Chapter XI

Neural Network:
Automating Knowledge Application

Abstract

This chapter deals with neural networks as one of the promising knowledge management systems for decision support in the loan-granting contexts. The granting of loans by a financial institution (bank or home loan business) is one of the important decision problems, which require delicate care. It can be performed using a variety of different processing algorithms and tools. Neural networks are considered one of the most promising approaches. In this study, optimal parameters and the comparative efficiency and accuracy of three models: multilayer perceptron, ensemble averaging, and boosting by filtering, have been investigated in the light of credit loan application classification. The goal was to find the best of the three neural network models for this kind of decision context. The experimental results indicate that committee machine models were superior to a single multilayer perceptron model, and that boosting by filtering outperformed ensemble averaging.
Introduction

The granting of loans by a financial institution (bank or home loan business) is one of the important decision problems that require delicate care. Loan applications can be categorized into good applications and bad applications. Good applications are the applications that are worthy of giving the loan. Bad applications are those ones that should be rejected due to the small probability of the applicants ever returning the loan. The institution usually employs loan officers to make credit decisions or recommendations for that institution. These officers are given some hard rules to guide them in evaluating the worthiness of loan applications. After some period of time, the officers also gain their own experiential knowledge or intuition (other than those guidelines given from their institution) in deciding whether an application is loan worthy or not.

Generally, there is widespread recognition that the capability of humans to judge the worthiness of a loan is rather poor (Glorfeld & Hardgrave, 1996). Some of the reasons are: (1) There is a large gray area where the decision is up to the officers, and there are cases that are not immediately obvious for decision making; (2) Humans are prone to bias, for instance, the presence of a physical or emotional condition can affect the decision-making process. Also personal acquaintances with the applicants might distort the judgmental capability; (3) Business data warehouses store historical data from the previous applications. It is likely that there is knowledge hidden in this data that may be useful for assisting the decision making. Unfortunately, the task of discovering useful relationships or patterns from data is difficult for humans (Handzic & Aurum, 2001). The reasons for such difficulties are the large volume of the data to be examined, and the nature of the relationships themselves that are not obvious.

Given the fact that humans are not good at evaluating loan applications, a knowledge-modeling tool, thus, is needed to assist the decision maker to make decisions regarding loan applications. Knowledge management provides a variety of useful tools for discovering the nonobvious relationships in historical data, while ensuring those relationships discovered will generalize to the new/future data (Bigus, 1996; Marakas, 1999). This knowledge, in the end, can be used by the loan officers to assist them in rejecting or accepting applications. Past studies show that even the application of a simplistic linear discriminant technique in place of human judgment yields a significant, although still unsatisfactory, increase in performance (Glorfeld & Hardgrave, 1996).

Treating the nature of the loan application evaluation as a classification (Smith, 1999) and forecasting problem (Thomas, 1998), it was argued by Handzic et al. (Handzic, Tjandrawibawa, & Yeo, 2003) that neural networks may be suitable as knowledge management tools for the task. Therefore, the main objectives of their study presented in this chapter were: (1) To develop a robust knowledge management...
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