

Developing efficiencies for customer Retention by way of Customer Purchase prediction in Retail Industries – A Machine Learning Approach

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Abstract

For many service businesses, customer retention is a considerable concern. A vast amount of research has been produced by academics that address a component of that difficulty, with a specific focus on anticipating customer attrition. Customer Relationship Management (CRM) solutions are used to help Businesses obtain new customers. It also helps in establishing a long – term relationship with new customers. Improved Customer retention leads to increased profits. All activities made by an Organization to ensure customer loyalty and reduce customer churn are referred to as customer retention. Customer churn occurs when customers switch to a competing company or service provider. The suggested study is the result of an ongoing effort that intends to establish a general framework and applicable strategies for enhancing Customer retention by way of Customer purchase prediction by using sound Machine Learning algorithms.

Key words – Retention, Purchase Prediction, Customer churn, Machine Learning algorithms

Introduction

The Retail industry is one of the largest industries in India but it is highly fragmented and one of the least organized sectors. In other words, it is well dominated by an unorganized market in India. There are millions of such retail outlets - they represent not only the highest number in the world but also the highest per capita. Next to agriculture the retail sector is the highest source of employment in India.

Customer retention refers to a Business ability to attract and maintain repeat Customers. Customer retention rate is the rate at which Business is able to retain those existing shoppers. Customer retention refers to the ability of a company or product to retain its customers over some specified period. High customer retention means customers of the product or business tend to return to, continue to buy or in some other way not defect to another product or business, or to non-use entirely. Selling organizations generally attempt to reduce customer defections. Customer retention starts with the first contact an organization has with a customer and continues throughout the entire lifetime of a relationship and successful retention efforts take this entire lifecycle into account. A company's ability to attract and retain new customers is related not only to its product or services, but also to the way it services its existing customers, the value the customers actually perceive as a result of utilizing the solutions, and the reputation it creates within and across the marketplace.

Various machine learning methods for predicting customer retention and profitability have been analysed in the academia field and some of them are often used by practitioners. In most cases those approaches are based on extracting customer's latent characteristics from its past purchase behavior with the mindset that observed behavior is the outcome of an underlying stochastic process (Fader & Hardie, 2009). This approach to the customer's purchase prediction can be named as characteristics approach.

Machine learning is the subfield of computer science that gives computers the ability to learn without being explicitly programmed (Arthur Samuel, 1959). Machine learning is closely related to (and often overlaps with) computational statistics, which also focuses in prediction-making through the use of computers. It has strong ties to mathematical optimization, which delivers methods, theory and application domains to the field. There are several Machine Learning algorithms in which Support Vector Machine (SVM) is one of them.

Application of machine learning algorithms in Customer purchase Behaviour

Binary classification

A binary classification algorithm constructs a function: $RM \rightarrow \{0, 1\}$ in such a way that $(x) = y$ with high probability for pairs (x, y) from the so-called training data set. For constructing the regression function, the following state-of-the-art machine learning algorithms are used:

• **Logistic Lasso regression;**

For Lasso regression, the logistic model which is one of the most common models used in the context of classification (Hastie, Tibshirani, & Friedman, 2009). The coefficients (β_j) are estimated in the logistic model by adding the 1-penalty term $R(\beta) = \sum_{j=1}^p \beta_j$, which is known as the Lasso (Tibshirani, 1996).

• **Extreme learning machine – Neural Networks**

Neural networks are a class of machine learning algorithms used to model complex patterns in datasets using multiple hidden layers and non-linear activation functions. **Neural networks** are trained iteratively using optimization techniques like gradient descent.

• **Gradient tree boosting**

Among the machine learning methods, boosting (Freund, Schapire, & Abe, 1999), and specifically gradient tree boosting, frequently shows the best performance for many applications. Boosting is a procedure that combines the outputs of several weak classifiers in order to produce a powerful classifier. In this way, boosting has a similarity to bagging (Breiman, 1996) and other ensemble-based machine learning methods.

Other Machine Learning Techniques

- 1) Regression analysis: logistic regression.
- 2) Decision tree–CART
- 3) Bayes algorithm: Naïve Bayesian.
- 4) Support Vector Machine
- 5) Instance – based learning: k-nearest Neighbour.
- 6) Ensemble learning: Ada Boost, Stochastic Gradient Boost and Random Forest.
- 7) Artificial neural network: Multi-layer Perceptron.
- 8) Linear Discriminant Analysis.

Review of Literature

Telang et al. (2007) studied organized retailing in semi urban markets. According to this study, convenience, enjoyment and price are three important factors which play vital role in promotion of sales. Berry et al. (2002) has made the study with respect to vendor Bendpudi & Berry (1997) and have undertaken considerable work in the area of customer retention. According to them relationship maintenance depends either on desire (dedication) or on Dependency (Constraint). The volume of customer logs is higher which challenges the methods in identifying user interest in exact way and such issue can be handled with the inclusion of machine learning techniques (2021). A novel customer interest prediction algorithm was developed in which it first identified the purchase histories and enquires of various users. Then, the method identifies the list of purchase patterns. This method also identifies the concrete interest of the user and identifies the similar interested users. The developed method supports the customer retention in higher ratio.

It is widely accepted by business wisdom and research literature that it costs five to ten times more to acquire a new customer than to retain an existing customer (Bhattacharya, 1998; Daly, 2002). While the factor itself may vary substantially depending on the business context, retaining customers has received strong attention from both academia and practitioners (see Van den Poel & Larivière, 2004 for an overview).

While purchase prediction has received attention for a long time in consumer research (see e.g., Herniter, 1971, the rise of customer analytics by marketing analysts has revived such issues in the recent years (Winer, 2001). As outlined in Platzner and Reutterer (2016), one of the most challenging areas remains the prediction of customer purchases in the non-contractual settings: The current status of the customer is not directly observable at a time and the available historical record is censored while customer data tends to vary substantially.

Use of Customer Purchase prediction in Customer Retention

Customer purchase prediction seeks to predict future purchases by customers, and the predictions' outcomes are critical for future commercial activity. Machine learning frameworks assist in obtaining reliable forecasts of client purchases based on prior behavioural data. First, this work provides a feature combination approach based on the improved factorization machine technique, which takes into account the sparsity of behavioural data. Second, this research provides an unbalanced prediction approach based on the maximum marginal category and cost-sensitive ensemble learning due to the imbalance of consumer purchase data.

Customer Retention

It is perceived that retained customers tend to be committed and loyal to a firm by engaging in repeat purchases (Oyeniyi& Joachim, 2008). Repeat purchase is expressed as an intense obligation to continuously purchase and repurchase a service in the future (Haghighi, Dorosti, Rahnama&Hoseinpour, 2012). Repeat purchases also indicate that customers are satisfied with the firms' offerings (Hueng&Ngai, 2008). Repeat customers will essentially buy the same or other services during their consequent visits without considering other retailers (Wilkins, Merrilees& Herington, 2010). This customer in turn will suggest to their social circles to purchase and continue purchasing in the future from a particular firm and increase firm's performance levels (Ang&Buttle, 2006). It is widely known that customers who hold a favourable attitude towards a firm would put in a good word regarding the firm to their social contacts (Bowen & Chen, 2001). Word-of-mouth is viewed as the customers' enthusiasm in recommending a particular firm to their social circles (Mazzarol, Sweeney & Soutar, 2007; Kumar, Andrew & Robert, 2007). Customers usually spread positive word-of-mouth regarding a particular firm especially when they are delighted with the services received (Rasha, 2006). Customer's attitudes and behaviours are easily affected by positive word-of-mouth which would eventually enhance their withholding towards the firm and hence, customer satisfaction (Mazzarol et al. 2007).

Discussions & Conclusion

Predicting future customer behaviour provides many benefits for a company, reaching from supporting of planning the inventory at the warehouse to the identification of customer churn. While purchase prediction has received attention for a long time in consumer research, the rise of customer analytics by marketing analysts has revived such issues in the recent years. The current status of the customer is not directly observable at a time and the available historical record is censored while customer data tends to vary substantially. During the last years, large improvements in the information technology domain have resulted in the increased availability of customer transaction data. The application of machine learning or data mining techniques for predictive purposes on the customer-base is often analysed in the customer relationship management and expert systems domain, and customer churn prediction is the most popular objective in this fields. The concept of churn and associated statistical implementations have been well studied in B2C business models. The importance of retention for suppliers becomes even clearer in the B2B context where customers make larger and more frequent purchases with far higher transactional values.

The present study gives an overview about how Machine Learning helps in predicting customer purchase prediction which in turn leads to the understanding of customer retention strategies. Machine learning techniques include Binary classification which includes Logistic Lasso regression, Extreme learning machine and Gradient Tree Boosting.

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