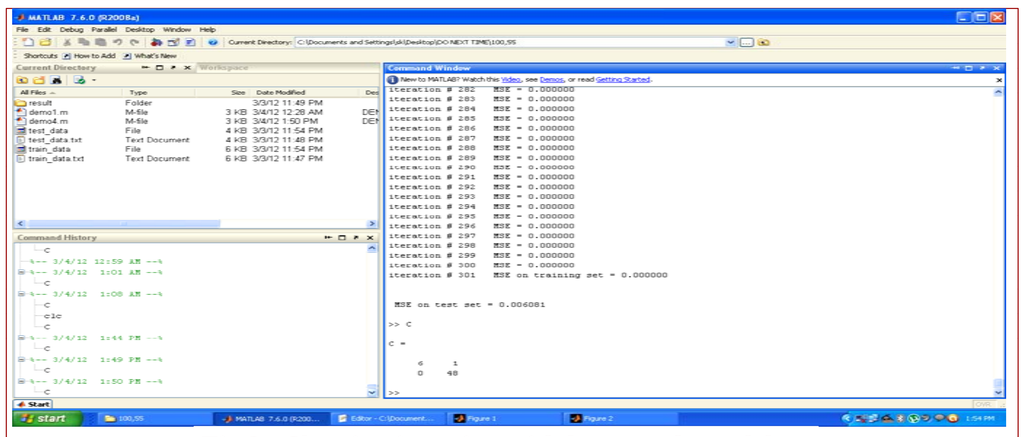

Fig 3 : Showing iteration with best result model

Table 1: MSE result

S. No.	Optimization in the M-Step	Expectation Maximization step	Min . Squared Error (MSE) for train data	MSE for test data	Accuracy	Matrix
1.	Scaled gradient	200	0.000000	0.036248	92.73%	5 2 2 46
2.	Scaled gradient	200	0.000000	0.013742	98.18%	6 1 0 48
3.	Conjugate gradient	200	0.000000	0.006081	98.18%	6 1 0 48
4.	Conjugate gradient	300	0.000000	0.013742	98.18%	6 1 0 48
5	Conjugate gradient	800	0.000001	0.018146	96.36%	6 1 1 47

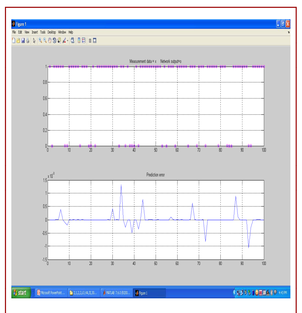

Figure 4.Train graphical result

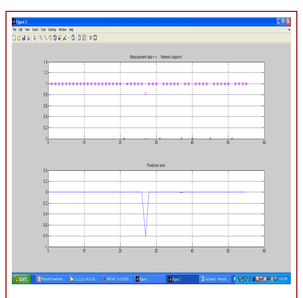

Figure_5. Test graphical result

Table 2. Confusion Matrix

	Without hepatitis	With hepatitis
Without hepatitis	6	1
With hepatitis	0	48

CONCLUSIONS

Mixture of Expert based tool can help the physician for the easy, cost effective, fast and accurate hepatitis diagnosis. In future studies on the hepatitis diagnosis diseases, this method can be further modified to get more accuracy. The accuracy may also be increased by increasing the number of subjects in the dataset.

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