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# BOOSTING SHOPPING MALL REVENUE THROUGH REAL-TIME CUSTOMIZED DIGITAL COUPON ISSUANCE

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## ABSTRACT

Following the advancements in big data and deep learning technologies, these fields have also been used to the business administration discipline of marketing. One of the key facets of marketing is managing customer turnover. In this research, we suggested a real-time, big data-driven approach to reduce customer attrition and boost buy conversion rate: offering personalised discount coupons in real time to consumers who exhibit high rates of attrition. A real-time churn rate estimate model based on clickstream data was created for each customer segment after two-dimensional segment analysis was used to divide the customer base into groups. Following that, we sent our clients personalised vouchers. Lastly, we conducted tests on sales growth and conversion rate. It was discovered that a recommendation system coupled with a two-dimensional cluster analysis-based churn rate calculation was much more helpful than the corresponding basic models. By automatically assessing the customer's likelihood of churn and shopping inclination, this suggested methodology may boost sales without adding to the online mall's marketing expenses.

## 1. INTRODUCTION

The fields of marketing and deep learning have been impacted by the advancement of these technologies, which were formerly exclusively associated with management. Additionally, as more people use the internet, digital coupons are becoming a common advertising tactic [1]. The issue of customised 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 [2]. Additionally, it makes much more financial sense to keep current consumers than to get new ones [3]. It is well known that the expense of acquiring new consumers is five to six times more than that of maintaining current ones [4]. Businesses that have successfully reduced customer attrition by increasing customer retention have been shown to benefit not just from increased profitability but also from enhanced brand perception as a result of higher customer satisfaction [5].

In highly competitive and urgent areas like banking, distribution, gaming, and telecommunications, customised coupon issuance research has historically been

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active. Its primary emphasis has been on creating predictive models using machine learning and artificial intelligence technologies [6]. 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 receptivity, such AI-driven targeting may save enormous marketing expenses and increase online sales [7].

The typical purchase conversion rate, in the case of online shopping malls specifically, is about 2%. The convenience of conveniently accessing online shopping malls via a PC or mobile device is a plus, but it can also be a drawback that makes it simple to notice and go. Therefore, even a little decrease in the client turnover rate may result in high conversion rates and significant financial gains.

Online malls make it easier to gather data than physical malls. The retail center's internal database has the ability to instantly compile all of the online behavioural traits of its patrons. As a result, it is feasible to have a vast amount of historical consumer data and to use it to recognise patterns in your clientele. In conclusion, you can raise customer conversion rates without running special promotions if you leverage extensive customer history data to predict preferences and behaviours.

Real-time personalisation of coupons is the simplest and most natural method. It is feasible to raise sales by raising

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 customised discount coupons. Additionally, you need an AI-powered strategy in order to implement these techniques. Once AI has automatically learnt client histories, it can detect individual consumers' preferences and behaviours to effectively provide discounts.

Deep learning-based tactics in particular may be used with AI approaches. To make the best choice, deep learning has to learn a lot of data, and the more data it has, the better the outcome. Customer behaviour and preferences may be predicted by analysing vast amounts of real-time log data collected in an online mall. Specifically, by updating and relearning the current model with daily-accumulating data, a more complex model may be produced on a daily basis.

Three main categories may be found in AI-based customised coupon issuing techniques: client segmentation, customer churn prediction, and personalised suggestion.

The process of classifying consumers based on their shared attributes is known as customer segmentation, and it serves as the foundation for targeted marketing campaigns tailored to specific customer segments [8]. supervised learning approaches like decision trees or unsupervised learning models like self-organising maps (SOMs) or K-means

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models were the most common machine learning models employed for consumer segmentation [9]. Recent machine learning-based customer segmentation studies include as one of their main characteristics the segmentation of customers being done for associated other marketing research reasons, such customer churn prediction [10], [11]. One of the primary machine learning-based marketing research areas is the prediction of customer turnover. Not to mention that successful customer churn prediction has been identified as a crucial area of research for enterprise-wide management strategy as well as marketing [4]. With customer churn rates rising in today's fiercely competitive business environment, numerous new model development studies have been carried out in an effort to successfully predict customer churn. In the past, significant research has been conducted to learn models to predict customer deviations using single 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 [12]. Along with churn prediction, personalised recommendation systems are among the most active subjects in machine learning-based marketing research [13]. There is a growing body of research on personalised suggestions for platforms like Netflix and Amazon. Model development research to improve prediction performance have dominated personalised recommendation investigations [13], [14].

However, issuing personalised coupons may have a big impact on online retailers. Compared to a conventional shopping mall, an online shopping mall has to operate in real-time due to the high volume of consumers who come and leave quickly. As such, using the conventional offline discount coupon issuing technique online is incorrect. Additionally, a lot more log data may be gathered online than offline. As a result, you may create efficient marketing tactics like a discount coupon issuance plan in real time if you use the marketing approach using AI.

In the majority of research, AI prediction models are created simultaneously and the whole client base is considered as a group. However, it is incorrect to consider all consumers to be part of a single customer group since varied transaction patterns and inexplicable factors lead to distinct behavioural traits across customers. If AI models are developed for each group that exhibits similar tendencies based on consumer behaviour, it will be even more potent. Using deep learning algorithms on real-time click stream data, we identify consumers in this research who are likely to churn and provide them with a voucher tailored to their preferences. The following are the importance of this study: We started by segmenting the client base and creating a model that was appropriate for predicting customer attrition for each category. Second, we used deep learning models to create a click stream-based real-time customer churn risk prediction model. Third, by offering personalised coupons on

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the official website of a genuine mall, we increased the conversion rate.

In contrast to previous research, this study made a scientific addition by using real-time data collection to analyse customers and by following three procedures to reduce customer attrition. Additionally, we implemented our model in a real shopping mall to show the three stages of our approach's economic efficacy and efficiency.

## 2. LITERATURE SURVEY

**“What makes a consumer redeem digital coupons? Behavioral insights from grounded theory approach,”**

**P. Naval and N. Pandey,**

The growth in internet adoption has made digital coupons a popular promotional tool. However, the extant literature on digital coupons is at an embryonic stage and requires theory building. This study adopts an inductive grounded theory approach to explore the new horizons for digital coupon redemption. The results showed that the intention to search and subscribe is a key driver of redemption, while coupon proneness and coupon acquisition value are its dimensions. Social media reviews, past experience, privacy risk, and customization are more relevant today for coupon redemption. The study also proposes segmentation of coupon users into deal buyers, planners, and convenience seekers based on consumer behavior.

**“Market segmentation based on hierarchical selforganizing map for markets of multimedia on demand,”**

**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.

**“Finding the hidden pattern of credit card holder’s churn: A case of China,”**

**G. Nie,**

In this paper, we propose a framework of the whole process of churn prediction of credit card holder. In order to make the knowledge extracted from data mining more executable, we take the execution of the model into account during the whole process from variable designing to model understanding. Using the Logistic regression, we build a model based on the data of more than 5000 credit card holders. The tests of model perform very well.

**“Customer satisfaction cues to support market segmentation and explain switching behavior,”**

**A. D. Athanassopoulos,**

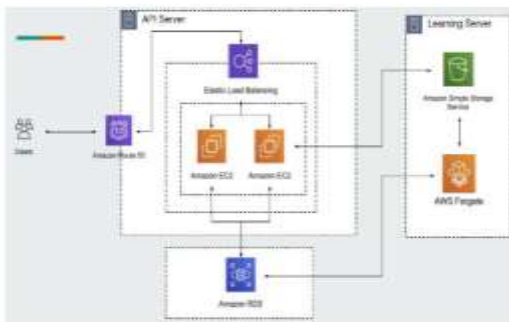
In this paper, customer satisfaction cues in retail banking services in Greece are



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examined. The study proposes an instrument of customer satisfaction that contains service quality and such other attributes as price, convenience, and innovation. The proposed framework of customer satisfaction was verified empirically yielding four distinct facets for business customers and five for individual customers. The performance implications of the customer satisfaction instrument are also explored. What is shown is that customer segments, in fact, yield statistically different satisfaction scores, which verifies the managerial value of customer segmentation practices. Finally, the facets of customer satisfaction as explanatory cues for the switching behavior of individual and business customers were tested successfully.

### 3. SYSTEM ARCHITETURE



### 4. EXISTING SYSTEM

Customer segmentation is a starting point for marketing research. After grouping customers based on the characteristics of homogeneous customers, marketing strategies for each target segment can be done. Customer segmentation should not

end in segmentation, but should be accompanied with subsequent marketing strategies. Companies that use customer segmentation techniques perform better by building differentiated and efficient marketing for each segment of customers. In addition, companies can gain a deeper understanding of customer preferences and requirements. Among various customer segmentation techniques, RFM methods are the most classical yet universally utilized methods. The RFM splits the purchasing behavior into three dimensions and scores each dimension. R is the last time since the last purchase, F is the total frequency of purchase, and M is the total purchase amount. The scores are calculated for each of the three dimensions. Subsequently, it constructs segments according to three dimensional classes [15], [16], [17], [18].

Along with traditional RFM methods, a lot of customer segmentation researches using machine learning have been conducted recently. When clustering using multiple variables, dimensionality reduction is often done. A representative dimensionality reduction technique using deep learning is the auto encoder. A typical example is the sequential method of applying cluster analysis after dimensionality reduction using an auto encoder [19]. Alternatively, modeling can combine dimensionality and clustering at the same time [20], [21].

The prediction and prevention of customer churn have always been studied as a key issue in loyalty management. The reason why companies are concerned with churn

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prediction is of two issues: the first reason is that a large number of customer churn affect the reputation and reliability of service providers. The second reason is that attaining a new customer costs five to six times than retaining an old customer. It is necessary to develop a churn prediction model that should catch deviating from normal purchase pattern [22]. Researches on customer churn are mainly based on machine learning techniques rather than empirical studies through hypothesis verification [23]. Predicting churning customers fall under the classification problem where the given customer is classified as either churn or non-churn. Reference [24] proposed a framework for proactive detection of customer churn based on support vector machine and a hybrid recommendation strategy. While SVM predict E-Commerce customer churn, recommendation strategy suggests personalized retention actions. Reference [25] come up with a customer churn model that predict the possibility and time of churn. The model used Naïve Bayes classification and Decision Tree algorithm. Reference [26] used LSTM model to predict customer churn prediction with clickstream data.

The personalized recommendation is one of the most actively conducted machine learning-based marketing research topics. In the past, personalized recommendation researches were mainly conducted using association analysis or purchase probability estimation for individual products [27]. However, in recent, collaborative filtering applied to recommended services such as

Amazon and Netflix and contentbased techniques are the leading trend within the research field. Recently, hybrid methods or deep learning-based research combining various auxiliary processing techniques has also been active [28]. Design of recommendation system depends on the objective of the system. Therefore, there exist a wide variety of techniques used in the recommendation system. Content-based and collaborative filtering systems are mostly used [29]. The other types of recommendation system like Knowledge-based recommendation system and constraint based recommendation system are also used [30], [31]. Classifier-based recommender systems like Decision tree, Neural networks, Naïve Bayes, MLP, KNN, SVM and Linear regression models are also used [32], [33], [34]. Clustering-based recommendations such as a K-means clustering algorithm is also used [35]. Recently, research on recommendation systems using deep learning has been active [36]. Recommendation systems using deep learning have strengths on nonlinear modeling, various formats of input data, and time series modeling. For example, [37] proposed a time-aware smart object recommendation system in the social Internet of Things. Reference [38] proposed a recommendation system that identifies and recommends the optimal location when opening a chain store. Reference [39] proposed a preference learning method from heterogeneous information for store recommendation.

### **Disadvantages**

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- The complexity of data: Most of the existing machine learning models must be able to accurately interpret large and complex datasets to detect Improving Shopping Mall Revenue.
- Data availability: Most machine learning models require large amounts of data to create accurate predictions. If data is unavailable in sufficient quantities, then model accuracy may suffer.
- Incorrect labeling: The existing machine learning models are only as accurate as the data trained using the input dataset. If the data has been incorrectly labeled, the model cannot make accurate predictions.

## 5. PROPOSED SYSTEM

Using deep learning algorithms on real-time click stream data, we identify consumers in this research who are likely to churn and provide them with a voucher tailored to their preferences. The following are the importance of this study: We started by segmenting the client base and creating a model that was appropriate for predicting customer attrition for each category. Second, we used deep learning models to create a clickstream-based real-time customer churn risk prediction model. Third, by offering personalised coupons on the official website of a genuine mall, we increased the conversion rate.

In contrast to previous research, this study made a scientific addition by using real-time data collection to analyse customers and by following three procedures to reduce customer attrition. Additionally, we

implemented our model in a real shopping mall to show the three stages of our approach's economic efficacy and efficiency.

## Advantages

Two-dimensional customer segmentation produced RNN-based churn estimate models for every customer segment in the suggested system. Following that, we sent vouchers for certain product categories to clients who are likely to leave. A hybrid recommendation algorithm is used to provide personalised coupons.

## 6. 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 Train & Test Data Sets, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View Prediction Of Shopping Mall Revenue Type, View Shopping Mall Revenue Prediction Type Ratio, Download Predicted Data Sets, View Shopping Mall Revenue Prediction Type Ratio Results, View All Remote User

#### View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.



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### 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 Prediction Type, VIEW YOUR PROFILE.

## 7. CONCLUSION

In order to forecast user behaviour, we examined prior e-commerce marketing strategies. An adequate result was obtained using a deep learning algorithm for real-time customer churn prediction. In order to increase conversion rate and revenue, we implemented our study at an online shopping mall. We created a framework to monitor sales amount when combined with segment model and personalised advised digital discount in order to verify if our experiment has a monetary benefit. We discovered that the best outcomes are shown by our model (scenario 1). We discovered that it works well for e-commerce online malls to increase sales and conversion rates. Our work actually shown that the use of big data and deep learning technology might address problems related to marketing, a subject of management, more rapidly and effectively.

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