

## Machine Learning Techniques in Bank Credit Analysis

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**Abstract :** The aim of this paper is to compare and discuss better classifier algorithm options for credit risk assessment by applying different Machine Learning techniques. Using records from a Brazilian financial institution, this study uses a database of 5,432 companies that are clients of the bank, where 2,600 clients are classified as non-defaulters, 1,551 are classified as defaulters and 1,281 are temporarily defaulters, meaning that the clients are overdue on their payments for up to 180 days. For each case, a total of 15 attributes was considered for a one-against-all assessment using four different techniques: Artificial Neural Networks Multilayer Perceptron (ANN-MLP), Artificial Neural Networks Radial Basis Functions (ANN-RBF), Logistic Regression (LR) and finally Support Vector Machines (SVM). For each method, different parameters were analyzed in order to obtain different results when the best of each technique was compared. Initially the data were coded in thermometer code (numerical attributes) or dummy coding (for nominal attributes). The methods were then evaluated for each parameter and the best result of each technique was compared in terms of accuracy, false positives, false negatives, true positives and true negatives. This comparison showed that the best method, in terms of accuracy, was ANN-RBF (79.20% for non-defaulter classification, 97.74% for defaulters and 75.37% for the temporarily defaulter classification). However, the best accuracy does not always represent the best technique. For instance, on the classification of temporarily defaulters, this technique, in terms of false positives, was surpassed by SVM, which had the lowest rate (0.07%) of false positive classifications. All these intrinsic details are discussed considering the results found, and an overview of what was presented is shown in the conclusion of this study.

**Keywords :** artificial neural networks (ANNs), classifier algorithms, credit risk assessment, logistic regression, machine Learning, support vector machines

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