Improving Shopping Mall Revenue by Real Time Customized Digital Coupon Issuance

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Abstract:

The rapid growth of big data and deep learning technologies has transformed their applications across various domains, including marketing within business administration. One critical aspect of marketing is customer churn management, which directly impacts business performance. This study presents a method to minimize customer churn and improve purchase conversion rates by distributing personalized discount coupons to customers identified with a high likelihood of churn, using real-time big data analysis.

The approach begins with two-dimensional customer segmentation through cluster analysis, followed by the development of a real-time churn prediction model utilizing clickstream data for each segment. Based on these predictions, tailored coupons are generated and delivered to target customers. The effectiveness of the method was validated by measuring conversion rates and sales growth.

The findings indicate that a hybrid model, integrating churn estimation with a recommendation system, outperforms traditional standalone models in predicting customer behaviour and enhancing engagement. This approach enables online retailers to boost sales and retain customers by automatically estimating churn probability and purchasing tendencies using Support Vector Machine, all while minimizing marketing costs.

Keywords — Churn Management, Coupon Generation, Customer Segmentation, Machine Learning, Purchasing Tendencies, Marketing Cost, Support Vector Machine, Personalized Discount Coupon

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I. INTRODUCTION

With the fast growth of big data and deep learning, these technologies are being widely used in different areas, especially in marketing. One important application is the use of digital coupons as a tool to attract and retain customers. Studies show that keeping an existing customer is much cheaper than getting a new one. Companies that reduce customer churn not only increase profits but also improve customer satisfaction and brand image.

In online shopping, conversion rates (turning visitors into buyers) are very low, usually around 2%. Since online platforms collect a lot of customer data in real time, they can use this data to better understand customer behaviour. By using AI and machine learning models, businesses can identify customers who might leave and give them personalized coupons at the right time. This approach helps improve sales with lower promotional costs.

Despite the fast growth of e-commerce, online purchase conversion rates remain very low. Customers often visit online shopping platforms but leave without completing a purchase. Traditional promotional strategies like general discounts are expensive and not always effective because they do not target the right customers.

A. LITERATURE REVIEW

Junyuan Guo et al. [1] This paper presents a large-scale, production coupon-allocation system for an online-to-offline marketplace. It formulates real-time allocation as a decision problem under budget and roi constraints, learns user intent from streaming behavioral signals, and deploys an online serving framework that updates recommendations with millisecond latencya.

Guangqiao Li et al. [2] Using large-scale observational data, they estimate user- and context-specific incremental responses to different coupons, then optimize targeting to maximize incremental revenue under budget constraints. Offline evaluation and online A/B tests show that uplift-based targeting outperforms probability-of-purchase or propensity models, yielding higher ROI and more efficient spend.

Similarly, P. Manikonda et al. [3] This industry paper details a real-world system for selecting which users receive which promotion while honouring business constraints (budgets, supply conditions). It combines causal-inference-based incremental lift estimation with an optimizer that chooses offers across user segments. The deployment improved order conversion and marketing efficiency relative to heuristics, highlighting the

importance of modelling incremental impact rather than raw response.

B. EXISTING SYSTEM:

Customer segmentation is one of the most common methods used in marketing research. In this approach, customers are grouped based on similar traits, and companies then design targeted marketing strategies for each segment. However, segmentation should not stop at just grouping; it should also involve specific actions for each customer segment. Customers are scored on each dimension and then grouped accordingly.In recent years, machine learning-based segmentation has become more popular. Often, techniques such as dimensionality reduction (e.g., autoencoders in deep learning) are applied before clustering. Some approaches reduce dimensions first and then cluster, while others combine both steps into a single process.

C. PROPOSED SYSTEM:

The proposed system applies deep learning techniques to real-time clickstream data in order to identify customers who are at high risk of churn. Based on this prediction, personalized coupons are issued to retain those customers. Customer Segmentation: Customers are grouped into meaningful segments, and churn prediction models are developed for each segment.
Real-Time Churn Prediction: A deep learning model analyzes clickstream data to predict churn risk in real time.
Personalized Coupon Issuance: Coupons tailored to each customer's preferences are issued immediately to improve retention and increase conversion rates.
Unlike traditional systems, this approach not only analyzes customer behaviour in real time but also uses a three-step process (segmentation → churn prediction → coupon issuance). The system was tested in a real shopping mall environment, showing both economic efficiency and practical effectiveness.

II. METHADOLOGY

The methodology involves multiple steps for training, validating, and predicting outcomes. The proposed architecture for proactive churn prediction in shopping mall by clustering customer segmentation by using algorithms such as SVM, Logistic Regression, Decision Tree and Random Forest.

A. SYTEM WORKFLOW

- **input** : Owner enters the shopping mall data
- **Examine** : Analyze the data through ML analysis
- **Detection** : Predict and classify the customers

B. OBJECTIVES:

The main objectives of this study are:
To analyze how big data, machine learning, and deep learning can be applied in marketing for customer retention.

- To design a method that can predict customer behaviour using classification algorithms.
- To explore the K-Nearest Neighbour (KNN) algorithm for making recommendations based on customer data.
- To test and compare the performance of multiple algorithms (Logistic Regression, KNN, SVC, Random Forest, etc.) using train-test splits and cross-validation.
- To improve purchase conversion rates by distributing personalized coupons in real time.

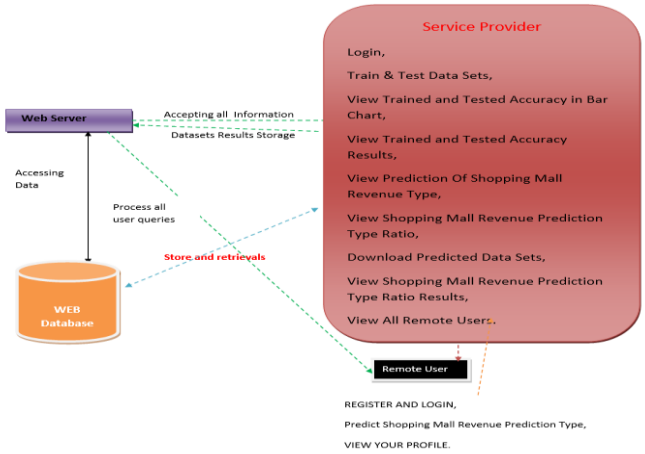

Fig. 1 System Architecture

C. RESULTS

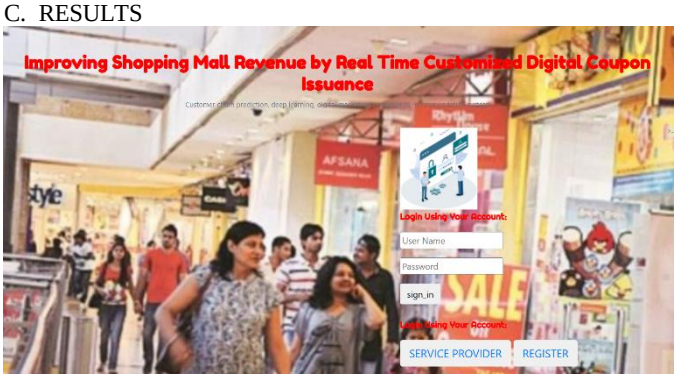

Fig. 2 Home Page

Fig. 3 Owner Register Page

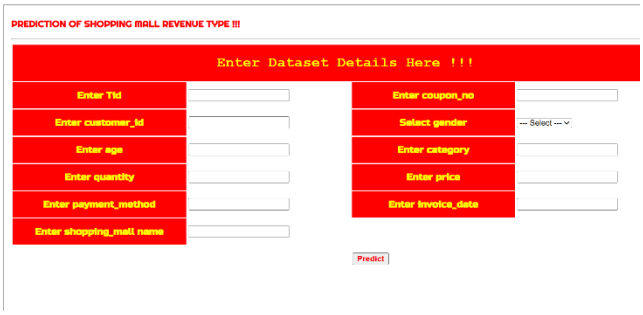

Fig. 4 Data Entry Page

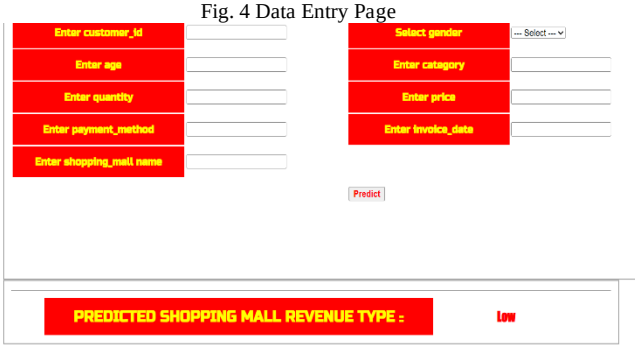

Fig. 5 Prediction Page

III CONCLUSION

In conclusion, this project pioneers a sophisticated approach to customer churn prediction and personalized coupon recommendation in real-time shopping mall environments. Through the segmentation of customers and the development of tailored churn prediction models, coupled with real-time analysis of clickstream data, the system enables proactive intervention to mitigate churn risk and enhance customer retention. By integrating a hybrid recommendation system for issuing customized coupons, the project demonstrates tangible economic benefits by improving the conversion rate on the shopping mall website. This comprehensive solution underscores the potential of deep learning techniques to drive actionable insights and business outcomes, bridging the gap between scientific research and practical implementation in the domain of customer relationship management and marketing strategies.

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