

# CUSTOMER SEGMENTATION AND CLASSIFICATION IN E-COMMERCE PLATFORMS

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## Abstract:

In recent years, e-commerce platforms have experienced rapid growth, leading to increased competition and a strong need for customer-oriented services. Traditional e-commerce systems provide uniform offers to all users without considering individual purchasing behavior, resulting in reduced customer satisfaction. This project proposes a customer segmentation and classification system for e-commerce platforms using a rule-based data mining approach.

The system is developed using the .NET framework (C#) as the front end and SQL Server as the back end. It records customer purchase history automatically and analyzes buying behavior based on frequency and total expenditure. Customers are classified into Gold, Silver, and Platinum categories, and personalized discounts are provided accordingly. This approach enhances customer satisfaction, reduces manual effort, and improves overall business efficiency.

**Keywords — Customer Segmentation, E-Commerce, Data Mining, Rule-Based Classifier, Purchase Behaviour.**

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## I. INTRODUCTION

Electronic commerce has become one of the fastest-growing sectors in the digital economy, enabling businesses to reach customers globally with minimal infrastructure. Modern online platforms provide convenient shopping experiences, flexible payment options, and personalized product recommendations. However, despite technological advancements, many e-commerce systems still fail to utilize customer data effectively for improving services and business decision-making.

Customer segmentation is a powerful data analysis technique that divides customers into meaningful groups based on behavior, purchasing patterns, and preferences. It allows organizations to understand customer needs, design targeted marketing

strategies, and increase profitability. Traditional e-commerce systems typically provide identical offers and services to all users without considering individual differences, which leads to reduced customer engagement and satisfaction.

The purpose of this project is to develop a customer segmentation and classification system that analyzes purchase history and categorizes customers automatically. By using rule-based classification techniques, the system identifies high-value customers and provides customized offers. This improves user experience, strengthens customer loyalty, and enhances business performance. The proposed system demonstrates how integrating data mining techniques into e-commerce platforms can transform raw data into valuable business insights.

## II. EXISTING SYSTEM

In the existing system, e-commerce platforms treat all customers equally regardless of their purchasing behavior or loyalty. The system does not analyze customer data or transaction history to identify patterns. Offers and discounts are distributed uniformly, without considering factors such as purchase frequency, total spending, or customer preferences.

This approach leads to inefficient marketing strategies and misses opportunities for improving customer satisfaction. Since the system does not segment customers, businesses cannot identify their most valuable clients or tailor services accordingly. Moreover, manual data analysis is often required to understand customer behavior, which is time-consuming and prone to human error.

### Limitations of Existing System

- No automated customer classification mechanism
- Same discounts provided to all customers
- Lack of personalized marketing strategies
- Low customer retention rate
- Increased manual workload for administrators

These limitations highlight the need for a smarter system capable of analyzing customer behavior automatically and generating actionable insights.

## III. PROPOSED SYSTEM

The proposed system introduces an intelligent customer segmentation and classification mechanism designed specifically for e-commerce platforms. Unlike traditional systems that treat all customers equally, the proposed model analyzes user purchase history, spending patterns, and transaction frequency to categorize customers into meaningful segments such as **Gold, Silver, and Platinum**.

The system automatically stores purchase information whenever a transaction occurs and uses

rule-based logic to evaluate customer value. Based on predefined thresholds such as purchase count and total spending, customers are classified dynamically. This automation eliminates manual work and ensures accurate classification.

Personalized offers and discounts are then provided according to customer category. High-value customers receive premium offers, encouraging loyalty and repeated purchases. This improves customer satisfaction, increases sales, and strengthens long-term business relationships. The system is scalable and can be integrated into any online shopping platform with minimal modifications.

## IV. SYSTEM ARCHITECTURE AND TECHNOLOGIES

The system architecture defines how different components interact to perform customer segmentation and classification. The proposed system follows a layered architecture model consisting of user interface, application logic, classification engine, and database layers. This modular structure improves maintainability, scalability, and performance.

### Architecture Components:

#### 1. User Layer

The user layer represents customers who interact with the system through a web interface. Users can register, log in, browse products, add items to the cart, and make purchases. All user actions are captured and transmitted to the business logic layer.

#### 2. Web Application Layer (C#.NET)

This layer acts as the front-end interface between users and the system. It manages user requests, validates input data, and communicates with backend components. It also ensures secure authentication and session management.

#### 3. Business Logic Layer

The business logic layer processes user requests, performs calculations, manages transactions, and implements application rules. It

controls product management, purchase processing, and customer activity tracking.

#### 4. Rule-Based Classification Engine

This module analyzes purchase history stored in the database and applies predefined rules to classify customers. Rules may be based on criteria such as total purchase amount, number of transactions, or frequency of visits. Based on these rules, customers are assigned categories such as Silver, Gold, or Platinum.

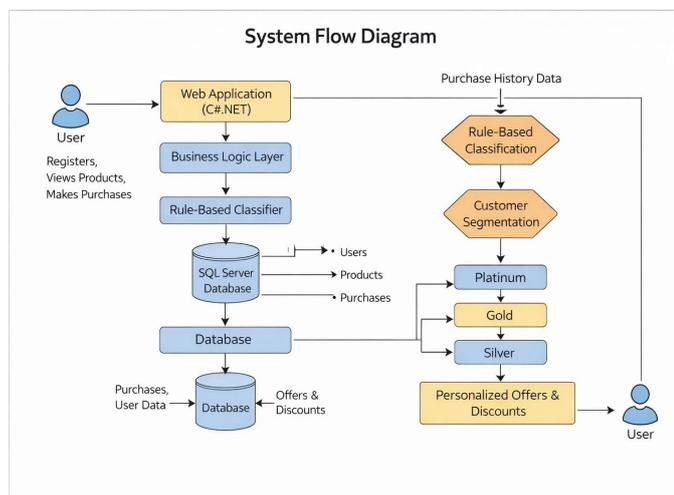
#### 5. Database Layer (SQL Server)

The database stores all system information, including user details, product data, transactions, and classification results. It ensures data consistency and supports efficient querying for analysis and reporting.

#### Advantages of Architecture

- Modular design improves maintainability
- Scalable system structure
- Secure data handling
- Efficient data processing
- Easy integration with future modules

#### SYSTEM FLOW DIAGRAM:



### V. MODULE DESCRIPTION

#### 1) User Module

- Allows users to register, login, and manage profiles
- Enables browsing products and making purchases

#### 1) Admin Module

- Manages products, users, and offers
- Monitors sales reports and customer categories

#### 2) Purchase Module

- Records transaction details automatically
- Updates purchase history for classification

#### 3) Classification Module

- Applies rule-based logic for segmentation
- Assigns customer categories dynamically

#### 4) Discount Module

- Provides personalized offers based on category
- Encourages repeat purchases and loyalty

#### 5) Database Module

- Stores structured data securely
- Supports fast retrieval for analysis

### VI. DATABASE DESIGN

The database design is a fundamental part of the system, as it determines how data is organized, stored, and retrieved. A relational database model is used to ensure structured data storage and efficient access.

#### Database Tables

##### 1. User Table

Stores customer information such as ID, name, email, password, phone number, and address. Each user is uniquely identified by a primary key.

## 2. Product Table

Contains product details including product ID, name, price, description, category, and stock quantity.

## 3. Purchase Table

Records transaction details such as purchase ID, user ID, product ID, quantity, total price, and date of purchase.

## 4. Category Table

Stores classification results indicating whether a customer belongs to Silver, Gold, or Platinum category.

## 5. Admin Table

Stores administrator for credentials and access privileges.

## VI. RESULT AND DISCUSSION

The developed system was tested using sample customer transaction data to evaluate its performance and accuracy. The results show that the system successfully classifies customers into predefined categories based on their purchase behavior. The classification process is fast and requires minimal processing time, demonstrating system efficiency.

The system effectively distinguishes high-value customers from occasional buyers. This segmentation helps administrators understand customer behavior patterns and make informed business decisions. Personalized discounts generated by the system improved customer engagement and encouraged repeat purchases during testing.

Compared with traditional e-commerce platforms, the proposed system significantly reduces manual effort and improves operational efficiency. It also ensures fairness in discount allocation by basing

rewards on measurable purchasing behavior rather than random offers.

The system proved to be scalable and can handle increasing numbers of users without performance degradation. Overall, the results demonstrate that implementing data mining techniques in e-commerce platforms enhances customer experience and improves business performance.

## VIII. CONCLUSION

This project presents an efficient customer segmentation and classification system for e-commerce platforms using rule-based data mining techniques. The proposed solution analyzes customer purchasing patterns and automatically assigns them to appropriate categories such as Gold, Silver, and Platinum.

By providing personalized discounts and targeted offers, the system enhances customer satisfaction and encourages loyalty. It also reduces manual workload for administrators and improves operational efficiency. The integration of database management and classification algorithms ensures reliable performance and accurate results.

The system demonstrates that applying data mining concepts in e-commerce environments can significantly improve decision-making and business strategies. Future enhancements may include integrating machine learning algorithms for predictive analysis, real-time recommendation engines, and advanced customer behavior analytics. Such improvements would further increase system intelligence and adaptability in dynamic market conditions.

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