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.

INTRODUCT ION:

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 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 [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, customized coupon issuance research has historically been 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. Customers' whole online behavioral profile may

be gathered in real time inside the shopping center's own database. As a result, it is feasible to have a vast amount of historical consumer data and to use it to recognize patterns in your clientele. In conclusion, you can raise customer conversion rates without running special promotions if you use comprehensive consumer history data to predict behaviors and preferences.

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 specific consumer preferences and behaviors to effectively provide coupons.

Deep learning-based tactics are one kind of AI methodology that may be used. 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 behavior and preferences may 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, a more complex model may be produced on a daily basis.

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-organizing maps (SOMs) or K-means 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 attrition prediction, customized recommendation systems are among the most active subjects in machine learning-based marketing research [13]. There is a growing body of research on tailored suggestions for platforms like Netflix and Amazon. Model development research to improve prediction performance have dominated personalized recommendation investigations [13], [14].

SYSTEM ARCHITECTURE:

System architecture refers to the high-level design of a software or information system, outlining its components, structure, interactions, and technologies used. It defines how different parts of the system work together to achieve the desired functionality, performance, scalability, and other quality attributes. A system architecture provides a blueprint for developers, guiding the implementation and integration of various elements to meet the system's requirements and objectives.

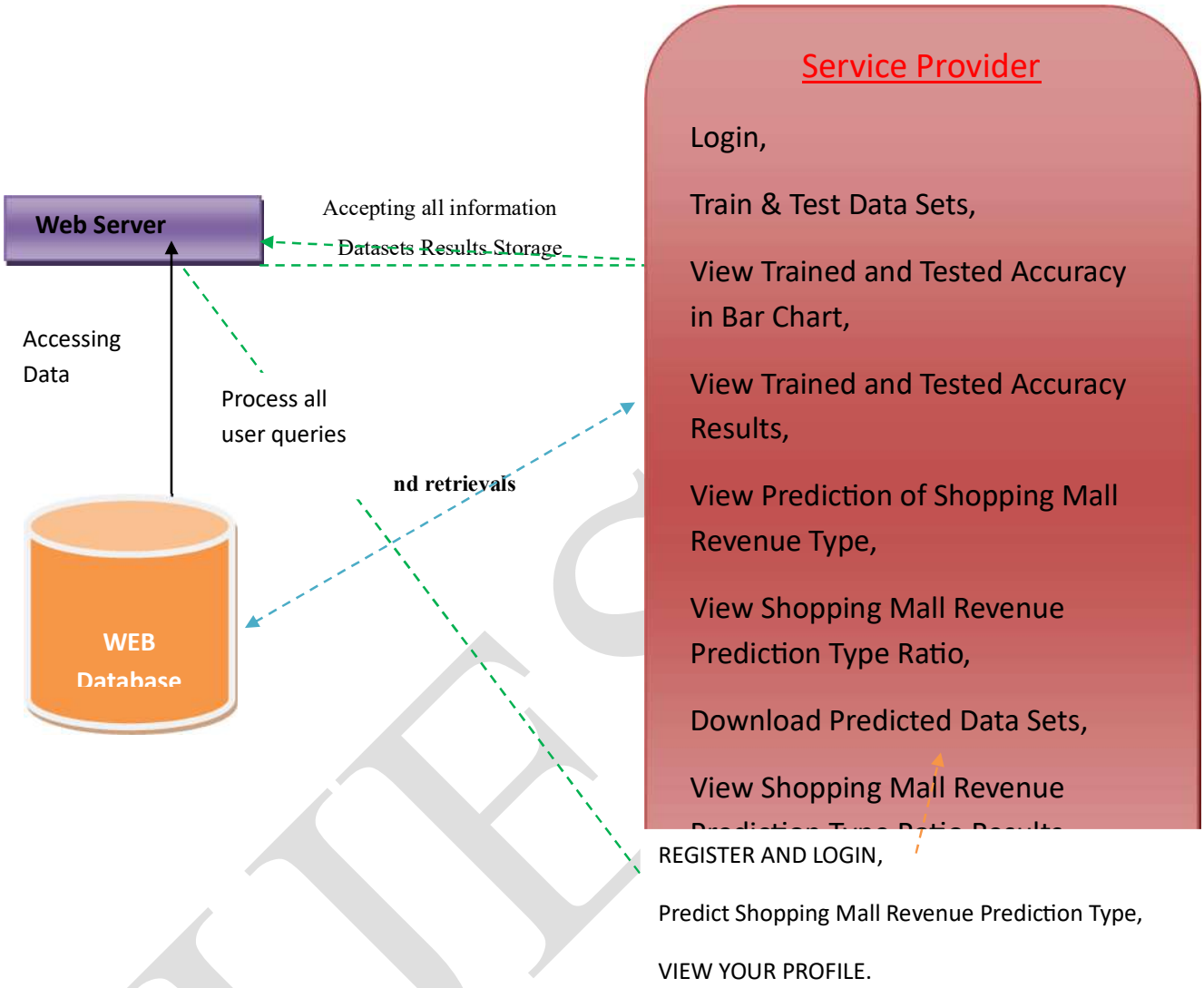
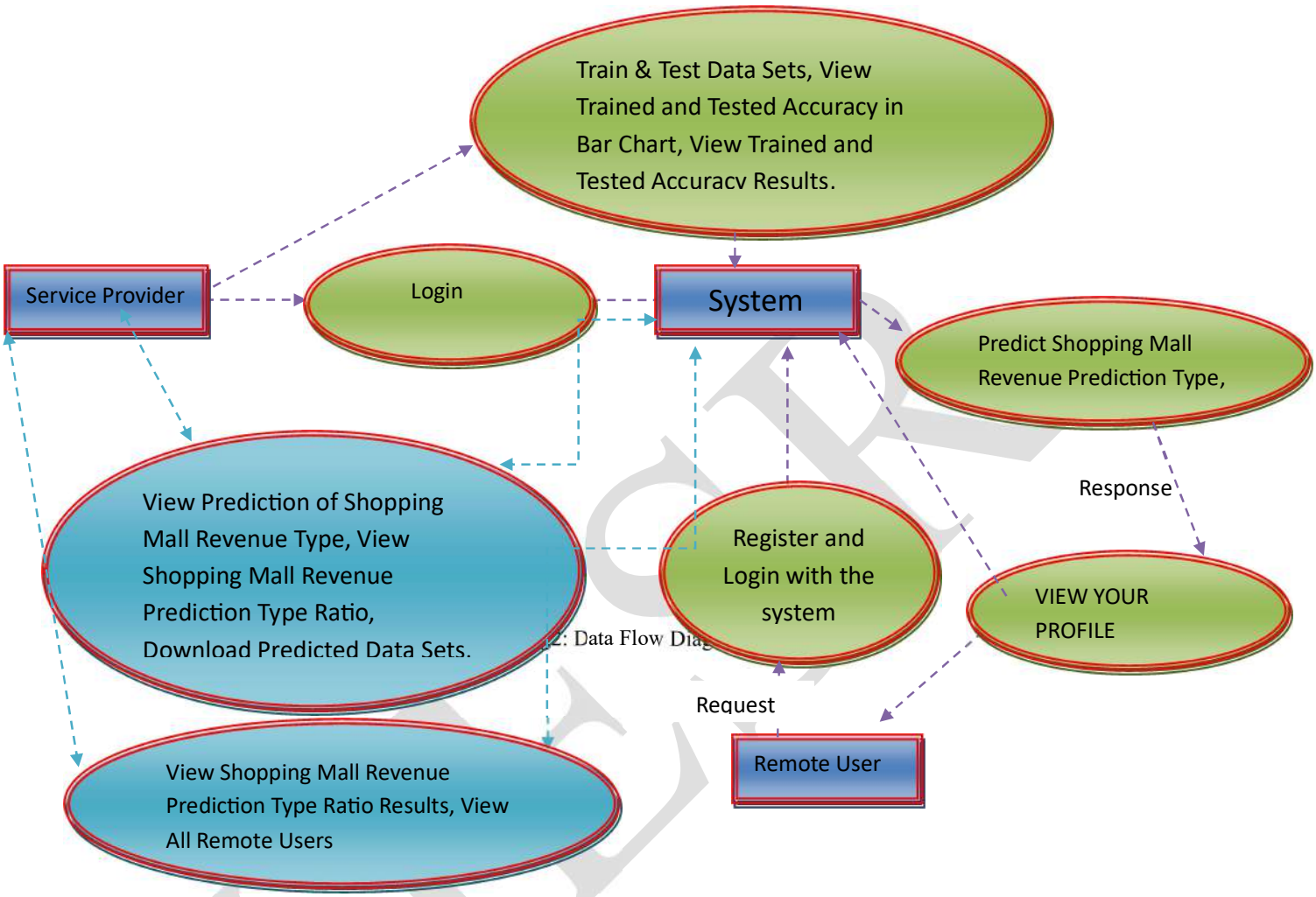


Fig1: System Architecture

Data Flow Diagram:

A Data Flow Diagram (DFD) is a graphical representation that illustrates the flow of data within a system. It shows how data moves from input sources, through processes, to output destinations. The primary purpose of a DFD is to model the system's data flow and transformations clearly and understandably.



Decision tree classifiers:

Decision tree classifiers are used successfully in many diverse areas. Their most important feature is the capability of capturing descriptive decision-making knowledge from the supplied data. Decision tree can be generated from training sets. The procedure for such generation based on the set of objects (S), each belonging to one of the classes C1, C2, …, Ck is as follows:

Step 1. If all the objects in S belong to the same class, for example Ci, the decision tree for S consists of a leaf labeled with this class

Step 2. Otherwise, let T be some test with possible outcomes O1, O2,…, On. Each object in S has one outcome for T so the test partitions S into subsets S1, S2,… Sn where each object in Si has outcome Oi for T. T becomes the root of the decision tree and for each outcome Oi we build a subsidiary decision tree by invoking the same procedure recursively on the set Si.

Gradient boosting

Gradient boosting is a machine learning technique used in regression and classification tasks, among others. It gives a prediction model in the form of an ensemble of weak prediction models, which are typically decision trees.[1][2] When a decision tree is the weak learner, the resulting algorithm is called gradient-boosted trees; it usually outperforms random forest.A gradient-boosted trees model is built in a stage-wise fashion as in other boosting methods, but it generalizes the other methods by allowing optimization of an arbitrary differentiable loss function.

K-Nearest Neighbors (KNN)

- Simple, but a very powerful classification algorithm
- Classifies based on a similarity measure
- Non-parametric
- Lazy learning
- Does not "learn" until the test example is given
- Whenever we have a new data to classify, we find its K-nearest neighbors from the training data

SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail unacceptably. There are various types of test. Each test type addresses a specific testing requirement.

Unit testing:

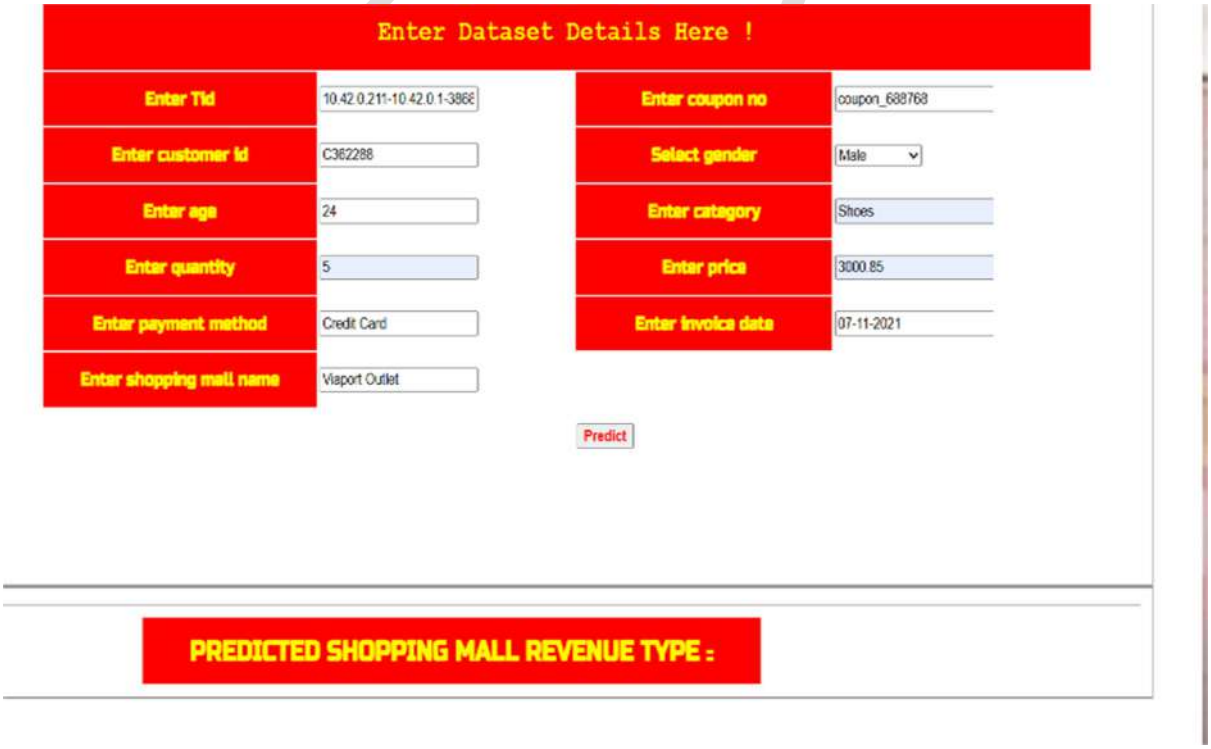
Unit testing involves the design of test cases that validate that the internal program logic is functioning properly and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application.it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at the component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

Integration testing

Integration tests are designed to test integrated software components to determine if they run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfied, as shown by successful unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

RESULTS


Improving Shopping Mall Revenue by Real Time Customized Digital Coupon Issuance
Login Using Your Account:
User Name
Password
Log in
Sign up/ Login Using Your Account:
SERVICE PROVIDER
REGISTER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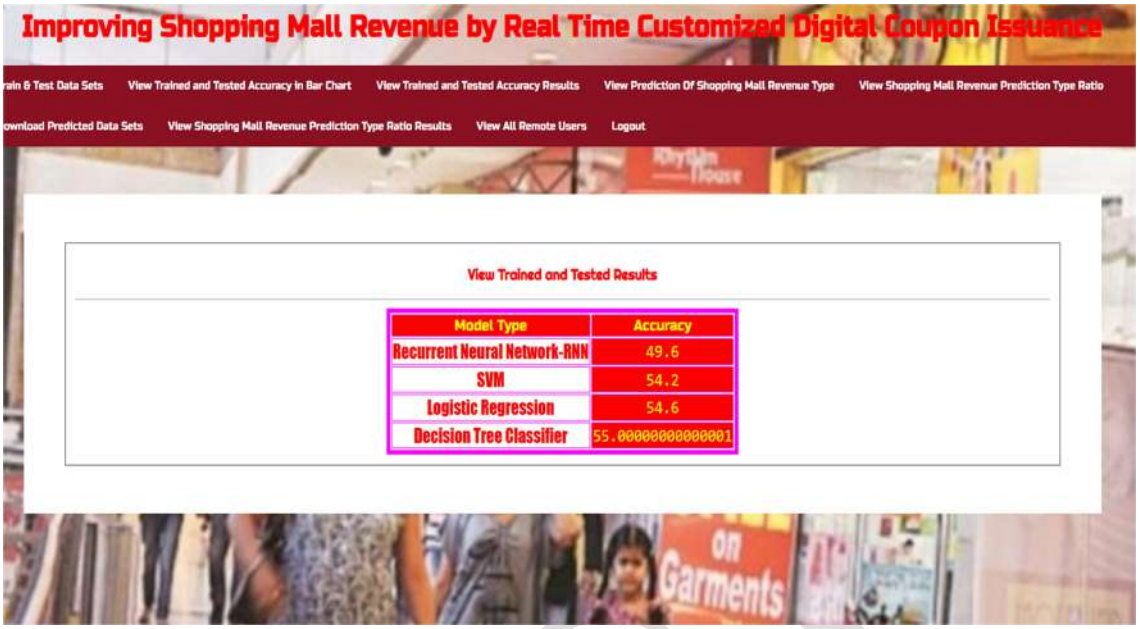
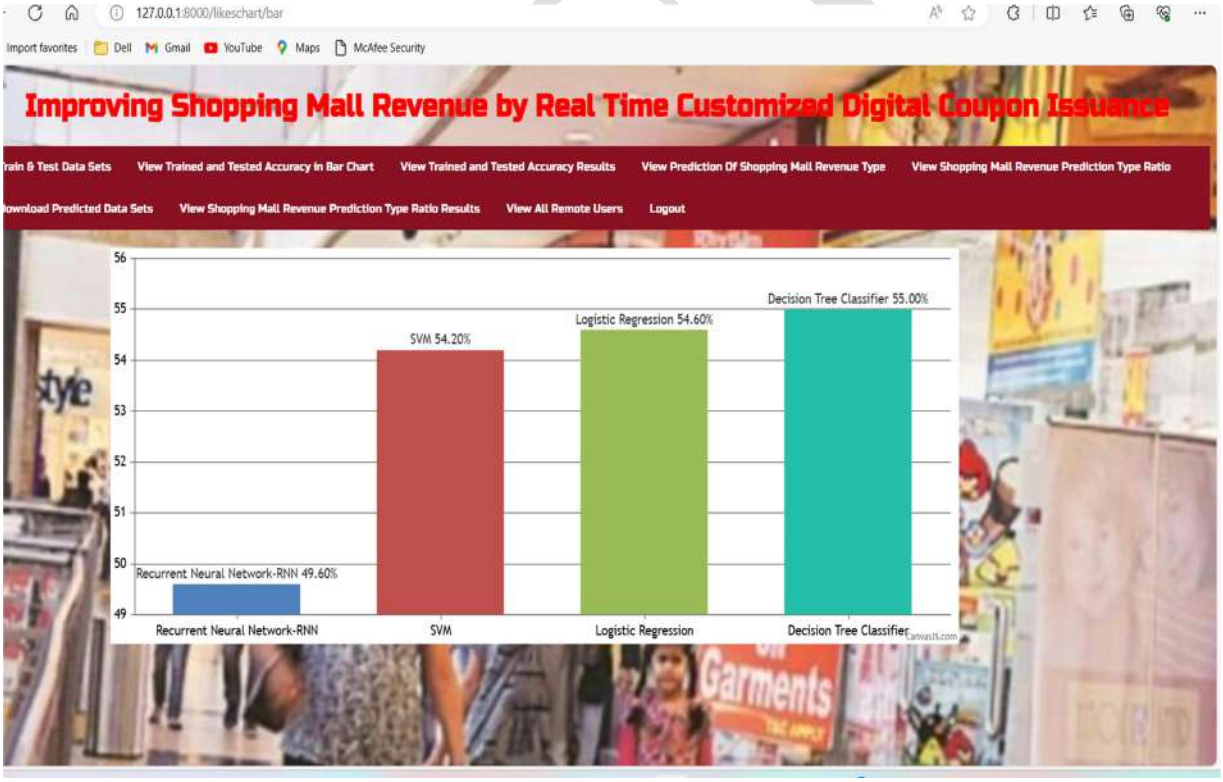
Predict
PREDICTED SHOPPING MALL REVENUE TYPE :





CO NCLUSION:

We identified previous e-commerce marketing approaches to derive user behaviour prediction. A deep learning method for real-time customer churn prediction showed an appropriate result. We applied our research to online shopping malls to raise conversion rates and sales. To check whether our experiment carried out monetary value,

we developed a framework to measure the sales amount when used with a segment model and personalized recommended digital coupons. We found that our model (scenario 1) shows the best results. We found it is suitable for e-commerce online shopping malls to raise conversion 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.

FUTURE ENHANCEMENT:

In the future, this project opens avenues for refining deep learning models, integrating advanced analytics, and developing real-time decision support systems to enhance customer churn prediction and personalized coupon recommendation capabilities. Further exploration could extend to personalized marketing campaigns and the evaluation of similar approaches across diverse industries, fostering continual innovation in customer relationship management and data-driven marketing strategies.

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