

Chapter 15

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction in Telecommunication Sector

Babita Majhi

Guru Ghasidas Viswavidyalaya, Bilaspur, India

Sachin Singh Rajput

Guru Ghasidas Vishwavidyalaya, Bilaspur, India

Ritanjali Majhi

National Institute of Technology, Karnataka, India

ABSTRACT

The principle objective of this chapter is to build up a churn prediction model which helps telecom administrators to foresee clients who are no doubt liable to agitate. Many studies affirmed that AI innovation is profoundly effective to anticipate this circumstance as it is applied through training from past information. The prediction procedure is involved three primary stages: normalization of the data, then feature selection based on information gain, and finally, classification utilizing different AI methods, for example, back propagation neural network (BPNNM), naïve Bayesian, k-nearest neighborhood (KNN), support vector machine (SVM), discriminant analysis (DA), decision tree (DT), and extreme learning machine (ELM). It is shown from simulation study that out of these seven methods SVM with polynomial based kernel is coming about 91.33% of precision where ELM is at the primary situation with 92.10% of exactness and MLANN-based CCP model is at third rank with 90.4% of accuracy. Similar observation is noted for 10-fold cross validation also.

INTRODUCTION

Modeling of customer churn prediction (CCP) has been used in various sectors like different products, commodities, finance, social network, telecommunication, airlines, online gaming and banking (Athanasopoulos, 2000). The CCP models are developed to find out those customers whose probability or chances of churning or leaving the organization is high. It helps the organizations to focus seriously on those customers with some retention strategy. Hence it helps the enterprise to use efficiently its limited marketing budgets. Retention of consumers is highly profitable to companies because of three reasons: (1) finding out new customers is more costly than retaining existing customers (Athanasopoulos, 2000). (2) old customers are more loyal, do not attracted by other marketing competitors, require less budget to serve, and in the other hand they generate revenue for the organization through viral marketing (Farquad et. al., 2014), and (3) churn of customers means loss to organization due to reduction in sales (Ganesh et.al., 2000). Therefore, most of the companies are now interested in retention of old customers than attracting new customers (Amin et. al., 2016). However, identification of active churners out of a large samples of customer base is a hectic job. For this reason, enterprises are now a days using predictive churn models to make their position in the competitive market.

Recently, (Höppner et. al, 2018) has proposed a expected maximum profit measure for customer churn (EMPC) using decision tree technique. Authors are employing social network analytics to predict customer churn in the telecommunication industry (Óskarsdóttira, et. al. 2017; Mitrovi et. al., 2019). The concept of classifier's certainty estimation using distance factor is presented for CCP in (Amin et. al., 2018). A predictive churn model by using big data has reported in (Shirazi et.al., 2018). ProfLogit, a classifier uses genetic algorithm during training step to maximize the EMPC has suggested in (Stripling et. al, 2018). Three new profit-driven strategies for CCP using support vector machine (SVM) is given in (Maldonado et. al. 2019).

Presently, organizations in the telecommunication sectors (TCS) have adequate data about their consumers where data mining can be applied. This enables the machine learning group to develop various predictive models to handle the CCP in TCS (Amin et.al., 2016). Prediction of churn is a binary classification problem. Using the historical data of the customers the ML models can be trained so that it can able to tell whether a new customer will churn or not. This motivates the authors to develop models using various ML techniques. The main objective of this paper is to study the performance of different machine learning techniques for the churn prediction of telecommunication data. The chapter has used Support Vector Machine (SVM), Multilayer Artificial Neural Network (MLANN), Decision tree (DT), Discriminant Analysis (DA), Naïve Bayesian classifier and Extreme Learning Machine (ELM) for developing CCP models and done the comparison between these models to find out the best model.

Rest of the chapter is organized as follows: Section 2 deals with brief description about each of the machine learning techniques used in this study. Development of a churn prediction model using multilayer artificial neural network is described in Section 3. Data collection and simulation study is given in Section 4. Discussion on results is outlined in the Section 5. Finally conclusion of the chapter is presented in Section 6.

Methodology Used

The churn prediction model is a binary classification model. Means there is only two classes whether the customer will churn (represented as 1) or not churn (represented as 0). For this binary classification

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