

STATISTICAL RESEARCH

An artificial neural network model for predicting TB

Background

Prediction models to identify patients with active TB have been lacking. The reason for this lies in the complexity of the clinical and radiographic presentation, the relatively small patient samples, and the use of modeling techniques that are poorly suited for the task. Previously, El-Solh *et al.* introduced a classification tree to assist physicians in their decision regarding whether respiratory isolation for suspicion of active pulmonary TB is needed. The model achieved a high degree of sensitivity at the expense of low specificity. Neural networks are computation systems that process information in parallel, using large numbers of simple units, and that excel in tasks involving pattern recognition. These intrinsic properties of the neural networks have been translated into higher performance accuracy in outcome prediction compared to expert opinion or conventional statistical methods.

Aim

- To build a neural network model for early prediction of pulmonary TB

Methods

A total of 451 (195 culture positive, 256 culture negative) patients' data referred to the clinical trials of the Centre from January, 2006 to March, 2007 were considered for the artificial neural network (ANN) model. A set of 15 signs and symptoms were used for constructing the ANN model with back propagation error correction. An algorithm called the summation algorithm was developed based on the frequency of occurrence of the combination of signs and symptoms. A Perl code was written for implementing the summation algorithm. The resultant pattern specific outputs extracted by the Perl program were given as inputs into the back propagation network.

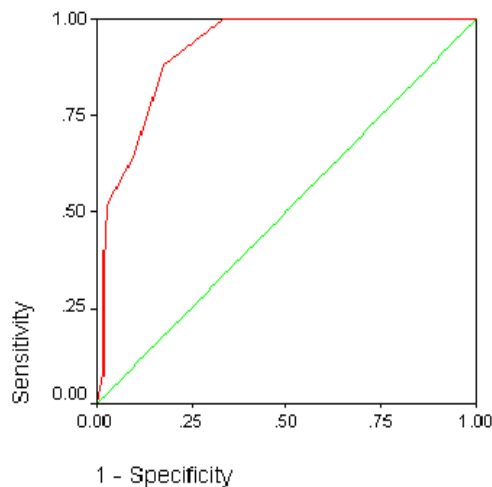
Results

A prediction accuracy of exact 91% was achieved. A root mean square error of 9% and a correlation of 0.97 were achieved between the predicted and observed results (Fig.29).

Conclusions

The ANN can help physicians in faster and efficient decision-making in identifying TB patients based on the presented clinical symptoms. Fuzziness added to the input further increases the accuracy of prediction. Further work is continuing to improve the performance of the model using other feature extraction techniques and to improve accuracy.

Fig.29: ROC curve



[Contact person: Dr.P.Venkatesan (E-Mail ID: venkatesanp@trchennai.in)]