Chapter V

Data Mining Medical Information: Should Artificial Neural Networks be Used to Analyze Trauma Audit Data

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Abstract

Trauma audit is intended to develop effective care for injured patients through process and outcome analysis, and dissemination of results. The system records injury details such as the patient’s sex and age, the mechanism of the injury, various
Introduction

An artificial neural network (ANN) attempts to model human intelligence using the neurons in a human brain as an analogy. ANNs have been described numerous times (Lee & Park, 2001; Bose & Mahapatra, 2001; Setiono, Thong, & Yap, 1998; Lee, Hung Cheng, & Balakrishnan, 1998), but a brief description is that the network accepts a series of factors as input, which it processes to output a probability that the input belongs to a certain class. For example, in the case of the trauma data analysed in this study, the characteristics of the trauma are the input to the ANN, which then outputs the probability that the patient will die. The processing is done by layers of neurons (called hidden layers) which apply a weight to each input factor according to how important that factor is in calculating the classification probability. The weight is learned by the network during its training. In training, a series of input factors to which the correct classification is known is fed into the ANN. The ANN then adjusts its weights to minimise the error between its predicted classification and the known correct class. A pictorial representation of an ANN is shown in Figure 1.

An ANN has the potential to discriminate accurately between patients who will live and those who will die, and can capture complex relationships between factors that traditional analysis methods may miss. However, there are two potential problems with using ANNs to analyse trauma data. First, they are affected by imbalances in the data (Fu, Wang, Chua, & Chu, 2002). A common characteristic of medical data is its imbalance (Cios & Moore, 2002). What this means is that the attribute of interest to data miners is likely to be present only in a minority of records in the dataset. In the case of the trauma data discussed here, a much higher percentage of patients lived than died. The second disadvantage with neural networks is that it is
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