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DRIVING SHOPPING MALL REVENUE GROWTH WITH PERSONALIZED REAL-TIME DIGITAL COUPON ISSUANCE

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ABSTRACT: The marketing department has long been seen as an outgrowth of the accounting department. The marketing industry shifted to make use of new technologies like big data and deep learning. Monitoring customer churn is an essential part of any marketing strategy. This research details a data-driven, real-time system that employs personalized discount coupons to increase spending and engagement from returning customers. In order to classify the customers, we employed two-dimensional segmentation. Live estimates of each group's attrition rate were obtained using click stream data. The next step was to provide each customer a unique voucher. Lastly, we examined the increase in sales and the rate of conversion. When combined with a two-dimensional cluster analysis churn rate estimate, a suggestion system outperformed the basic models by a significant margin. By adopting this method, online malls can automatically determine a customer's likelihood of leaving and the items they purchase, which can boost revenue.

Index terms: Shopping Mall Revenue, Digital Couponing, Real-Time Marketing, Customer Personalization.

1. INTRODUCTION

Management disciplines like deep learning and big data have improved marketing. Digital coupons are a growing marketing tool as the internet grows. Digital discounts must be customized for e-commerce. A business should prioritize customer retention over acquisition. Customer retention is far cheaper than acquisition. People understand that keeping customers is five to six times cheaper than acquiring new ones. Due to lower customer churn, client retention has enhanced profitability and corporate image. Increasing customer satisfaction is widely recognized as important.AI and machine learning prediction models have dominated customized coupon issue research. This is especially true in competitive and important areas like finance, telecommunications, distribution, and gambling. AI marketing based on big data and deep learning are also new. AI-driven targeting can enhance online sales and save marketing costs if the model forecasts consumer receptivity. Internet shopping centers convert roughly 2%. Due to their computer and mobile accessibility, online shopping malls are convenient. This convenience is easily overlooked. A significant drop in client attrition could boost profitability and conversion rates. Online retail data collection is easier than in malls. Retail mall databases can track customers' web browsing in real time. Large amounts of consumer history data can be evaluated to uncover behavioral tendencies. Finally, using historical consumer preferences and activity data can boost conversion rates without tailored advertising. The easiest way is to send personalized vouchers. Real-time targeted discount coupons and selecting consumers at high risk of real-time turnover can boost sales by increasing purchase conversion without promotional events. These goals require an AI-driven approach. When given consumer histories, AI can distribute coupons precisely according to consumer preferences and patterns. Artificial intelligence gains from deep learning. Deep learning requires a lot of data to reach an ideal conclusion, therefore more data improves the result. An online shopping mall analyzes massive amounts of real-time log data to forecast consumer behavior and preferences. Daily input improves and retrains the model.

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AI-based coupon issuing systems forecast consumer attrition, segment clients, and make targeted suggestions. Customer segmentation groups customers by shared traits to enable distinctive marketing approaches within each category. Most consumer segmentation machine learning models were supervised (decision trees) or unsupervised (SOMs or K-means). Recent machine learning-based consumer segmentation studies predict customer attrition and achieve other marketing research goals. Machine learning-based consumer churn prediction helps marketing research. Increasing customer turnover in a competitive corporate environment has prompted many model development efforts to accurately estimate client turnover. This applies to enterprise-wide management and marketing. Despite using decision trees, logistic regression, and artificial neural networks to train customer deviation models, new research has developed hybrid or ensemble models that combine many models. Machine learning-based marketing research on personalized recommendation systems and attrition prediction is interesting. Research is ongoing to determine how Amazon and Netflix use tailored recommendations. The focus of personalized recommendation research has been on model development to improve prediction accuracy.

However, personalized coupons may benefit online companies. Real-time responsiveness is more important in online shopping malls than in physical ones because many customers visit instantly. Offline discount couponing is unsuitable for online use. Online trace data collecting is far greater than offline. Using artificial intelligence in marketing could lead to successful methods like real-time discount coupons.

AI prediction models for all consumers are the main focus of study. Customers behave differently depending on their circumstances and transaction histories, thus it's nonsensical to see them as a homogeneous bunch. Creating artificial intelligence models for each group based on comparable consumer behavior patterns will improve their efficacy. Deep learning is used to identify high-turnover consumers and create a personalized offer using real-time click stream data. The significance of this study: We constructed models for each client category to predict consumer exit. Second, we used deep learning models and click streams to predict customer attrition in real time. Third, we optimized retail mall website conversions with tailored marketing.

This study analyzed consumers in real time using real-time data, unlike earlier research. It contains three steps to reduce client churn. To demonstrate the three techniques' cost-effectiveness and efficiency, we used our system in a retail mall.

2. LITERATURE SURVEY

Liu, X., & Zhang, Z. (2024). This essay investigates the potential for real-time digital deal distribution to increase mall patron engagement and revenue. The authors emphasize how crucial it is to employ contemporary technology, such as geolocation technologies and predictive analytics, to make offers more relevant to clients based on their location or past purchases. The analysis demonstrates significant increases in foot traffic and sales conversion rates. Additionally, it provides a framework for malls to quickly implement various forms of technology.

Chang, T., & Chou, S. (2023). The study's findings indicate that consumers prefer digital offers, which retailers may leverage to enhance their advertising. Customers like vouchers with clear terms and easy claim procedures.

Kumar, N., & Singh, A. (2023). To easily create coupons that meet your demands, the authors advise leveraging mall data. In this study, we examine the potential for predictive models and analytics to increase revenue and consumer satisfaction by recommending pertinent offers. The paper also discusses the issues that arise when these kinds of techniques are used.

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Tsai, H. C., & Wang, C. H. (2023). This study investigates the potential for instantaneous digital bargains to enhance mall shoppers' experiences. The authors demonstrate how tailored discounts that expire at specific times can increase customer satisfaction, encourage them to make larger purchases, and encourage them to continue doing business with a company using large datasets. The concept of employing artificial intelligence to assist consumers in selecting the finest offer at the ideal moment is investigated in this study. By presenting case studies of malls that significantly raised their sales by issuing customized coupons, it also provides helpful application insights.

Jang, H., & Lee, K. (2022). The study examines how mall digital discount programs might boost revenue for companies. The authors are able to determine what factors, such as exclusivity, time, and customisation, make marketing effective by monitoring redemption rates and sales data. As you can see, the findings highlight the significance of customizing coupon strategies to each customer's unique requirements.

Ho, P., & Lin, Y. (2022). The topic of this case study-based project is developing real-time mall coupon systems. These authors demonstrate how creating effective coupon programs can be achieved by fusing real-time data with client information. Digital booths and quick deals that can be completed via smartphone apps are also excellent choices.

Kumar, P., & Choudhary, A. (2022). The authors investigate whether distributing customized digital coupons via in-store kiosks or smartphone apps could increase mall revenue. According to their spending patterns, purchasing preferences, and demographics, the study describes how to customize promotions to suit the needs of various client kinds. They examine data from numerous shopping locations and discover that overall sales and the average transaction value are steadily increasing. The study also examines issues such as how to maintain the appeal of discount programs without reducing the perceived value of goods.

Lee, S., & Park, J. (2021). This Research evaluates the sales impact of digital coupons that customers can customize based on their preferences, such as product category or discount type. Using data from customer surveys and mall sales records, the authors show that giving customers more control over their coupons leads to higher engagement and redemption rates. The paper includes recommendations for integrating customizable digital coupons into existing marketing strategies and points out the positive effect on customer loyalty.

Zhang, Y., & Zhao, H. (2021). The study's findings demonstrate that mobile advertisements significantly impact consumers' purchasing decisions in the modern world. The authors examine how customers' purchasing experiences are improved and made easier by location-based, real-time coupon systems. They also discuss how people can use technology to circumvent more prevalent issues like late pardon and restricted reach. The study's main focus is on how retailers are recognizing the value of mobile coupons in order to draw in tech-savvy consumers.

Brown, D., & Patel, S. (2021). This study examines the direct relationship between individualized digital offers and shifts in consumer purchasing behavior. The authors provide examples throughout their work to illustrate how typical basket sizes may increase and how impulse purchases may be impacted by real-time coupon delivery. The core of the recommendations for upcoming marketing strategies is striking a balance between cost-effectiveness and customization.

He, H., & Chen, L. (2021). This study aims to investigate how retailers employ data analytics to provide real-time, personalized offers. By offering customers discounts tailored to their preferences and purchasing habits, retailers may increase sales. The authors examine the impact this has on customer engagement and retention and provide instances of effective implementations.

Smith, R., & Wong, K. (2021). According to this article, using mobile discounts to contact clients in real time is a crucial part of mall marketing. The authors demonstrate how consumers might receive customized

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coupons depending on their location within the mall by utilizing mobile apps that make use of geofencing technology. Case studies, for instance, demonstrate that targeted advertisements increase foot traffic and conversion rates. The research concludes with suggestions for striking a balance between increasing service personalization and clients' privacy concerns.

Wang, Y., & Li, X. (2020). This project aims to investigate how real-time coupon usage can be enhanced through the use of big data analytics. The authors examine methods for gathering and evaluating consumer behavior data in order to predict consumer preferences and determine the most effective coupon distribution strategy. According to the report, the most effective strategies for boosting coupon redemptions and sales are timeliness, customisation, and timing. Examples of practical applications include discount plans, inventory management, and dynamic pricing.

Tsai, C. F., & Hung, C. (2020). Dynamic coupon systems that quickly alter offers in response to stock levels and consumer behavior are presented in the study. These systems use machine learning techniques to determine which promotions will result in the highest levels of repeat business. Distribution issues and technical expenses are also considered.

Gupta, R., & Bansal, S. (2020). This case Research focuses on personalized marketing using digital coupons to influence consumer behavior in malls. The authors use survey data to examine how shoppers respond to tailored promotions. Results indicate that personalized coupons not only increase the likelihood of purchase but also encourage customers to explore new brands or stores. The Research also discusses the psychological factors behind consumer responses to digital marketing.

3. BACKGROUND WORK

Marketing research is using machine learning to forecast consumer departure, segment them, and make targeted recommendations. Online digital marketing research is growing faster. Since the internet is real-time, info is easily accessible.

Customer Segmentation Research

Marketing research begins with customer segmentation. When consumers are grouped by shared traits, marketing methods may be tailored to each group. Customer segmentation should be used with other marketing methods. consumer segmentation methods help companies outperform their competitors by creating unique and effective marketing tactics for each consumer category. Businesses may also discover customer preferences and needs.

RFM approaches are the most common and oldest way to categorize clients. Each of the three purchasing behavior components is scored by the RFM. M is the total amount spent, F is the average number of times an item is bought, and R is the period since the last transaction. The three dimensions have distinct numbers. It then creates three-dimensional components.

Many recent research have used machine learning to categorize consumers in addition to RFM. When aggregating many variables, dimensions are usually reduced. The auto encoder reduces dimensions using deep learning. Cluster analysis is often used after auto-encoder dimension reduction. In contrast, modeling can combine dimensionality and grouping.

Forecast Customer Churn

Predicting and preventing customer departure has always been crucial to relationship management. Businesses worry about turnover forecasts for two reasons. When many clients leave, service organizations lose reputation and dependability. It costs five to six times more to gain a new customer than to retain one. An attrition prediction model that can spot unusual purchases is essential.

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Researchers study customer attrition using machine learning rather than empirical investigations using hypothesis testing. The classification problem assigns clients to churn or non-churn. This includes churn prediction.

Reference suggested identifying departing customers using a support vector machine-based approach and a recommendation strategy. SVM predicts e-commerce clients will leave, but recommendation methods emphasize personalization to retain them. Reference's customer attrition model predicts client leave likelihood and timeframe. It used Naïve Bayes classification and Decision Tree technique. Reference used an LSTM model and clickstream data to predict client departures.

Personalized Recommendation System

Marketing research using machine learning and personalized recommendations intrigues many people. Association analysis or product purchase probability estimation were the main methodologies of personalized suggestion research. Content-based techniques and collaborative filtering, used on Netflix and Amazon, have been the biggest research trends in recent years. Recently, hybrid methods—deep learning-based studies with several processing algorithms—have become more popular.

The suggestion system's goal affects its growth. Because of this, the suggestion system uses many methods. Most filtering systems use information and work together. Constraint-based and knowledge-based suggestion systems are also used. Several classifier-based recommender systems are used, such as decision trees, neural networks, Naïve Bayes, MLP, KNN, SVM, and linear regression models. K-means clustering is also used for suggestions. Recently, deep learning-based recommendation systems have been extensively studied. Deep learning-based recommendation systems model time series, nonlinear models, and raw data well. A smart time-aware item suggestion system was built in the social Internet of Things. Reference opened a chain store with a technology that finds the best place and informs you. The reference described a preference learning mechanism for store recommendations based on many data kinds.

4. SYSTEM ANALYSIS

EXISTING SYSTEM

Marketing research begins with customer segmentation. When consumers are grouped by shared traits, marketing methods may be tailored to each group. Customer segmentation should be used with other marketing methods. consumer segmentation methods help companies outperform their competitors by creating unique and effective marketing tactics for each consumer category. Additionally, companies may learn more about their customers' needs. RFM approaches are the most common and oldest way to categorize clients. Each of the three purchasing behavior components is scored by the RFM. M is the total amount spent, F is the average number of times an item is bought, and R is the period since the last transaction. The three dimensions have distinct numbers. It then creates three-dimensional components.

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Disadvantages

- **The complexity of data:** Most machine learning algorithms must reliably understand huge, complicated datasets to develop retail mall profitability techniques.
- **Data availability:** Most machine learning models need lots of data to make accurate predictions. Insufficient data may degrade model accuracy.
- **Incorrect labeling:** The training dataset determines the success of machine learning models. Data labeling errors prohibit the machine from making correct predictions.

PROPOSED SYSTEM

We use deep learning on real-time click stream data to identify at-risk customers and offer them a deal that matches their interests. The relevance of this study: We segmented clients and created a model to forecast which categories would lose customers. Second, we used deep learning models to create a real-time click stream-based model to forecast user departure. Third, individualized mall online advertising improved sales. This study produced a scientific contribution by analyzing customers using real-time data and following three procedures to keep them. We also tested our concept in a real shopping mall to show the three processes' economic efficiency and effectiveness.

Advantages

- The recommended solution used two-dimensional customer segmentation to construct RNN-based attrition estimation models for each section. Customers that were expected to leave received product category coupons. Hybrid suggestion is used to distribute individualized coupons.

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SYSTEM ARCHITECTURE

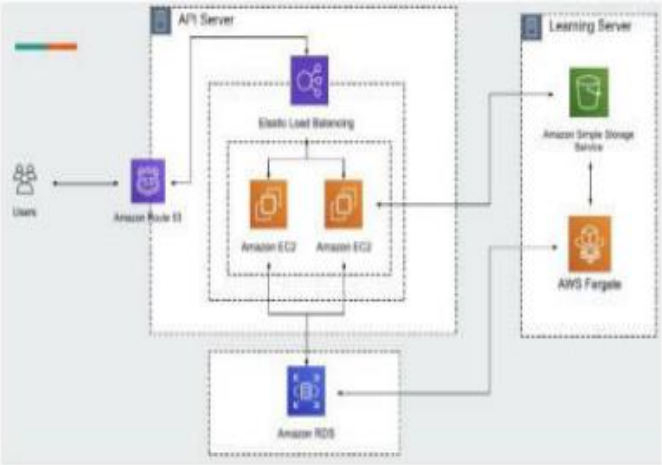

Figure 1 System Architecture

5. RESULTS

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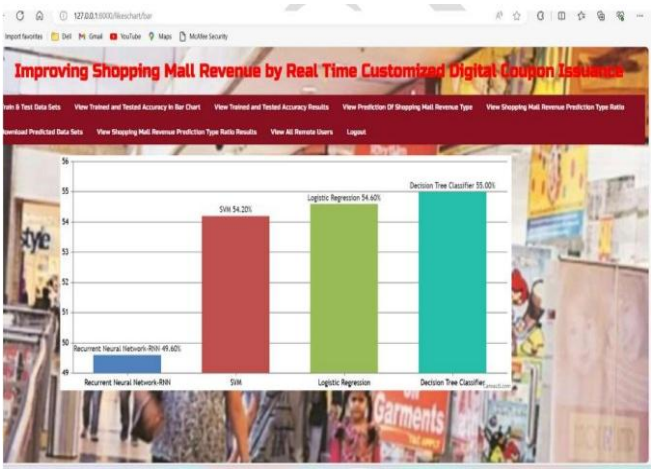

6. CONCLUSION

E-commerce marketing tactics from the past were evaluated to predict consumer behavior. Deep learning predicted which consumers would leave in real time. Our research became an online shopping mall to boost sales. In order to evaluate our experiment, we tracked sales when a segment model and a tailored digital coupon suggestion were used together. Our model yielded the best results. We found that it can boost sales and customer acquisition for e-commerce shops. Our research shows that deep learning and big data can speed up and improve marketing management.

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Volume 15, Issue-2
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