In this paper author, Malhotra, R., & Malhotra, D. K. compared performance of multiple discriminant analysis and neural network model in identifying potential loan. Neural Network model consistently performs better than Multiple Discriminant Analysis (MDA) in identifying potential problem in loans.

Consumer Loans included short – midterm loans extended through different financial channels for services like purchasing automobile, home equity credit, secured and unsecured revolving credit etc. Lending money to consumers are one of the main source of income for financial institution. With the increase of consumer loans, delinquencies and bankruptcies also increased. These are potential revenue loss of banks. Traditional loan application decisions are made by humans mainly using credit scores and other consumer data. But parameters such as cut off scores, income range – these are very subjective. Many banks are trying to use artificial intelligence techniques such as Artificial Neural Network, fuzzy logic etc. to standardize and automate loan evaluation system.

An Artificial Neural Network (ANN) works like a human brain. It accepts input through input layer neuron and the passes it through the in between hidden layers neuron to output layer. Each neurons are connected to each other and these connections are numerically represented as weight. It’s a supervised learning process – the input attributes and outputs are labelled. Learning process involves computing the output and finding out the delta between desired output and actual output, then adjust the weights and repeat the process to minimize the delta. In this training process, the weights get adjusted repetitively and minimizes the delta. Backpropagation Neural Network is suitable for credit loan evaluation. Backpropagation Neural Network training involves repetitively passing the inputs through input, hidden and output layers until it develops memory by identifying the relationship between input and output. After each iteration, the output layers calculates the error and backpropagates it back to input layer through hidden layers. It then adjusts the weights to reduce the error and repeat the process.

There are some advantages of using Artificial Neural Network over Multiple Discriminant Analysis. Neural Network model can be easily adjusted by varying the weights and learning rate. So it is adaptable to real world changes. It is very robust. Simple and universal training algorithm function independently of the number of input. Using neural network doesn’t require detailed knowledge of the system’s internal structure.

Approaches for experiments –

Identify the input attributes such as total payment to income ratio, total debt to income ratio, ownership of a house, length of time at current address, credit card possession etc and one output with two possibility – good loan & bad loan. Train Multiple Discriminant Analysis and Backpropagation Neural Network.

Perform cross validation and compare the matrices.

Training data for Neural Network should represent the good variation of the total populations. Also training should mix data in right proportion with both types of outcome class. It was trained with 700 observations – 350 good loan and 350 bad loan. Also these training data covered the entire input space. Experiments were done with different numbers of training cycles to get the optimal neural network model.

The result of cross validation and tests, showed promising outcome. Neural Network was able to classify 75% to 78% of the 350 applications of good loan applicants and 62% to 65% of the 350 applications of bad loan applicants from cross validation. On test dataset, the neural network screened 72 to 85 percent of the good loan applicants and 61 to 76 percent of the bad loan applicants accurately, with an overall classification accuracy of 70 to 77 percent. For "bad" loans the average performance of the neural network model is 64.79%, which is higher than the discriminant analyzer's classification rate of 59.56%.

The question that I want to ask the author, what is the normal ratio of bad and good loan in real world. I see the cross validation was done using a 50-50 ratio. Is that the approx. ratio in real world or it was done intentionally by oversampling the minority class or under sampling the majority class.

**Reference:**

Malhotra, R., & Malhotra, D. K. (2003). Evaluating consumer loans using neural networks. Omega, 31(2), 83-96.