



Improving Shopping Mall Revenue by Real-Time Customized Digital Coupon Issuance

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Abstract: 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 paper, 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. Finally, we tested the conversion rate and sales growth. A two-dimensional cluster analysis-based churn rate estimation combined with a recommendation system was found to be significantly more useful than the respective simple models. Using this proposed model, it is possible to increase sales by automatically estimating the customer's churn probability and shopping propensity without the burden of marketing costs in the online shopping mall.

Keyword: Customer churn prediction, deep learning, digital marketing, ecommerce, recommendation system.

INTRODUCTION

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. Companies that have effectively managed customer churn by improving customer retention are known to have a positive effect not only on the company's profitability but also on improving brand image by improving customer satisfaction. Customized coupon issuance research has traditionally been active in highly competitive and urgent sectors such as telecommunications, finance, distribution, and game industries, and has focused mainly on developing predictive models using machine learning and artificial intelligence technology. Also, recently, AI-based marketing using big data analysis and deep learning is emerging. Such AI-driven targeting can save huge amounts of marketing costs and raise online sales provided that the targeting model succeeds in estimating customer responsiveness accurately. In particular, in the case of online shopping malls, the average purchase conversion rate is around 2%. Online shopping malls have the advantage of being easily accessed through the PC web or mobile web, but on the contrary, this advantage can be a disadvantage that it is easy to see and leave quickly. Therefore, even the slightest reduction of customer churn rate can lead to high conversions, which can lead to huge profits. Unlike offline shopping malls, online shopping malls are easy to collect data. All online behavioral characteristics of customers can be collected in real time in the shopping mall's own DB. Therefore, it is possible to have a wealth of customer history data and to use it to understand customer tendencies. In conclusion, if you use rich customer historical data to infer behaviors and tastes, you can increase customer conversion rates without special promotions.

The easiest and most intuitive way is to issue personalized coupons to customers in real time. By selecting customers with a high risk of real-time churn and issuing real-time customized discount coupons, it is possible to increase sales by increasing the purchase conversion rate without burdening special expenses such as promotional events. And to put these strategies into action, you need an AI-powered strategy. After AI automatically learns the histories of customers, it is possible to properly issue coupons by identifying the behaviors and tastes of individual customers. Among the AI methodologies, in particular, deep learning based strategies can be implemented. Deep learning learns a large amount of data to make an optimal decision, and the more data, the better the result. By learning a large amount of real-time log data accumulated in an online shopping mall, it is possible to predict customer behavior and taste. In particular, it is possible to create a more sophisticated model every day by updating and re-learning the existing model with data that accumulates every day.

AI-based customized coupon issuance methods are largely divided into three: customer segmentation, customer churn prediction, and personalized recommendation. Customer segmentation is an activity that categorizes customers according to their homogeneous customer characteristics, providing the basis for differentiated marketing activities by customer group. Machine learning models used for customer segmentation were mainly used either supervised learning models such as decision trees or unsupervised learning models such as self-organizing maps (SOMs) or K-means models. One of the key features of recent machine learning-based customer segmentation studies is that customer segmentation is being performed for related other marketing research purposes, such as customer churn prediction. Customer churn prediction is also one of the main marketing research topics based on machine learning. Not to mention the fact that effective churn prediction has been recognized as a critical research topic not only for marketing but also for enterprise-wide management strategy [4], with the increasing number of customer churn under a highly competitive modern business environment, many new model development studies have been conducted to successfully predict customer churn.

In the past, there have been major studies to learn models using single algorithms such as decision trees, logistic regression, and artificial neural networks to predict customer deviations, however, in recent, more attempts have been made to develop ensemble models or hybrid models that interconnects different models. Meanwhile, personalized recommendation systems are also one of the most active machine learning-based marketing research topics along with churn prediction. Research on personalized recommendations applied to recommended services such as Amazon and Netflix is increasing. Personalized recommendation studies have been dominated by model development studies to enhance predictive performance itself. On the other hand, customized coupon issuance can contribute greatly to online shopping malls. In the case of an online shopping mall, real-time performance is required compared to an offline shopping mall because a large number of users come and go in an instant. Therefore, it is inappropriate to apply the traditional offline discount coupon issuance strategy online. Also, in online, a lot of log data can be collected much more than offline.

Therefore, if you use the marketing method using AI, you can establish effective marketing strategies such as discount coupon issuance strategy in real time. In most studies, the entire customer group is regarded as a group and AI prediction models are developed at once. In fact, however, customers have different behavioral characteristics due to unexplainable and different transaction patterns, so it is unreasonable to assume the entire customer as a single customer group. It will be much more powerful if AI models are established for each group who are sharing similar tendencies according to customer behavior. In this study, applying deep learning techniques to real-time click stream data, we find customers with high chance of churning rates and issue a coupon that suits customers' preferences. This study has the following significance: First, we segmented the customer and develop a suitable model for customer churn prediction for each segmentation. Second, we made a clickstream-based real-time customer churn risk prediction model using deep learning models. Third, we improved the actual conversion rate by issuing customized coupons in real shopping mall website.

II. LITERATURE SURVEY

C. Hung and C. F. Tsai, Customer relationship management (CRM) aims at understanding and measuring the true value of customers. Market segmentation is a general method for successful CRM. This paper focuses on approaches that provide a human manager with a visualized decision making tool for market segmentation. We propose a novel market segmentation approach, namely the hierarchical self-organizing segmentation model (HSOS), for dealing with a real-world data set for market segmentation of multimedia on demand in Taiwan. HSOS is able to give a human manager a general idea of market segmentation step by step, which can be considered as a potential alternative approach to other hierarchical cluster approaches for market segmentation.

H.-S. Kim and H. Seung-Woo, most industries have recently become aware of the importance of customer lifetime value as they are exposed to a competitive environment. As a result, preventing customers from churn is becoming a more important business issue than securing new customers. This is because maintaining churn customers is far more economical than securing new customers, and in fact, the acquisition cost of new customers is known to be five to six times higher than the maintenance cost of churn customers. Also, Companies that effectively prevent customer churn and improve customer retention rates are known to have a positive effect on not only increasing the company's profitability but also improving its brand image by improving customer satisfaction. Predicting customer churn, which had been conducted as a sub-research area for CRM, has recently become more important as a big data-based performance marketing theme due to the development of business machine learning technology. Until now, research on customer churn prediction has been carried out actively in such sectors as the mobile telecommunication industry, the financial industry, the distribution industry, and the game industry, which are highly competitive and urgent to manage churn. In addition, These churn prediction studies were focused on improving the performance of the churn prediction model itself, such as simply comparing the performance of various models, exploring features that are effective in forecasting departures, or developing new ensemble techniques, and were limited in terms of practical utilization because most studies considered the entire customer group as a group and developed a predictive model.

R. M. Gubela, S. Lessmann, and S. Jaroszewicz, uplift models support decision-making in marketing campaign planning. Estimating the causal effect of a marketing treatment, an uplift model facilitates targeting marketing actions to responsive customers and efficient allocation of marketing budget. Research into uplift models focuses on conversion models to maximize incremental sales. The paper introduces uplift models for maximizing incremental revenues. If customers differ in their spending behavior, revenue maximization is a more plausible business objective compared to maximizing conversions. The proposed methodology entails a transformation of the prediction target, customer-level revenues that facilitates implementing a causal uplift model using standard machine learning algorithms. The distribution of campaign revenues is typically zero-inflated because of many non-buyers. Remedies to this modeling challenge are incorporated in the proposed revenue uplift strategies in the form of two-stage models. Empirical experiments using real-world e-commerce data confirm

the merits of the proposed revenue uplift strategy over relevant alternatives, including uplift models for conversion and recently developed causal machine learning algorithms. To quantify the degree to which improved targeting decisions raise return on marketing, the paper develops a decomposition of campaign profit. Applying the decomposition to a digital coupon targeting campaign, the paper provides evidence that revenue uplift modeling, as well as causal machine learning, can improve campaign profit substantially.

Y. Yoo, T.-S. Heo, Y. Park, and K. Kim, the problem of measuring sentence similarity is an essential issue in the natural language processing area. It is necessary to measure the similarity between sentences accurately. Sentence similarity measuring is the task of finding semantic symmetry between two sentences, regardless of word order and context of the words. There are many approaches to measuring sentence similarity. Deep learning methodology shows a state-of-the-art performance in many natural language processing fields and is used a lot in sentence similarity measurement methods. However, in the natural language processing field, considering the structure of the sentence or the word structure that makes up the sentence is also important. In this study, we propose a methodology combined with both deep learning methodology and a method considering lexical relationships. Our evaluation metric is the Pearson correlation coefficient and Spearman correlation coefficient. As a result, the proposed method outperforms the current approaches on a KorSTS standard benchmark Korean dataset. Moreover, it performs a maximum of a 65% increase than only using deep learning methodology. Experiments show that our proposed method generally results in better performance than those with only a deep learning model.

D. Koehn, S. Lessmann, and M. Schaal, Clickstream data is an important source to enhance user experience and pursue business objectives in e-commerce. The paper uses clickstream data to predict online shopping behavior and target marketing interventions in real-time. Such AI-driven targeting has proven to save huge amounts of marketing costs and raise shop revenue. Previous user behavior prediction models rely on supervised machine learning (SML). Conceptually, SML is less suitable because it cannot account for the sequential structure of clickstream data. The paper proposes a methodology capable of unlocking the full potential of clickstream data using the framework of recurrent neural networks (RNNs). An empirical evaluation based on real-world e-commerce data systematically assesses multiple RNN classifiers and compares them to SML benchmarks. To this end, the paper proposes an approach to measure the revenue impact of a targeting model. Estimates of revenue impact together with results of standard classifier performance metrics evidence the viability of RNN-based clickstream modeling and guide employing deep recurrent learners for campaign targeting. Given that the empirical analysis shows RNN-based and conventional classifiers to capture different patterns in clickstream data, a specific recommendation is to combine sequence and conventional classifiers in an ensemble. The paper shows such an ensemble to consistently outperform the alternative models considered in the study.

III.RELATED WORKS

On the other hand, customized coupon issuance can contribute greatly to online shopping malls. In the case of an online shopping mall, real-time performance is required compared to an offline shopping mall because a large number of users come and go in an instant. Therefore, it is inappropriate to apply the traditional offline discount coupon issuance strategy online. Also, in online, a lot of log data can be collected much more than offline. Therefore, if you use the marketing method using AI, you can establish effective marketing strategies such as discount coupon issuance strategy in real time.

In many examinations, the whole client bunch is viewed as a gathering and man-made intelligence expectation models are created immediately. Not with standing, clients have different conduct qualities because of unexplainable and different exchange designs, so it is outlandish to expect the whole client as a solitary client bunch. It will be substantially more impressive on the off chance that man-made intelligence models are laid out for each gathering who are having comparative inclinations as indicated by client conduct. In this review, applying profound learning methods to continuous snap stream information, we find clients with high possibility beating rates and issue a coupon that suits clients' inclinations. This study has the following importance: First, we divided the client and foster a reasonable model for client beat pre-word usage for every division.

We assume that the data owner is trusted, and the data users are authorized by the data owner. The communication channels between the owner and users are secure on existing security protocols such as SSL, TLS. With regard to the cloud server, our scheme resists a more challenging security model which is beyond the "semi-honest server" used in other secure semantic searching schemes. In our model, the dishonest cloud server attempts to return wrong/forged search results and learn sensitive information, but would not maliciously delete or tamper with the outsourced documents. Therefore, our secure semantic scheme should guarantee the verifiability, and confidentiality under such a security model.

IV.PROPOSED SYSTEM

In this paper, 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. Finally, we tested the conversion rate and sales growth. A two-dimensional cluster analysis-based churn rate estimation combined with a recommendation system was found to be significantly more useful than the respective simple models. Using this proposed model, it is possible to increase sales by automatically estimating the customer's churn probability and shopping propensity without the burden of marketing costs in the online shopping mall.

With the improvement of enormous information and profound learning innovation, large information and profound learning innovation have likewise been applied to the showcasing field, which was a piece of the executives. Likewise, development in web reception has made

computerized coupons a famous limited time apparatus. Modified computerized coupon issuance is a vital theme in

web-based trade. This is on the grounds that keeping up with existing clients is a more significant business issue than getting new clients. Likewise, holding existing clients is considerably more monetarily profitable than obtaining new clients. As a matter of fact, the procurement cost of new clients is known to be five to multiple times higher than the support cost of existing clients. Organizations that have really overseen client stir by further developing client maintenance are known to have a beneficial outcome on the organization's benefit as well as on further developing brand picture by further developing consumer loyalty.

Proposed Algorithm

linear programming (LP) problems to obtain the encrypted MWTC

Treating the matching between queries and documents as an optimal matching task, we formulate the word transportation (WT) problem following the optimal transportation problem of linear programming. We utilize WT problems to calculate the minimum word transportation cost (MWTC) as the similarity metric between queries and documents.

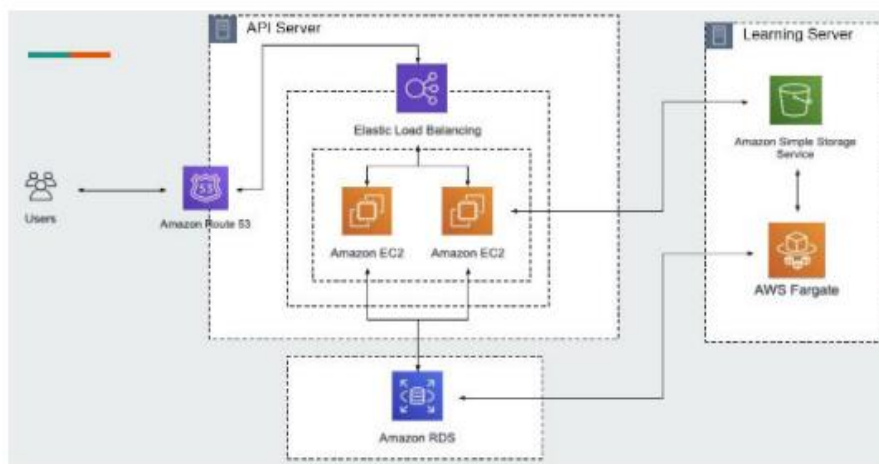


Figure 1. Architecture of the work.

We introduce the forward indexes as semantic information of documents. We define each keyword and its weight in the forward index of a document as the keywords distributions for the document. Therefore, we need to select keywords for each document and calculate the weight of each keyword in a specific document. Without loss of generality, we use TF-IDF (term frequency inverse document frequency) as a criterion to select keywords in our scheme.

In this project data owner has a register all details and then login. Data owner can be an upload a document. Data owner can have a send request to the data user. Data user can search a query with uploaded document. The file has also a download it will show an encryption format. Data user also a send a request to the cloud server. Cloud server can a login. It will accept a key approve. Cloud server can also see all the data information's. Cloud server can also see all the user information. Cloud server can see all the stored information. Cloud server can approve a key request from the user. Then data owner has get the request data owner can send a secret key to the user. Then user can also download a file. If the user has given wrong keys it gets warning the user has a block permanently. The file it gets an attacks.

	spending amount in the last month (\$)	the average payment per person (\$)	the average number of products purchased at one time	number of searches in the last month	average stay time per session time (second)	number of visits in the last month
Mean	(0.29, 45.03, 16.51)	(0.28, 40.53, 15.82)	(0.059, 4.10, 2.20)	(0.11, 0.40, 0.25)	(228.84, 460.85, 401.08)	(3.49, 8.53, 5.41)
Std	(1.29, 17.82, 6.71)	(1.28, 12.78, 6.24)	(0.27, 2.57, 1.32)	(3.58, 1.63, 1.17)	(779.71, 1088.87, 1012.87)	(35.29, 13.07, 9.98)
Min	(0, 29.56, 8.23)	(0, 9.54, 5.00)	(0,1,1)	(0,0,0)	(0,0,1)	(0,0,0)
25%	(0, 35.88, 9.94)	(0, 33.07, 9.94)	(0,2,1)	(0,0,0)	(38, 101.96,90)	(0,0,0)
50%	(0, 39.83, 15.62)	(0, 37.58, 14.53)	(0,4,2)	(0,0,0)	(80, 207.86, 176.75)	(0,3,0)
75%	(0, 44.44, 19.79)	(0, 4.08, 18.79)	(0,5,3)	(0,0,0)	(180.80, 442.29, 370.12)	(4,13,7)
max	(9.93, 323.07, 39.05)	(7.55, 145.23,27.25)	(7,22,12)	(647,56,30)	(21794.50, 21378, 21699)	(6378,163,132)

Table 1. Statistics for each segment.

V.CONCLUSION

We identified previous e-commerce marketing approaches to derive user behavior prediction. A deep learning method for real time customer churn prediction showed an appropriate result. We applied our research to online shopping mall to raise conversion rate and sales. To check whether our experiment carry out monetary value, we developed a framework to measure the sales amount when used with segment model and personalized recommended digital coupon. We found that our model (scenario1) shows the best results. We found it is suitable for e-commerce online shopping mall to raise conversifon rate and sales. Our study empirically showed that marketing, which was a field of management, could be solved more efficiently and quickly by applying big data and deep learning technology.

Finally, we confirm how much the purchase conversion are improved compared to the non-applied control group. Also, after applying the model, we estimate the rate of revenue increase in shopping mall.

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