CLASSIFICATION OF CUSTOMIZED DIGITAL COUPON ISSUANCE FOR ENHANCING SHOPPING MALL REVENUE

[1]N.SENDHIL KUMAR, [2]JILAKARAMENTHI SHAIK RIZWANA, [3]KOMMINENI SRAVANI, [4]KALASAPATI MADHUKIRAN, [5]AKULA VAMSI

[1]Assoc. Professor, Dept. of MCA, Sri Venkateswara College Of Engineering And Technology (Autonomous), Andhra Pradesh, Chittoor (AP).

[2,3,4,5]PG Scholar, Dept. of MCA, Sri Venkateswara College Of Engineering And Technology (Autonomous), Andhra Pradesh, Chittoor (AP).

ABSTTRACT – With the development of big data and deep learning technology, big data and deep learning technology have also been applied to the marketing field, which was a part of management. Also, growth in internet adoption has made digital coupons a popular promotional tool. Customized digital coupon issuance is a very important topic in online commerce. This is because maintaining existing customers is a more important business issue than acquiring new customers. Also, retaining existing customers is much more economically advantageous than acquiring new customers. In fact, the acquisition cost of new customers is known to be five to six times higher than the maintenance cost of existing customers. With the development of big data and deep learning technology, big data and deep learning technology have also been applied to the marketing field, which was a part of business administration. Customer churn management is one of the most important areas of marketing. In this project, we proposed a method to prevent customer churn and increase purchase conversion rate by issuing customized discount coupons to customers with high churn rate based on big data in real time. After segmenting customer segments with two-dimensional segment analysis, a real-time churn rate estimation model based on clickstream data was generated for each segment. After that, we issued customized coupons to our customers.

Keywords: classification, Machine Learning, digital marketing, ecommerce, recommendation.

I. INTRODUCTION

The fields of marketing and deep learning have been impacted by the advancement of

these technologies, which were once exclusively associated with management. Additionally, as more people use the internet, digital coupons are becoming a common promotional tactic. The issue of customized digital coupons is crucial to online business. This is due to the fact that retaining current clients is a more crucial business concern than attracting new ones. Additionally, it makes financial sense to keep current clients rather than seek out new ones. It is well known that the expense of acquiring new consumers is five to six times more than that of maintaining current ones. Businesses who have improved customer retention to reduce customer turnover are recognized to have a favorable Traditionally, customized coupon issuance research has been active in highly competitive and urgent areas including finance, distribution, gaming, and telecommunications. Its primary focus has been on creating predictive models with artificial intelligence and machine learning. Additionally, deep learning and large data analysis are being used in AI-based marketing. As long as the targeting model is successful in correctly measuring user responsiveness, this kind of AI-driven targeting can save enormous marketing expenses and increase online sales. The typical purchase conversion rate, in the case

of online shopping malls specifically, is approximately 2%. The ease with which online shopping malls may be reached via PC or mobile devices is an advantage; nevertheless, it can also be an obvious negative.

Therefore, even a little decrease in the client turnover rate can result in high conversion rates and significant financial gains. Online malls make it easier to gather data than physical malls. Customers' entire online behavioral profile can be gathered in real time and stored in the shopping center's database. As a result, it is possible to have a vast amount of historical consumer data and to utilize it to recognize patterns in your clientele. In conclusion, you can raise customer conversion rates without running special promotions if you leverage comprehensive customer historical data to predict preferences and behaviors. Real-time personalization of coupons is the simplest and most natural method.

It is feasible to raise sales by boosting the buy conversion rate without incurring additional costs for promotional events by choosing consumers who have a high risk of real-time churn and providing real-time personalized discount coupons. Additionally, you need an AI-powered strategy in order to

implement these techniques. Once AI has automatically learned client histories, it can detect individual consumers' preferences and habits to effectively provide coupons.

Deep learning-based tactics in particular can be used with AI approaches. To make the best choice, deep learning needs to learn a lot of data, and the more data it has, the better the outcome. Customer behavior and preferences can be predicted by analyzing vast amounts of real-time log data collected in an online mall. Specifically, by updating and relearning the current model with daily-accumulating data, an increasingly complex model can be produced on a daily basis. Three main categories may be found in AI-based customized coupon issuing techniques: client segmentation, customer churn prediction, and personalized suggestion.

By classifying consumers based on shared traits, a process known as customer segmentation serves as the foundation for tailored marketing campaigns targeted at specific customer segments. supervised learning models like decision trees or unsupervised learning models like self-organizing maps (SOMs) or K-means models were the two main types of machine learning models utilized for consumer segmentation. Recent machine learning-based customer segmentation studies have as one of its main

characteristics the segmentation of customers for relevant additional marketing research purposes, like customer churn prediction. One of the primary machine learning-based marketing research areas is the prediction of customer turnover. Not to mention that, in the highly competitive modern business environment, there is a growing number of customers leaving, making effective churn prediction a critical research topic not only for marketing but also for enterprise-wide management strategy. As a result, numerous new model development studies have been carried out to successfully predict customer churn. In order to predict customer deviations, significant research has previously been conducted on learning models using individual algorithms like decision trees, logistic regression, and artificial neural networks. More recently, though, efforts have been made to create ensemble models or hybrid models that combine several models.

II. LITERACTURE SURVEY

Customer segmentation, customer churn prediction, and tailored suggestion are three areas where machine learning-based marketing research has been actively carried out. Because online data is easily accessible and can be accessed in real-time, there has

been a surge in related study since the advent of digital marketing over the internet.

A. Customer Segmentation Study

Segmenting customers is the first step in conducting marketing research. Marketing strategies can be developed for each target segment once clients have been grouped according to the traits of homogeneous customers. Segmenting customers should not stop there; instead, it should be followed by further marketing initiatives. Businesses that employ customer segmentation strategies outperform their competitors by developing effective and unique marketing strategies for every consumer category. Additionally, businesses can learn more about the needs and preferences of their customers.

B. Forecast Customer Churn

One of the most important aspects of loyalty management has always been the forecast and mitigation of client attrition. Businesses are concerned with churn prediction for two reasons: The first argument is that a high rate of client attrition damages service providers' credibility and dependability. The second rationale is that acquiring new clients is five to six times more expensive than keeping existing ones. Creating a churn prediction

model that can identify deviations from the typical buying pattern is essential.

C. Personalized Recommendation System

One of the most popular subjects for machine learning-based marketing research is the tailored recommendation. Previously, purchase probability calculation for specific products or association analysis were the primary methods used in personalized recommendation research. However, content-based approaches and collaborative filtering applied to suggested services like Netflix and Amazon have emerged as the dominant trends in the field of study in recent times. Lately, there has also been activity in hybrid approaches or deep learning-based research that combines several auxiliary processing algorithms.

The goal of the system determines how the recommendation system is designed. As a result, the recommendation system employs a large range of methodologies. Most often, collaborative and content-based filtering techniques are employed. There is also application for other kinds of recommendation systems, such as knowledge-based and constraint-based systems.

Neural networks, Decision trees, Naïve Bayes, MLP, KNN, SVM, and linear regression models are examples of classifier-based recommender systems that are also in use. Recommendations based on clustering, like the K-means clustering technique, are also employed. Deep learning-based recommendation systems have been the focus of much recent research. Deep learning-based recommendation systems excel in time series modeling, different input data formats, and nonlinear modeling.

III. PROPOSED SYSTEM

When issuing digital coupons, we employed a deep learning network and recommendation system methodology based on RNNs. We used a recommendation algorithm, based on the RNN network findings, to provide digital coupons to high-churn risk clients. Specifically, the model's accuracy was increased by segmenting the consumer base and creating models for each group. We experimented with revenue improvements for shopping malls after assessing the effectiveness of coupon issuance.

The study separated the two types of client loyalty: behavioral and expenditure. Due to its ability to capture both spending and behavioral patterns, the two-dimensional customer loyalty segment is well-known for

its effectiveness in categorizing consumer behavior [6]. Through consultation with the organization, suitable candidate variables were chosen in order to measure two dimensions of loyalty. "Spending in the last month" and "Average payment per time" were used as expenditure variables, and "Average number of products purchased at one time," "Number of searches in the last month," "Average stay time per session," and "Number of visits in the last month" were used as behavioral variables. We used the elbow approach to get the ideal number of clusters in each loyalty dimension, and we used K-means clustering to produce a segmentation.

Additionally, we want to provide real-time digital coupons to clients who are anticipated to be at a high risk of leaving in the near future. We specifically sent discounts that are only good for a limited number of products, which raised purchase conversion rates and boosted client loyalty. By merging content-based recommendation algorithms with collaborative filtering, product categories that consumers would find appealing were anticipated. Because the collaborative filtering recommendation system suggests products bought by neighbors or similar consumers, it is appropriate for customers who are prone to accepting the opinions of

others. Conversely, since content-based recommendation algorithms keep recommending goods that are comparable to what they have already bought, they are a good fit for clients who have significant distinctive qualities.

Fig 1 shows the procedure of the model proposed in this work. We generated CNN and RNN-based churn estimation models for each customer segment resulted from two-dimensional customer segmentation. After that, we issued customized product category coupons to customers who are at high risk of churn. Hybrid recommendation system is utilized for customized coupon issuance.
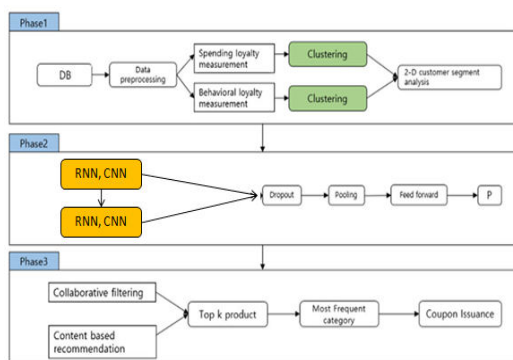

Fig. 1: Proposed Model.

Implementation Modules

Service Provider:

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some

operations such as Browse Datasets and Train & Test Data Sets, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View Predicted shopping mall revenue type, View shopping mall revenue type Ratio, Download Predicted Data Sets, View shopping mall revenue type Ratio Results, View All Remote Users.

Train and Test Model

In this module, the service provider split the Used dataset into train and test data of ratio 70 % and 30 % respectively. The 70% of the data is consider as train data which is used to train the model and 30% of the data is consider as test which is used to test the model.

Graphical Analysis

In this module, display the graphs like accuracy and predicted ratio of the system. Various factors take into consideration for the graph analysis. In this phase plot the charts like bar chart and so others.

Remote User:

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by

using authorized user name and password. Once Login is successful user will do some operations like register and login, Predict shopping mall revenue type, View your profile.

Implementation Algorithms

Support Vector Machine

In machine learning, support-vector machines (SVMs, also support-vector networks) are supervised learning models with associated learning algorithms that analyze data for classification and regression analysis. An SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier.

Logistic Regression

Logistic regression is one of the most popular Machine Learning algorithms, which comes under the Supervised Learning technique. It is used for predicting the categorical dependent variable using a given set of independent variables. Logistic regression predicts the output of a categorical dependent variable. Therefore the outcome must be a categorical or discrete value. It can be either Yes or No, 0 or 1, true or False, etc. but instead of giving the exact value as 0 and 1, **it**

gives the probabilistic values which lie between 0 and 1.

CNN

In deep learning, a convolutional neural network (CNN, or ConvNet) is a class of artificial neural network (ANN), most commonly applied to analyze visual imagery. CNNs are also known as Shift Invariant, based on the shared-weight architecture of the convolution kernels or filters that slide along input features and provide translation-equivariant responses known as feature maps.

RNN

We used RNN based deep learning network and recommendation system methodology in issuing digital coupons. Based on the results of RNN network, we applied recommendation algorithm to issue digital coupon for customers with high churn risk.

We produced a model in which a large number of Long Short Term Memory (LSTM) cells are nested to estimate the churn rate according to page view. LSTM is meaningful in that real-time parameter optimization is performed in parallel using real-time data, and optimal prediction is possible. The last recurrent layer is followed by a dropout layer, which provides a computationally inexpensive but powerful

method of regularizing a broad family of neural networks. After the outcomes of the last recurrent layer, we included a pooling layer. Pooling aggregates the weights from time steps that are in the neighborhood of the specified kernel size. As a final step, the hidden states belonging to the last time steps of the processed input sequences are extracted and put into a feed-forward layer. It outputs a probability p-value of customer churn from the feedforward layer.

IV. RESULTS

Each segment was examined to find out how the churn rate estimation based on the results of 2-dimensional cluster analysis was more efficient than the churn rate estimation for the entire customers. We experimented with a total of number of customers who have visited in the past year. The experiment results are shown in the below figures.

Fig. 2: Home Page

Model Type	Accuracy
Recurrent Neural Network-RNN	50.8
SVM	52.2
LogisticRegression	54.2
Convolution NN	57.99999999999999

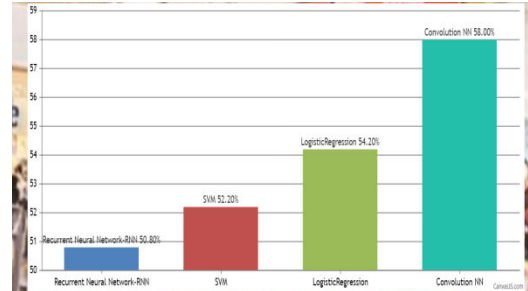Fig. 2: Accuracy results

Fig. 3: Accuracy Results in Bar chart.

V. CONCLUSION

In order to predict user behavior, we identified prior e-commerce marketing strategies. An appropriate result was obtained using a deep learning algorithm for real-time customer churn prediction. In order to increase conversion rate and sales, we implemented our research at an online shopping mall. We created a framework to monitor sales amount when used with segment model and tailored recommended digital discount in order to verify whether our experiment has a monetary benefit. We discovered that our model produces the best outcomes. We discovered that it works well for e-commerce online malls to increase sales and conversion rates.

REFERENCES

[1] P. Naval and N. Pandey, ''What makes a consumer redeem digital coupons? Behavioral insights from grounded theory approach,'' J. Promotion Manage., vol. 28, no. 3, pp. 205–238, 2021.

[2] C. Hung and C. F. Tsai, ''Market segmentation based on hierarchical selforganizing map for markets of multimedia on demand,'' Expert Syst. With Appl., vol. 34, pp. 780–787, Jan. 2008.

[3] G. Nie, ''Finding the hidden pattern of credit card holder's churn: A case of China,'' in Proc. Int. Conf. Comput. Sci. Cham, Switzerland: Springer, 2009, pp. 561–569.

[4] A. D. Athanassopoulos, ''Customer satisfaction cues to support market segmentation and explain switching behavior,'' J. Bus. Res., vol. 47, no. 3, pp. 191–207, Mar. 2000.

[5] C. Hung and C. F. Tsai, ''Market segmentation based on hierarchical selforganizing map for markets of multimedia on demand,'' Expert Syst. With Appl., vol. 34, pp. 780–787, Jan. 2008.

[6] H.-S. Kim and H. Seung-Woo, ''A two-dimensional customer loyalty segment-based customer churn prediction methodology,'' Intell. Inf. Res., vol. 26, no. 4, pp. 111–126, 2020.

[7] R. M. Gubela, S. Lessmann, and S. Jaroszewicz, ''Response transformation and profit decomposition for revenue uplift modeling,'' Eur. J. Oper. Res., vol. 283, no. 2, pp. 647–661, Jun. 2020.

[8] M.-S. Chang, H. Kim, and Joong, ''A customer segmentation scheme base on big data in a bank,'' J. Digit. Contents Soc., vol. 19, no. 1, pp. 85–91, 2018.