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Prediction of Default Customer in Banking Sector using Artificial Neural Network

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Abstract— The aim of this article is to present perdition and risk accuracy analysis of default customer in the banking sector. The neural network is a learning model inspired by biological neuron it is used to estimate and predict that can depend on a large number of inputs. The bank customer dataset from UCI repository, used for data analysis method to extract informative data set from a large volume of the dataset. This dataset is used in the neural network for training data and testing data. In a training of data, the data set is iterated till the desired output. This training data is cross check with test data. This paper focuses on predicting default customer by using deep learning neural network (DNN) algorithm.

Keywords-Neural Network, Deep learning neural network(DNN), Rapid Miner, DefaultCustomer

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I. INTRODUCTION

In recent research, works evolve around with neural network. So the neural network has enormous developing in every field because Neural Network learns to do the task by observational data without task specification programs. It typically has a number of neuron and connections those are divided by layers. Deep learning Neural Network (DNN) is a powerful technique for a neural network and it provides the best solution for many problems. At present in the field of business, customer relation management's first step is to create a customer retention analysis model. Most of the businesses fields hope to figure out the real cause of lost a customer, or even to be told that they are about to lose the customer by some clues before it occurs, and then they can propose or make some new sales strategies against the loss in advance [7].Banks have realized that customer relations are a very important factor for their success. Constants increase in customers, increase the volume of data stored in banking database. Those data may not provide sufficient information so the bank faces a challenge to find the default customer and how to retain most profitable customers. Data analysis techniques are resourceful for extracting the needed information [3]. This paper focuses on predicting the default customer from customer data set in banking sector using Deep Learning Neural Network with help of Rapid Miner studio software package which provides integrated solution for neural network and data analysis. The hypothesis was that customer who often uses bank transaction are more loyal and the bank should focus on a customer who uses the least transaction and make them turn to be a profitable customer.

II. LITERATURE REVIEW

Burez and Van den Poel indicate that there are two types of targeted approaches to managing customer churn: reactive and proactive. When a company adopts a reactive approach, it waits until customers ask the company to cancel their service relationship. On the other hand, when a company adopts a proactive approach, it tries to identify customers who are likely to default before they do so. Targeted proactive programs have potential advantages of having lower incentive costs [4]. In the financial area, the multilayer perceptron (MLP) network trained by the back-propagation learning algorithm is the most used technique for financial decision-making problems [10]. In existing system propose a method to solve such a problem, and according to the method, to find out behavior patterns of losing customers or clues before they stop using some products through Mining Sequential Patterns [7]. In existing paper Multilayer perceptron used to find default customer. It has two different approaches based on neural networks for identifying important variables. The first is based on error change and the second is based on weights contribution in the network [5]. Another existing work proposed back propagation feed forward to predict customers. It also provides a solution for overtraining problem that occurs in the neural networks[6].

III. RELATED WORK

According to research literature about default customer, most of the related work focuses on using only one data mining method such as classification or clustering to mine the customer retention data. From the review of the literature, we conclude that neural network can predict default customer in different domain like cellular network

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[6], pay TV [4], telecom [5], credit risk analysis [8], and bankrupt [9].

This paper proposed deep neural network based approach to predict the default customer in banking and following hypotheses question are consider for predictions

- How much transaction does the customer perform per month?
- What is the occupation of the customer?
- What is a profile for the high-risk borrower?
- How much Balance maintain each month?
- What is the private status of a customer?

IV. METHODOLOGY

a. Rapid Miner

Rapid Miner is a commercial data science software platform developed by the company of the same name that provides an integrated environment for machine learning, deep learning, text mining, and predictive analytics. It is used for business and commercial applications as well as for research, education, training, rapid prototyping, and application development and supports all steps of the machine learning process including data preparation, results in visualization, validation, and optimization.

b. Data Analysis

The used data set contain a large number of data collection which consists of noisy, irrelevant, missing values. We extract need data set by using one of data analysis method, this data set which can apply in neural network training. The extracted data set is 3846 based on the client age, job, day and month which most frequent.

c. Deep Learning Neural Network

Deep learning is part of machine learning, is an application to learn tasks of artificial neural network (ANN). It allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved in many domains like speech recognition, visual object recognition, object detection and other domains [12]. It is very best for supervised learning. DNN has common issues are overfitting and computation time this is due to naively training of data [13]. These can be overcome with well train data sets.

V. RESULT ANALYSIS

The paper used rapid miner software package which supports neural network to detect default customer. After selecting a data set, the software goes to data analysis phase, we are extracting need data and defining target output field which applied in a neural network for prediction.

In network training phase we are selecting number hidden layers and number of training cycles. The software package offers the best model which we can edit. Figure.1 shows our work uses three hidden layers with 9(8 input+1 thresholds) input neuron and two output results.
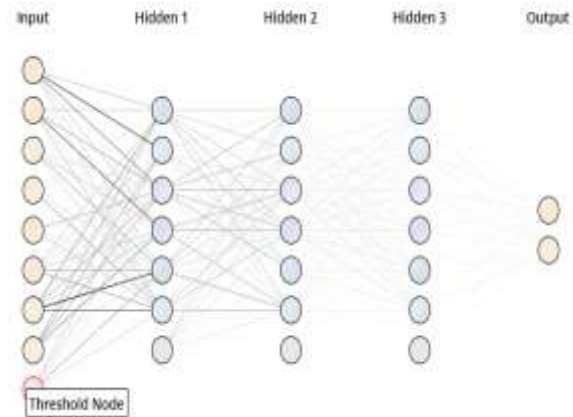

Figure 1. Network Topology in Rapid Miner

In figure 2 shows the deep learning neural network training and testing phase with parameter setting.
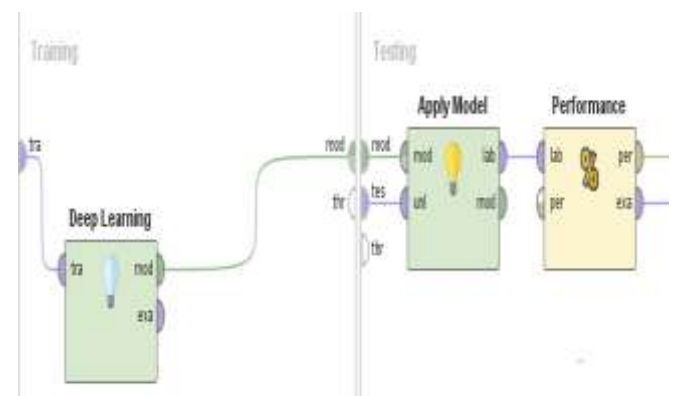

Figure 2. Deep learning in rapid miner

After training complete we get the results that shown in Table 1. With overall Accuracy: 78.18%

Table 1.Performance Accuracy Table

	True no	True yes	Class Precision
Pred.No	2775	305	90.10%
Pred.Yes	534	231	30.20%
Class recall	83.86%	43.10%	

Table 1. shows the Overall accuracy of actual prediction achieves by with three hidden layer models with six neurons is roughly trained with the result of 78.18%. the dataset is divided into 10 sets of the model and one testing model. each learning is iterated 10 times with one testing models on each set. The prediction made rough of 1000 example after being trained on nearly about 50 is nearly 78%. +/-1.09% is standard deviation calculated from 10 individual model

294

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accuracy errors on 10 models which are trained. The class precision shows the work of correct prediction for each label. Figure 3 shows the chart result.

Figure 3. Prediction Results

Confusion matrix calculation is shown in Table 2 with respected bar chart result shown in Figure 3.

Table 2. Confusion matrix table

	Predict. No	Predict. Yes	Error
Actual. No	2846	463	0.1399
Actual. Yes	284	252	0.5299
Totals	3130	715	0.1943

In Table 2. shows the confusion matrix for the actual and prediction with error mean values for each prediction. The total outcome of 3130 data the error is 0.19% its shows the efficient in reducing error for better prediction results
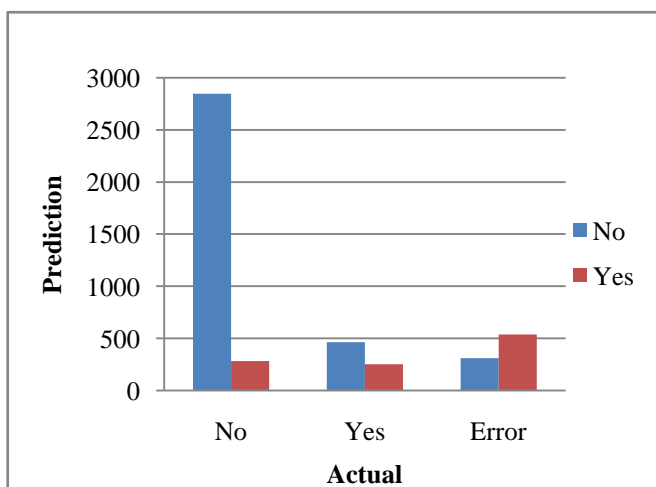

Figure 4. Confusion Matrix Chart With Error Mean

VI.   DISCUSSION

This work concludes that there is 'a problematic group' of people (self-employed, entrepreneur) with less transaction in a month also have credit balances, who in the future can become very important and very valuable clients. The bank should focus on offering services to these clients. For example, Bank could introduce new scheme tailored to self-employed and entrepreneur needs such as car loan with insurance, favorable interest rates, promotional use of internet banking, etc. Also, the DNN topology of the neural network gives the better results.

VII.   CONCLUSION AND FUTURE ENHANCEMENT

Building an effective default customer prediction model using various techniques has become a significant topic for business and academics in recent years. Default prediction and management is a curial task in the banking sector. In order to compete in the financial field, the bank has to be able to predict possible defaults and take proactive actions to retain the valuable loyal customer. The results show that The customer who uses bank often are more loyal and who uses bank very less turns to be defaulters. It also shows the accuracy rate of the defaulter. In future work, several issues can be considered and it can be implemented along with neural network several other popular prediction techniques can be applied in combination such as vector machine, machine learning to develop hybrid models.

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