



FINAL YEAR PROJECT REPORT

BS(COMPUTER SCIENCE)

ECCOMMEREC STORE RECOMMENDATION SYSTEM

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IQRA UNIVERSITY, KARACHI

MARCH 2024



FACULTY OF ENGINEERING, SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

**FINAL YEAR PROJECT REPORT BACHELOR OF COMPUTER
SCIENCE**

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PROJECT:

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ABSTRACT

In this report/project I try to make recommendation system which is integrated to ecommerce siteMade up of Django. Recommendation system is one of the major sources for generating revenue In different online companies. Recommendation not only increases the sales of product but it helps To make the system personalized and helps to find out the preferences and interest of particular user To the product. It is currently being used in big tech companies for recommending product, songs, Videos, Movies, jobs, services etc. It is also implemented in search engine, ranking, friend suggestion,gaming, Point of interest, online advertisements etc. It is one of the most studied and researched Topics in the field of artificial intelligence. Researcher and scientist now studying and developing Recommendation using deep neural network.The system incorporates deep learning models, such as neural networks and natural language processing,analyze user behavior, product attributes, and contextual information. Additionally, the recommendation system integrates with external data sources, such as social media platforms and product reviews, to enrich the recommendation process further. Through comprehensive testing and evaluation, including accuracy assessment, performance analysis, and user feedback, the efficacy of the hybrid recommendation model will be validated. Ultimately, this research aims to contribute to the advancement of personalized recommendation systems in e-commerce, enhancing user satisfaction and driving business growth.

We have approved this manuscript for submission and presentation as fulfillment of Bachelor of Software Engineering/ Computer Science.

Supervisor: FAHAD NAJEEB

Date: 17-03-2024

Project Coordinator: Dr. AARIJ MAHMOOD HUSSAIN

Date: 17-03-2024

DECLARATION

I hereby declare that the work has been done by myself to fulfill the requirement of the BS (Computer Science) and no portion of the work contained in this report has been submitted in support of any application for any other degree or qualification of this or any other university or institute of learning.

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LIST OF ACRONYMS

1. ML - Machine Learning
2. NLP - Natural Language Processing
3. CF - Collaborative Filtering
4. CB - Content-Based
5. UI - User Interface
6. API - Application Programming Interface
7. SQL - Structured Query Language
8. CSS - Cascading Style Sheets
9. HTML - Hypertext Markup Language
10. JS - JavaScript
11. DB - Database
12. HTTP - Hypertext Transfer Protocol
13. SPA - Single Page Application
14. CRUD - Create, Read, Update, Delete
15. ORM - Object-Relational Mapping
16. JSON - JavaScript Object Notation
17. AJAX - Asynchronous JavaScript and XML

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Chapter 1. Introduction

E-commerce, short for electronic commerce, has emerged as a revolutionary force shaping the landscape of business and commerce worldwide. In Pakistan, the adoption of e-commerce has witnessed a remarkable surge in recent years, driven by advancements in technology, increasing internet penetration, and evolving consumer preferences.

Historically, Pakistan's retail sector has been predominantly brick-and-mortar, with traditional markets and shopping malls dominating the consumer landscape. However, with the proliferation of smartphones, improved internet infrastructure, and the advent of digital payment solutions, the e-commerce sector in Pakistan has experienced exponential growth. One of the key drivers of e-commerce in Pakistan is the country's large and youthful population, characterized by a growing number of tech-savvy individuals eager to embrace online shopping as a convenient and efficient way to fulfill their purchasing needs. Additionally, the rise of social media platforms and digital marketing channels has played a significant role in expanding the reach of e-commerce businesses and attracting consumers from diverse demographic segments. Several factors have contributed to the rapid expansion of e-commerce in Pakistan.

Firstly, the convenience offered by online shopping platforms, allowing consumers to browse and purchase products or services from the comfort of their homes, has fueled the adoption of e-commerce.

Secondly, the availability of a wide range of products, including local and international brands, coupled with competitive pricing and attractive discounts, has attracted consumers to online marketplaces. Furthermore, the convenience of digital payment methods, such as credit/debit cards, mobile wallets, and cash-on-delivery options, has addressed one of the key challenges faced by e-commerce businesses in Pakistan – building trust and facilitating seamless transactions in a country where cash remains a preferred mode of payment for many consumers.

Despite the rapid growth of e-commerce in Pakistan, several challenges persist. These include logistical constraints, such as last-mile delivery infrastructure and fulfillment services, as well as issues related to consumer trust, data privacy, and cybersecurity. However, concerted efforts by both government and private sector stakeholders are underway to address these challenges and create an enabling environment for the sustainable growth of e-commerce in the country.

1.1 Motivation

Motivation for Creating a Recommendation System in E-commerce in Pakistan:

The e-commerce landscape in Pakistan is witnessing a significant transformation, driven by factors such as increasing internet penetration, growing smartphone usage, and changing consumer behavior. As more businesses venture into the online marketplace, competition intensifies, making it crucial for e-commerce platforms to differentiate themselves and enhance the shopping experience for customers. One powerful tool for achieving this is the implementation of a recommendation system.

1. Enhanced Personalization: In a diverse and dynamic market like Pakistan, where consumer preferences vary widely across regions, demographics, and cultural backgrounds, providing personalized recommendations can significantly improve the shopping experience. By analyzing user behavior, purchase history, and other relevant data, a recommendation system can offer tailored product suggestions that resonate with individual tastes and preferences.

2. Increased Engagement and Retention: With the abundance of choices available to consumers in the e-commerce space, capturing and maintaining their attention is a constant challenge. A well-executed recommendation system can help engage users by surfacing relevant products, thereby increasing the likelihood of conversions and repeat purchases. By keeping customers engaged and satisfied, e-commerce platforms can foster loyalty and drive long-term growth.

3. Cross-Selling and Up-Selling Opportunities: A hybrid recommendation model, combining collaborative filtering with content-based techniques, allows for a comprehensive understanding of customer preferences and behavior. This enables e-commerce platforms to not only recommend products similar to those a customer has previously shown interest in (cross-selling) but also suggest complementary or higher-value items (up-selling), thereby maximizing revenue opportunities.

4. Competitive Advantage: In a competitive e-commerce market, where players are constantly vying for market share and customer attention, implementing advanced recommendation systems can serve as a strategic differentiator. By offering a superior shopping experience characterized by relevant recommendations and personalized content, e-commerce platforms can stand out from the competition and attract discerning consumers.

5. Data-Driven Decision Making: A recommendation system generates valuable insights into customer preferences, purchasing patterns, and trends. By leveraging this data, e-commerce

businesses can make informed decisions regarding product assortment, marketing strategies, inventory management, and more. This data-driven approach not only optimizes business operations but also ensures alignment with customer needs and preferences.

6. Adaptability to Local Market Dynamics: Pakistan's unique socio-economic and cultural context presents both challenges and opportunities for e-commerce businesses. A recommendation system tailored to the specific nuances of the Pakistani market can account for factors such as seasonal trends, cultural preferences, and local product offerings, thereby enhancing its effectiveness and relevance to users.

1.2 Academic Question:

How will a recommendation system that uses machine learning technique be used to predict the interest/desires of users, boost their experience to increase the sale of products, earn revenue in ecommerce sector and what are the possible challenges and issues in real word?

1.3 Aims:

- Enhance user experience by providing personalized product recommendations.
- Increase conversion rates by guiding users towards relevant products.
- Drive sales and revenue through cross-selling and up-selling opportunities.
- Optimize inventory management by highlighting high-demand products.
- Improve marketing effectiveness with targeted recommendations.
- Gain insights into customer behavior, preferences, and trends.
- Enhance competitiveness by offering a personalized shopping experience.
- Foster customer loyalty and retention through value-added services.

1.4 Objective:

- Increase user engagement by offering personalized product suggestions.
- Enhance user satisfaction by simplifying the product discovery process.
- Boost sales and revenue by promoting relevant products to customers.
- Improve customer retention through targeted recommendations.
- Optimize inventory turnover by highlighting popular and in-demand items.
- Gather valuable insights into customer preferences and behavior.

- Differentiate the e-commerce platform by offering a unique and tailored shopping experience.
- Streamline the decision-making process for users by presenting curated product options.
- Foster long-term customer relationships by delivering value-added services and personalized experiences.

1.5 Artifact:

To develop all the artifact given below, Django framework with SQL Lite database is used. The developed system is ecommerce which can recommend products to similar users of the system.

1.5.1 Artifact 1-Web Application:

The developed system has scalable website design with different features like registration, authentication, search products, product details, categories, sub categories, search bar, user generated review, ratings etc. All the front-end is displayed from the database where only admin can upload all the content. This site has also review system where user can give their view about the specific products and can also give rating from 1 to 5. Admin can add the item to display to other users. The system is also made mobile user-friendly and Search engine optimization for the better performance.

1.5.2 Artifact 2-Product Recommendation:

This site recommends relevant product to users individually based upon the user's behaviors, ratings and history of purchase. Various techniques are used and tested to develop the model. Python is used to develop the model for this system.

1.6 Scope and limitation of project:

As the main aim of this project is to develop and test the ecommerce system and to integrate recommendation system into web-based application. The scope of the study may include product bought on various part of Pakistan but can be used worldwide. The study is not specific to one country or the region. Today's users are demanding very rich system to purchase product online. There is some limitation of the system: I may not work well with newly signed in users due to the fact that the recommendations emerge from a correlation between the intended user and other used focused on collection of ratings. So, it is almost impossible to judge the user and to categorize a user with very few ratings. It only starts recommending things after user

rate some of the products from the system. In similar fashion, new item if not rated by any user, it gets recommended at the last part of the recommendation. Since user only see upper part of the recommendation. The Product rated very low also does not appear at the top part of the recommendation. It is also known as “early rater” problem and cold start program. To deal with this problem, homepage of this site does not show recommended things but only shows the latest product from the database and recommended things for the user can only be seen from recommendation webpage. It takes much more time to recommend products to fresh user. The reason behind choosing this project is to show how recommendation can be build, designed and analyzed. The recommendation is that type of system which can be extended in future and the algorithm used during the development of this project can be improved throughout the period of maintenance of this project. Although the system works perfect in larger dataset.

Chapter 2 Literature and review

My topic of research is not the new topic but active area of research. Recommendation system (RS) is popular field of study among the researcher and scientist since last few decades. RS to recommend products, books and news is fairly common in large tech companies including amazon and Google. Social media site like Facebook, Tinder and twitter also suggest new friends and advertisements. Not only that but last FM, pandora etc. also offers songs that the user may like. Films and online videos are likewise generating meaningful recommendation by companies such as Netflix, Movie Lens, IMDb, YouTube etc. RS comes into practice in order to address, deeper analyze and resolve the issue and problem of both buyers and sellers by automating the activities based on the quality of user-item communication. Recommendation engines is totally transforming or reshaping ecommerce industry by helping the customer to choose the relevant product. Recommendation system allows to increase the figures of sells, to offer more varied products, to improve user satisfaction and to fully consider customer needs. In simplest term recommendation engines are the ranked list of products to the user based upon different factors like user's preference and constraints. To first determine the constraints and preference, RS collects user's view with the help of ratings to the particular product in most of the cases. RS can also be called as information retrieval as it is used to filter the system and display only item's that match the user's interest. For this, user must give some of interest to the system and system tries to display products user may like. If user does not give any information to the system, the system cannot provide any recommendation. Various tools are available to recommend the product. Most used recommender system in existing online environment are collaborative filtering, content-based filtering, Popularity based, Hybrid approach.

2.1 Types of recommendation system:

Before making recommendation system, one must know the pros and cons of each type of recommender system which are described in this section. Broadly speaking there are two approaches of recommendation system. They are content based filtering, collaborative filtering and hybrid filtering. Each of this type has their own limitation and benefits which is shown in later part of this section. Collaborative filtering is further divided into two type: Model-based filtering techniques and memory-based filtering techniques. Model-based filtering techniques is further divided into clustering, association, Bayesian and neural networks. Memory based

filtering technique is further divided into user-user based collaborative filtering and item-item based collaborative filtering. Hybrid filtering is combination of both collaborative and content-based filtering.

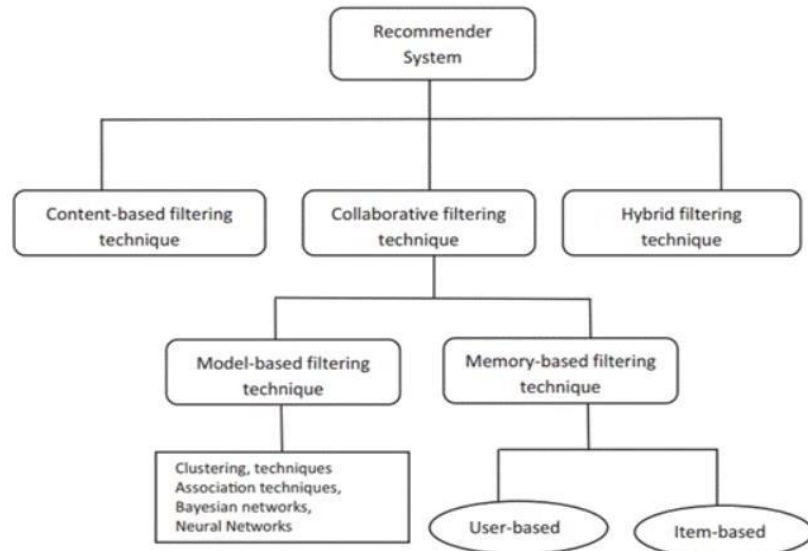


Figure 1 types of recommender system

2.1.1 Content-based (CB) filtering:

Content-based (CB) filtering, also known as cognitive filtering recommends similar products that the user had already bought from the system. Content-based filtering can also recommend product to user with other factors like age, gender, geography, review, usage pattern etc. The preferences of particular users can be determined by retrieval method such as cosine similarity matrix, term frequency-inverse document frequency, Long Distance Affair etc. or by using machine learning techniques like support vector machines, Naïve Bayes, decision trees etc. (Pazzani & Billsus, 2015)

2.2 Collaborative filtering (CF):

The developers at xerox first coined and developed the term collaborative filtering. Since then, has been enhanced and developed by using different technology and algorithms. The main goal of recommendation system is to suggest the content based on individuals' desires. Collaborative filtering (CF) suggests the item which are preferred by other related users. There are various types of algorithms that can recommend the item and every algorithm has different set of features. Different algorithm may be great or bad for various datasets depending upon

the features. The algorithm can take more time to function better in particular datasets. (HERLOCKER, et al., 2004) Some of the algorithm are described briefly:

2.3 Hybrid filtering:

A hybrid model of machine learning in e-commerce combines multiple techniques, like collaborative filtering and content-based filtering, to improve recommendation accuracy by leveraging the strengths of each approach. It aims to provide more personalized and effective product recommendations to users, enhancing their shopping experience and increasing engagement and sales.

Chapter 3 Requirement gathering and analysis

Analysis of requirement can be defined as to identify system requirements for investigation, documentation all the requirements and analysis of those collected requirement. The major problem behind this project is to build the ecommerce webapp and integrate recommendation system.

In this section we discuss about the fact-finding techniques, function requirement, non- functional requirement and usability requirements.

3.1 Sources of data:

The dataset provided only contained data of products as suggested by our supervisor, it did not include user data. Therefore, in our project, during training our model, we created random 20 to 40 users because user data was not available. Many large websites keep their user data private, which is why. The dataset for recommendation system is the data provided by DARAZ (ALI BABA) at Kaggle.com that I have used in my project.

3.2 fact finding techniques:

I have researched on different topic related to ecommerce and recommendation system. There are many fact findings technique, but I focused in only two of them. I did not choose interview and questionnaires as the fact-finding techniques rather I chose observation, research and studying ecommerce companies as fact finding technique. One must observe the similar system to get the insights of Competitors fact.

3.2.1 Research:

I think research also plays a vital role to find what the user really wants from the user. Before this study I have not known about this problem domain, I have manually researched and read papers on the main topic needed for the ecommerce site. So, I decided to view, understand and manipulate internal mechanism of existing system similar to my system as much as possible. I have found that there are many topics rather than just purchasing product in ecommerce site like searching, sorting, Wishlist etc. Recommended product is also one of them. I have also researched about the existing web application like flip cart, amazon, Daraz etc. Although these sites are very large site with millions of transactions and billions of activities in a day, basic features of ecommerce are almost similar to small enterprise ecommerce system.

3.2.2 Observation:

Observation has been used to observe app behavior explicitly. I have examined, observed, viewed and displayed numerous web-based application similar to ecommerce system. I have attempted to make the system similar to my research as much as possible to make this system as much as practicable in real world.

3.4 Functional requirement:

Functional requirements are the system's technical features or what the system is meant to do. Some of the functional requirement are described below:

3.4.1. UI/ UX requirement:

Attractive design, easy to navigate and speedy page loading are three features ecommerce site must have. Apart from that, use of color, fonts and images also plays a vital role to engage the user. These issues must be resolved. Mobile devices are the great source of user nowadays. So, this system must be mobile friendly and scalable to different screen sizes. This system must have features of search and filter product based upon categories. To ease the use for the native user, this system must have language option to change the language to English, Urdu, Sindhi etc. Customer always want to hear from other customer how the shopping suits their needs and expectation. To solve this problem review and ratings must be used. This system must have featured of shopping cart and checkout to both logged in user and anonymous user.

3.4.2. Personalized recommendation system:

Most popular system are dynamic and personalized to user. It is one of the key factors to engage the user with the system. The products are recommended to users based upon their preferences, user history and ratings. The already rated product must not be recommended to the user.

3.4.3 Management requirements:

Management requirements contains only registered admin can access the admin panel and login to admin panel of the system. Only admin can upload and manage products and customer can buy needed product from the system.

3.5 Non-functional requirement:

Nonfunctional requirements specify whether a particular task will be performed or not. Some of the no non – functional requirements are listed below:

3.5.1. Speed:

Speed is actually much more complicated than it seems. Speed is one of the nonfunctional requirements that must be considered. The speed may lag because of many reasons. Some of the common reason for slow load is due to high resolution unoptimize images, complex order entry process, use of many API calls to render, unclean code etc. All of these issues must be solved.

3.5.2. Security and privacy:

Since this web app use most sensitive data of the user. The system must be protected from vulnerabilities. The authentication must be secured from data breach. To protect the system from code manipulation, the software must be coded with much complexity. The privacy must be protected. Policies, terms and conditions must be able to update from the admin side.

3.5.3. Extensibility:

One of the strong points of this system is this system can be extended to large number of users and large number of products with different categories and sub categories because admin panel is responsible for the flash sale, slider, product, categories, subcategories and many more.

3.6.1 Ease of use:

The system must be easy to use and understand the system or the casual user. The navigation and function must be simple.

3.6.2 Satisfaction and memorability:

The design of the system must be pleasant to view and the user must be able to recall the site when user return after a certain period of time.

3.6.3 Graphics:

Graphics is considered as one of the components that helps user to better connect to the system. It mostly deals with data rendering and displaying high quality of data. The code must be optimized and should able to show similar quality in any hardware devices.

Chapter 4 Design And Architecture

Different design and architecture are designed in this section. All the process database and system are designed in this section.

4.1. Process Design:

4.1.1 Use case diagram:



Figure 2 use case diagram

4.1.2 Entity Relationship Diagram:

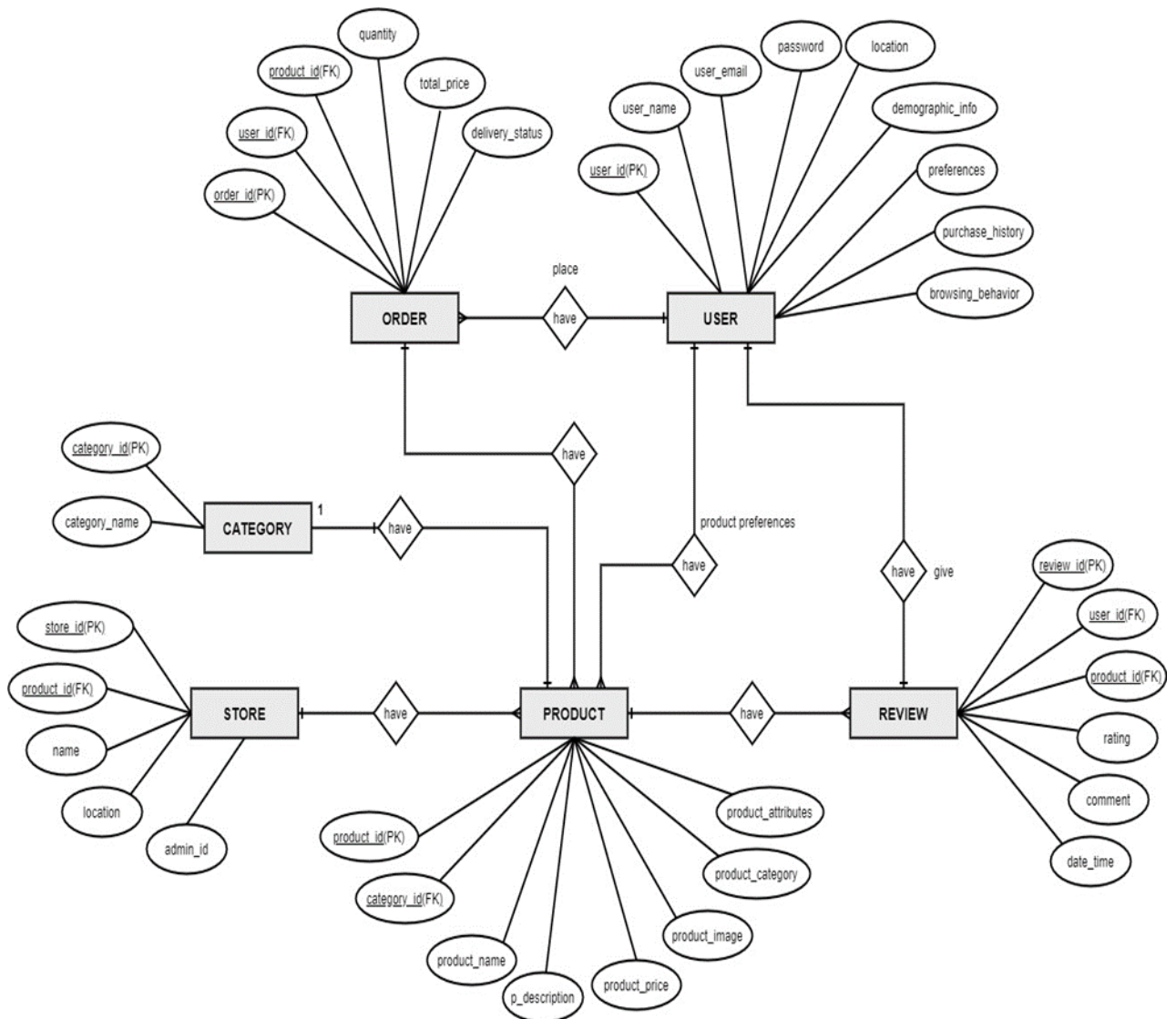


Figure 3 ERD diagram

4.1.3 DATA FLOW DIAGRAM:

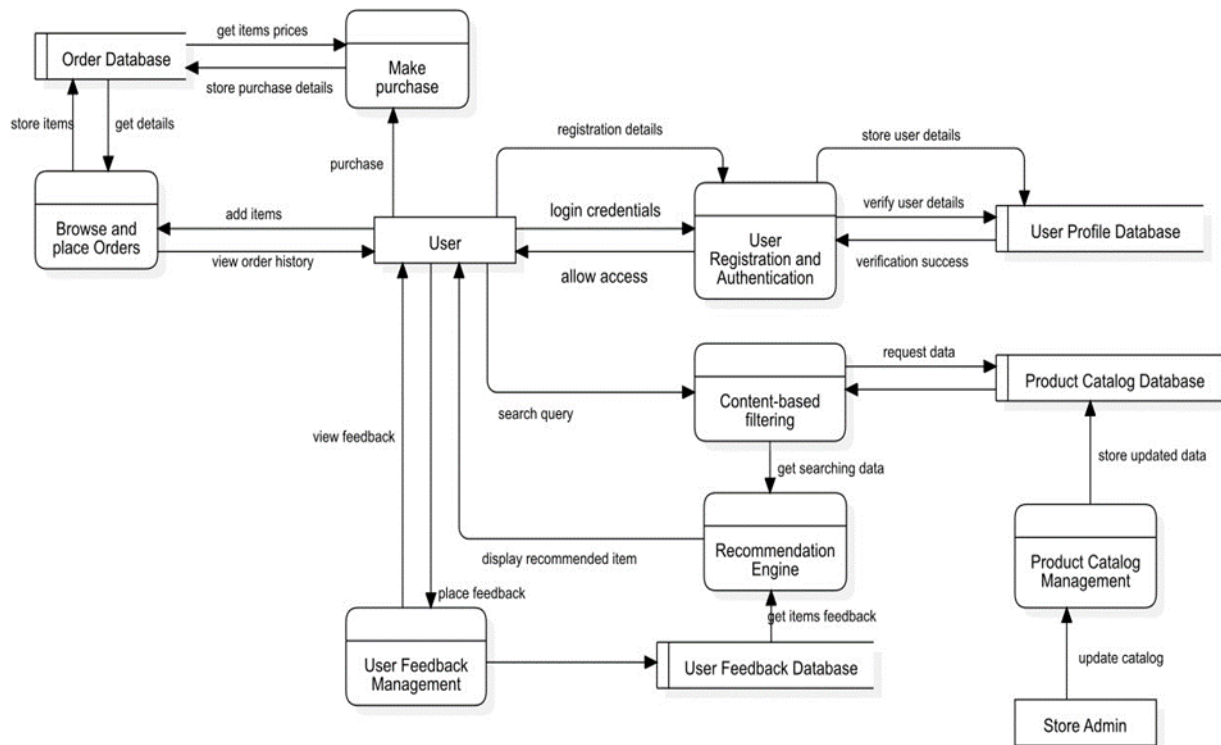


Figure 4 DFD diagram

4.2 Main screen page:

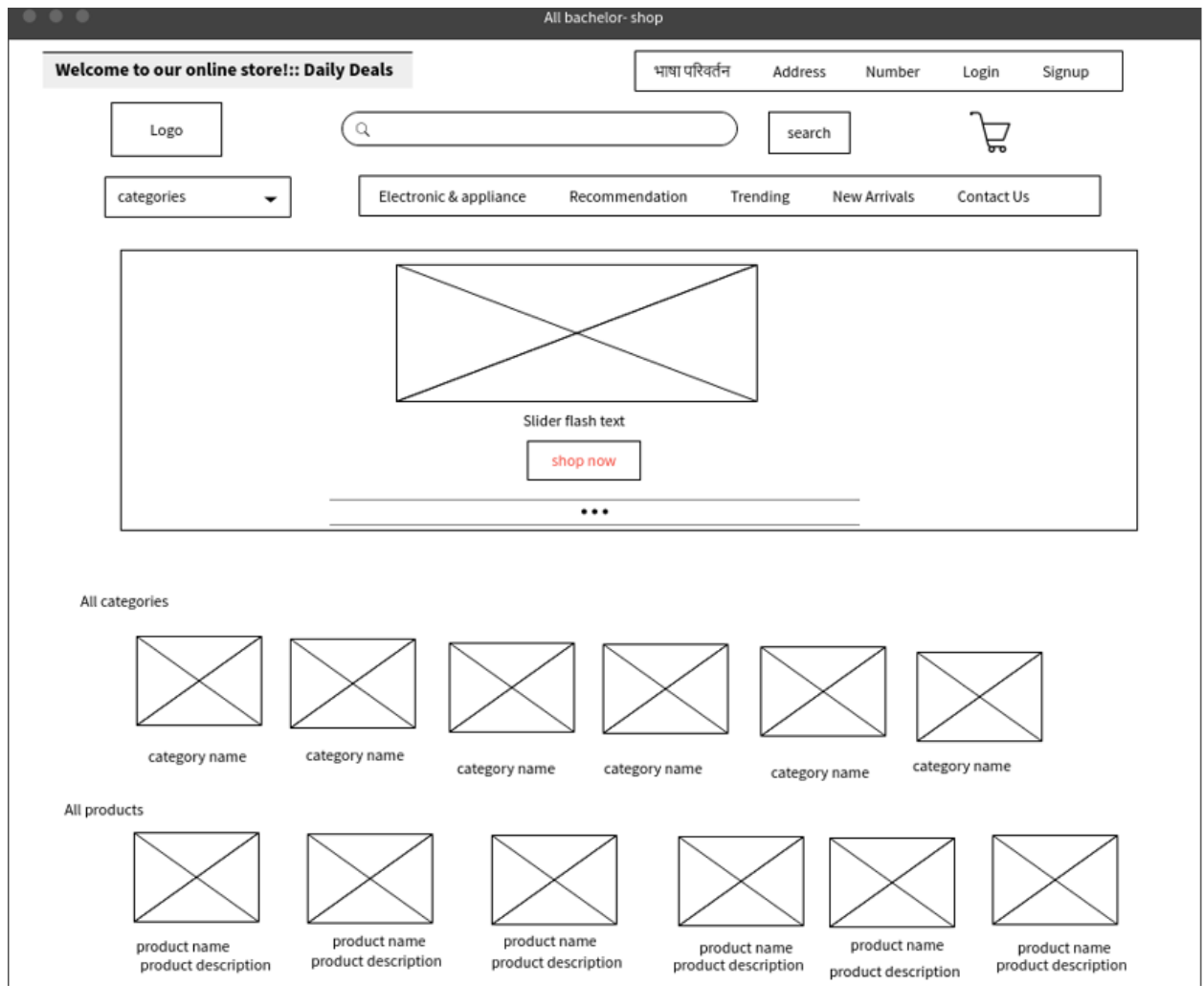


Figure 5 main screen page

Table 4.2.1 Product detail page

All bachelor shop

Wel-Come to our online site

Location | phone | Admin | Log out

logo

CL

search

Category

Electronic&appliances | Appliances | Recommendation | Trending | New Arrival | Contact Us

Category

Name

price

Description

Total review:

Average rating:

Last update:

Available stock:

Qty

Add to cart

You may also like

Name:

Price:

Name:

Price:

Recent Reviews

Name

date

rate

nice product. i like it.

Add your review

awesome product

Rate this product

Figure 6 product detail page

Table 4.2.2 [profile page](#)

The wireframe shows a user profile page for 'All bachelor-shop'. At the top, there's a header with a welcome message 'Welcome to our online store!:: Daily Deals' and a navigation bar with links for 'भाषा परिवर्तन', 'Address', 'Number', 'Login', and 'Signup'. Below the header, there's a search bar with a magnifying glass icon and a 'search' button. A 'Logo' placeholder is on the left, and a 'categories' dropdown menu is below it. A horizontal menu contains 'Electronic & appliance', 'Recommendation', 'Trending', 'New Arrivals', and 'Contact Us'. The main profile section includes a 'Profile picture' placeholder, a 'Full name' field with 'edit profile' and 'change password' buttons, and input fields for 'user email', 'city | country', 'Date of birth', 'Hobby', and 'Bio'. Below the profile section, there are four product cards arranged in a 2x2 grid. Each card features a placeholder for an image, a box for 'average rating' and 'total number of review', and fields for 'Product name' and 'product price'.

Figure 7 profile page

Table 4.2.3 [My cart page](#)

All bachelor shop

Wel-Come to our online site

Location | phone | Admin | Log out

logo

search

Category

Electronic&appliances | Appliances | Recommendation | Trending | New Arrival | Contact Us

My Cart

Continue shopping

Name:

Qty

* price

Total Price

Name:

Qty

* price

Total Price

Have promo code

Subtotal:
Shipping:
Tax:
Total:
Checkout

Figure 8 my cart page

Table 4.2.4 [order details page](#)

All bachelor shop

Wel-Come to our online site

Location | phone | Admin | Log out

logo

search

Category

Electronic&appliances | Appliances | Recommendation | Trending | New Arrival | Contact Us

Order details

Name of the card

Surname on card

Address

City

Contact Number

Total payment

Ready to buy

Order review

Name:

1

Price:

Figure 9 order details page

| Test Case ID | Test Case Description | Expected Result | Actual Result | Pass/Fail |
|---------------------|--|--|--|------------------|
| TC001 | Verify that the main screen loads successfully | Main screen is displayed with all elements visible | Main screen is displayed with all elements visible | Pass |
| TC002 | Verify the presence of a search bar | Search bar is visible | Search bar is visible | Pass |
| TC003 | Verify navigation to different categories | User can click on category links and navigate successfully | User can click on category links and navigate successfully | Pass |
| TC004 | Verify display of featured products | Featured products are visible on the main screen | Featured products are visible on the main screen | Pass |
| TC005 | Verify display of promotional banners | Promotional banners are visible and clickable | Promotional banners are visible and clickable | Pass |

4.3 Test case 1 Main Screen

Table 6 test case 1 main screen

4.3.1 Test case 2 Product details

| Test Case ID | Test Case Description | Expected Result | Actual Result | Pass/Fail |
|---------------------|--|--|--|------------------|
| TC006 | Verify display of product details | Product details page is displayed with all relevant info | Product details page is displayed with all relevant info | Pass |
| TC007 | Verify addition of product to the cart | Product is successfully added to the cart | Product is successfully added to the cart | Pass |
| TC008 | Verify display of related products | Related products are displayed on the product details page | Related products are displayed on the product details page | Pass |

Table 7 taste case 2 product details

4.3.3 Test case 3 Profile Page

| Test Case ID | Test Case Description | Expected Result | Actual Result | Pass/Fail |
|--------------|--|---|---|-----------|
| TC012 | Verify display of profile information | Profile information, such as name and email, is displayed | Profile information, such as name and email, is displayed | Pass |
| TC013 | Verify ability to edit profile information | User can update their profile details and save changes | User can update their profile details and save changes | Pass |
| TC014 | Verify ability to change password | User can enter a new password and update it | User can enter a new password and update it | Pass |

Table 8 test case 3 profile page

4.3.4 Test case 4 My Cart

| Test Case ID | Test Case Description | Expected Result | Actual Result | Pass/Fail |
|--------------|--|---|---|-----------|
| TC015 | Verify display of shopping cart | Shopping cart page displays all items added by the user | Shopping cart page displays all items added by the user | Pass |
| TC016 | Verify ability to update quantity of items | User can change the quantity of items in the cart | User can change the quantity of items in the cart | Pass |
| TC017 | Verify ability to remove items from the cart | User can delete items from the cart | User can delete items from the cart | Pass |

Table 9 test case 4 my cart

4.3.5 Test case 5 Order Details

| Test Case ID | Test Case Description | Expected Result | Actual Result | Pass/Fail |
|--------------|--|---|---|-----------|
| TC018 | Verify display of order history | Order history page displays all previous orders | Order history page displays all previous orders | Pass |
| TC019 | Verify display of details for a specific order | Order details page shows all information related to the order | Order details page shows all information related to the order | Pass |
| TC020 | Verify ability to track order status | Order status is updated and displayed accurately | Order status is updated and displayed accurately | Pass |

Table 10 test case 5 order details

Chapter 5 Implementation And Development Process

One of the key features of this system is to develop the recommendation for a given active user. The development component is then split into three major phases: firstly, the implementation of ecommerce system; secondly, the development of a recommendation system that can give reliable products independent of the size of the dataset and thirdly integrating the recommendation model to web app. First step is the downloading and installing all the necessary packages needed to develop the tool. Before development of the system, some of the software is installed as shown in technical specification below:

5.1.1 *Technical specification:*

Framework: Django

Library: Bootstrap, Numpy, Pandas, Scikit-learn

IDE: Visual studio

Language: python

Database: SQL lite

Browser: Google Chrome

Datasets: DARAZ (ALI BABA)

Front end: Html, CSS, JavaScript

Documentation, diagram and presentation: Microsoft Office, PowerPoint

5.1.2 *Development:*

After installing all above packages and library, it's time to develop the ecommerce system. First front-end part is made just like the wireframe mentioned above with the help of html, css, javascript and bootstrap. After that front end is connected to backend database SQL Lite with

the help of python and Django. The database is designed like the above-mentioned entity relation database. All of these. Building an e-commerce website entails a meticulous process aimed at delivering a seamless user experience while incorporating essential functionalities. Initially, our journey commenced with data acquisition, where we obtained a dataset provided by our supervisor. This dataset, albeit valuable, posed certain challenges, as it was not updated, resulting in the removal of numerous products. Despite this limitation, the dataset contained invaluable product ratings, reviews, and information on 56 categories, forming the backbone of our recommendation system.

With the dataset at hand, meticulous planning and design became imperative. We conceptualized the structure and functionality of the website to ensure it aligns with user expectations and business objectives. Leveraging Python, CSS, HTML, Django, SQL Lite Database, Bootstrap, and Django Rest Framework, we embarked on the development phase, meticulously crafting each component to harmonize with the overarching vision.

Python emerged as the cornerstone of our development process, facilitating the integration of machine learning algorithms and powering the backend functionality. CSS and HTML were instrumental in sculpting the visual appeal of the website, ensuring an intuitive and aesthetically pleasing user interface. Django, revered for its robustness and scalability, served as the framework of choice, enabling rapid development and seamless management of web applications.

The utilization of SQL Lite Database played a pivotal role in managing and organizing the extensive product data, ensuring efficient retrieval and storage. Bootstrap, with its pre-designed components and responsive grid system, bolstered the website's responsiveness and accessibility across various devices. Furthermore, the incorporation of Django Rest Framework facilitated the development of RESTful APIs, enabling seamless communication between the frontend and backend components. This streamlined the integration of the recommendation system into the application architecture, enhancing the website's functionality and user experience.

Despite the challenges posed by the dataset's outdated nature, we implemented innovative solutions to mitigate its impact. Notably, during the model training phase, we introduced random users to simulate diverse user interactions, ensuring the robustness and efficacy of our hybrid recommendation model. This proactive approach enabled our system to generate accurate and personalized recommendations, notwithstanding the dataset's limitations.

Chapter 6 Walkthrough Of System:

A walkthrough of the application is illustrated in this chapter. Examples of features are presented for each user type: new user, returned user and administrators. Additional functionality and features that are common to all users can be found in Appendix.

Admin Login:

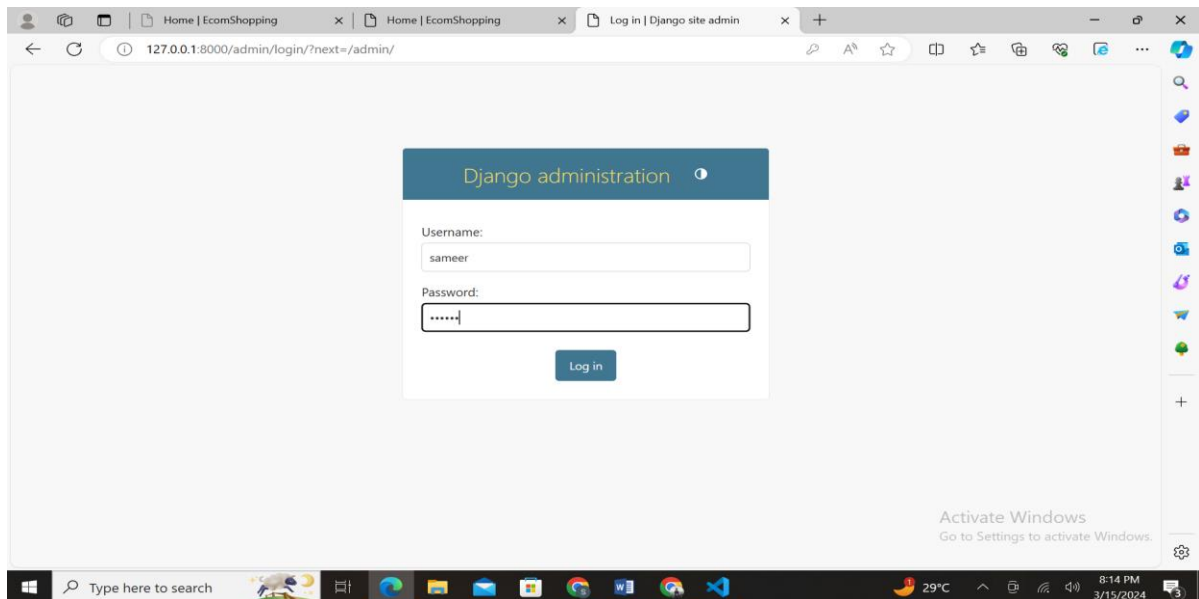


Figure 10 admin login

Admin Dashboard:

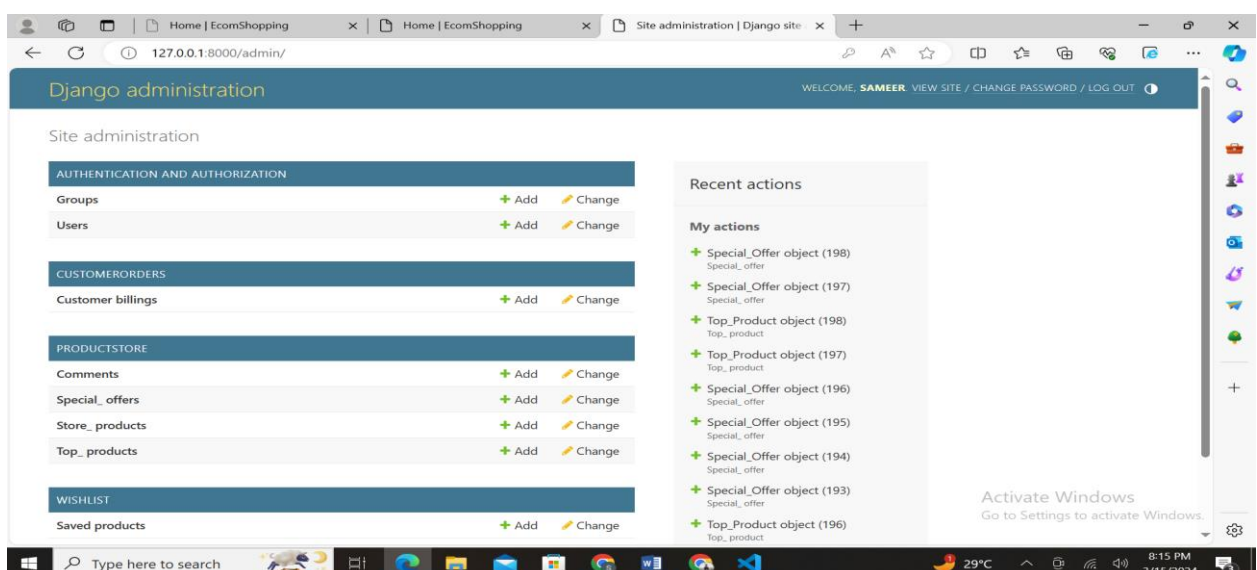


Figure 11 admin dashboard

Add Categories:

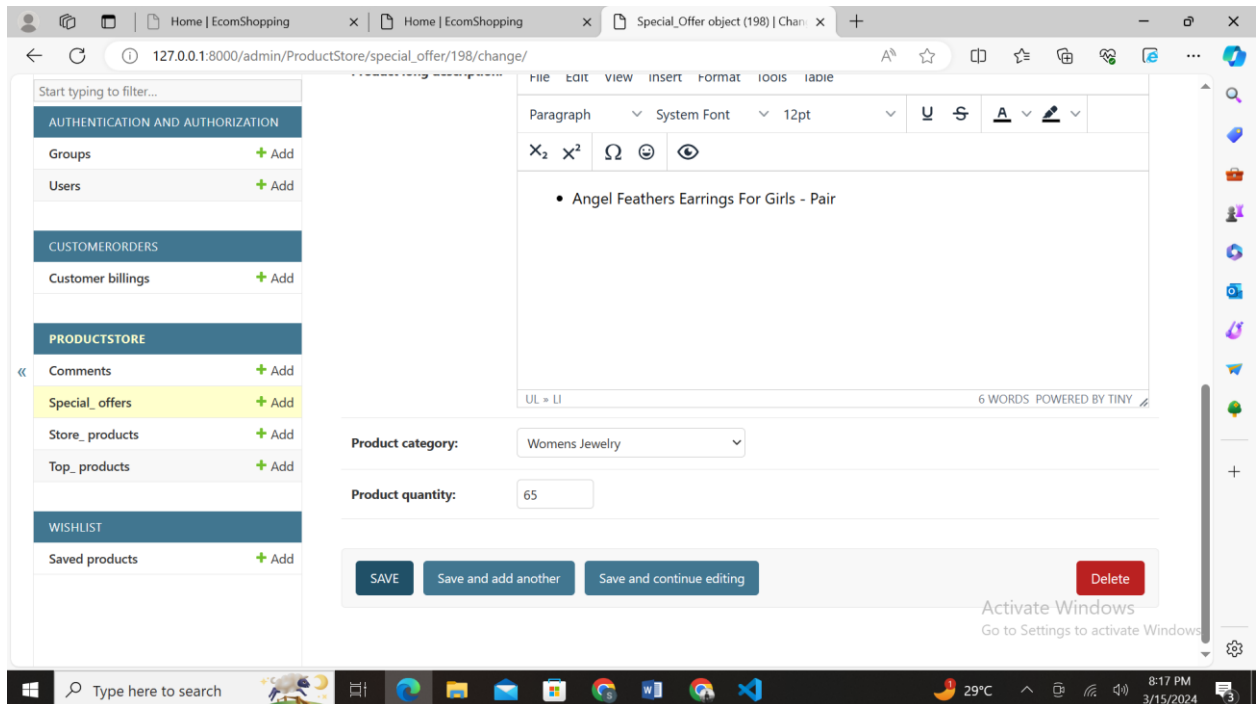


Figure 12 add categories

Add products:

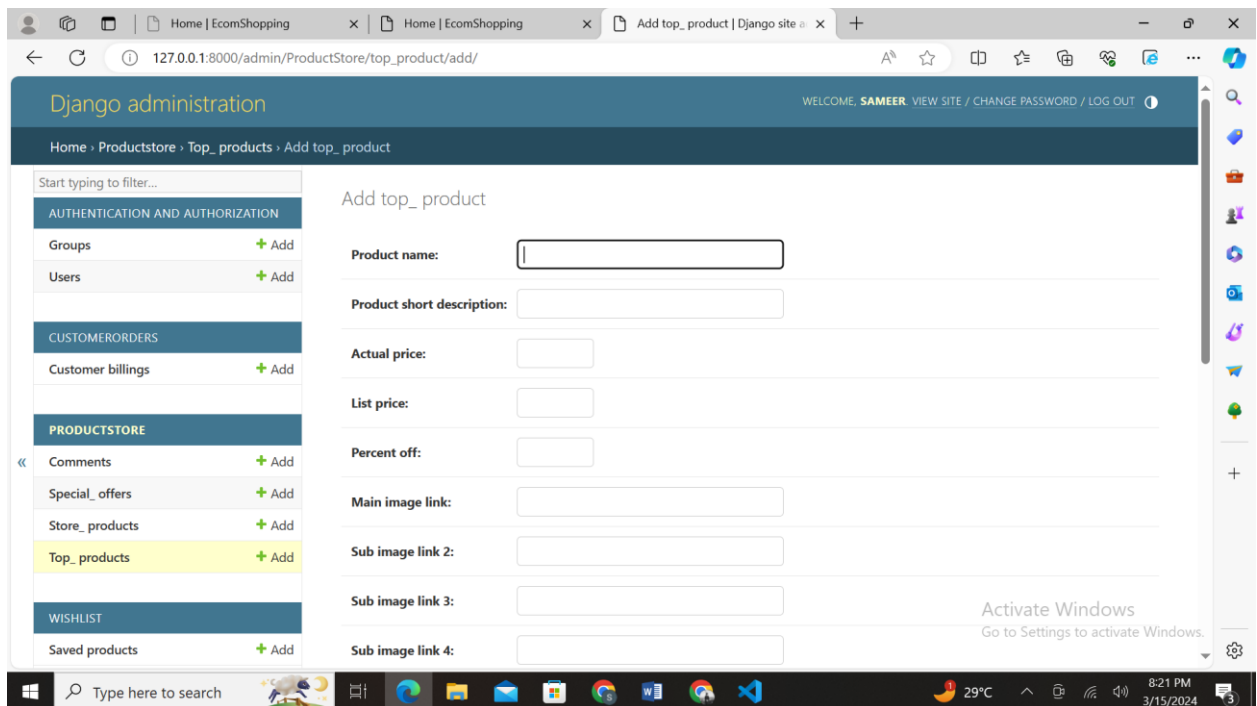


Figure 13 add product

View Users:

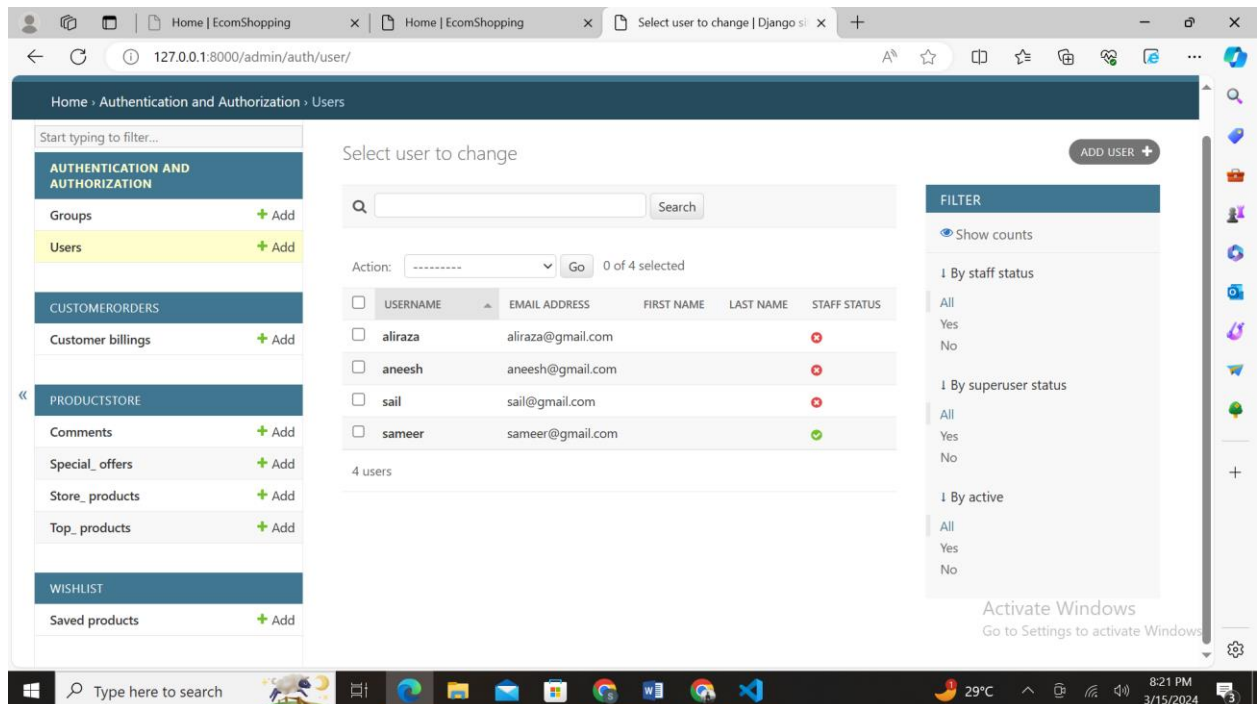


Figure 14 view users

Viewing profile information of users:

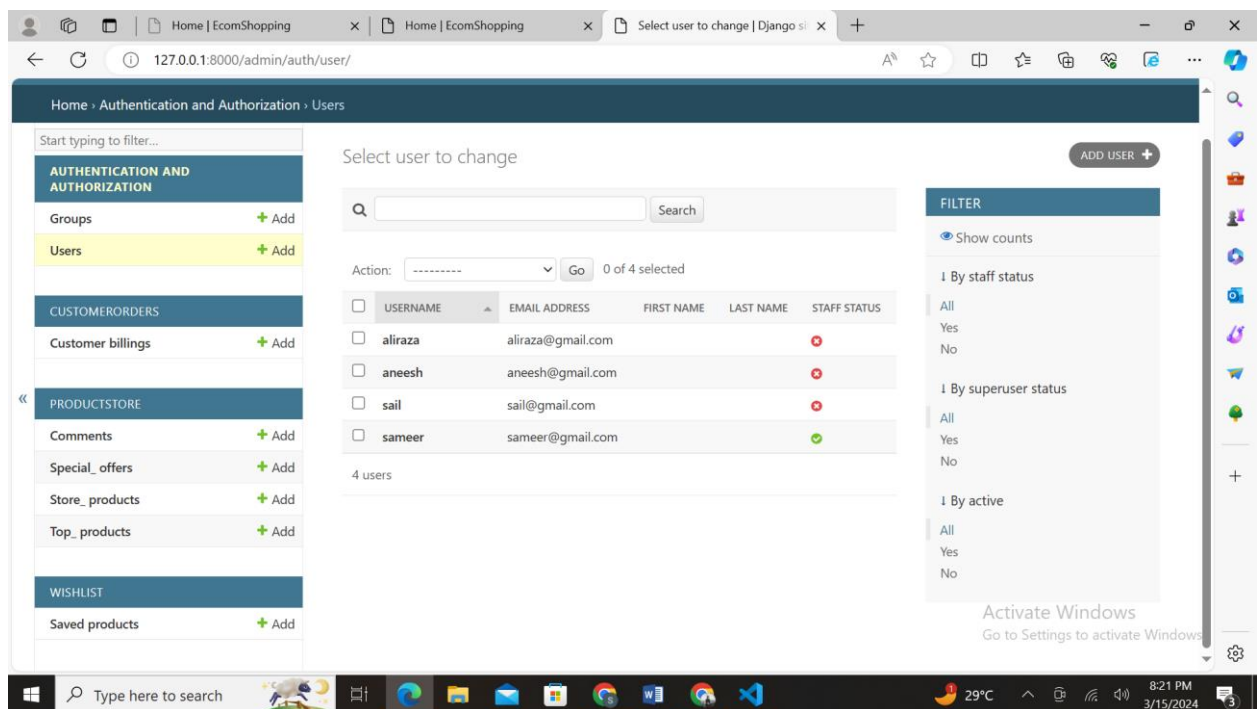


Figure 15 viewing profile information of users

Viewing Order Details:

The screenshot shows the Django administration interface for 'EcomShopping'. The user is logged in as 'SAMEER'. The page title is 'Select customer billing to change'. The left sidebar shows the navigation menu with 'Customer billings' highlighted under 'CUSTOMERORDERS'. The main content area displays a table of customer billings with columns: INVOICE NUMBER, FULLNAME, EMAIL, PROVINCE, DISTRICT, MOBILE NUMBER, ADDRESS, and CREATED AT. Two billings are listed: one for 'sameer' (invoice 1105521) and one for 'ali khan' (invoice 6198061). The bottom of the page shows the Windows taskbar with the date 3/15/2024 and time 8:29 PM.

| INVOICE NUMBER | FULLNAME | EMAIL | PROVINCE | DISTRICT | MOBILE NUMBER | ADDRESS | CREATED AT |
|----------------|--------------|-------------------|-----------------------------|------------|---------------|-----------------|--------------------------|
| 1105521 | samer sameer | sameer@gmail.com | Islamabad Capital Territory | Islamabad | 87836492387 | abcdabcd abdjcb | March 15, 2024, 8:28 p.m |
| 6198061 | ali khan | aliraza@gmail.com | Sindh | Bahawalpur | 3489398938 | street 1 2 | Feb. 2, 2024, 11:29 p.m. |

Figure 16 order details

View Orders:

The screenshot shows the 'Checkout' page in the 'EcomShopping' application. The page title is 'Checkout Shop'. The left sidebar shows the navigation menu with 'Checkout' highlighted. The main content area displays the 'Billing Details' form with fields for First Name, Last Name, Province, City, Street address, Email address, and Phone. The 'Your Order' section shows the product details and price. The total price is PKR-4899.00. The bottom of the page shows the Windows taskbar with the date 3/15/2024 and time 8:32 PM.

| Product | Price |
|--|-------------|
| GSS K6 Outdoor Full HD WiFi IP Security Camera, CCTV Surveillance Camera, Weatherproof - Night Vision - LED Lights - Two Way Audio | PKR-4899.00 |

Figure 17 view order

View Shop Cart of user:

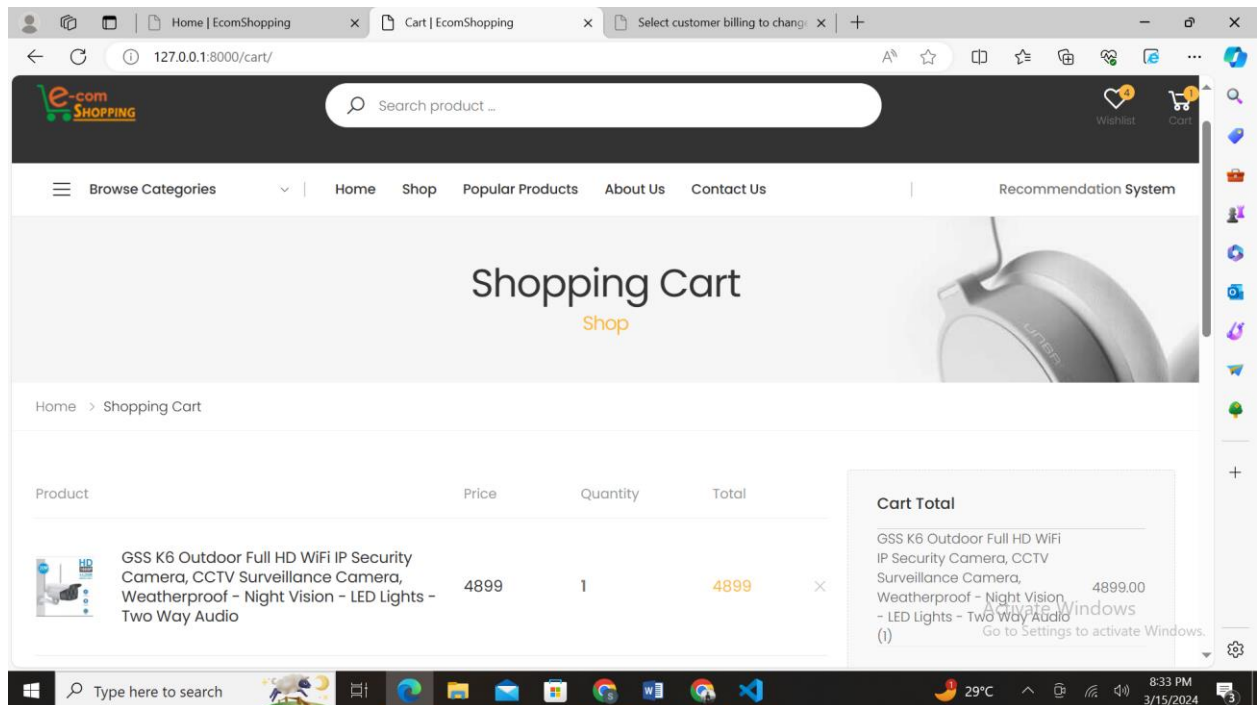


Figure 18 view shop cart of user

User Sign Up/Register:

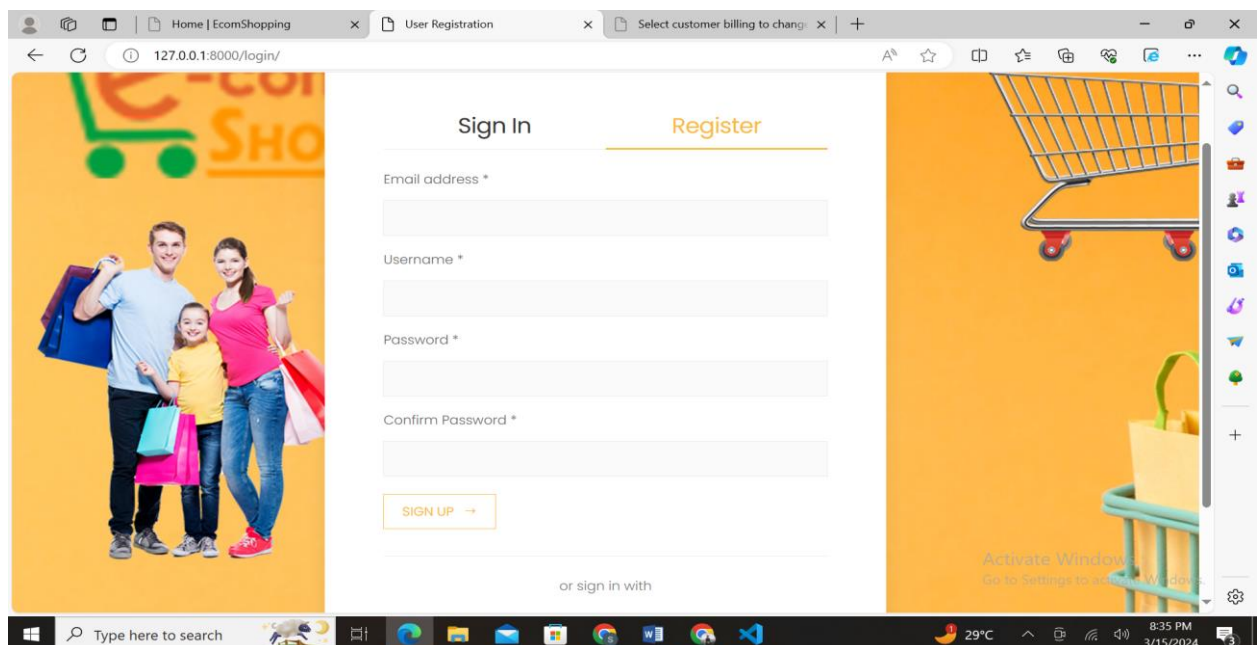


Figure 19 sign up/ register

User Sign In:

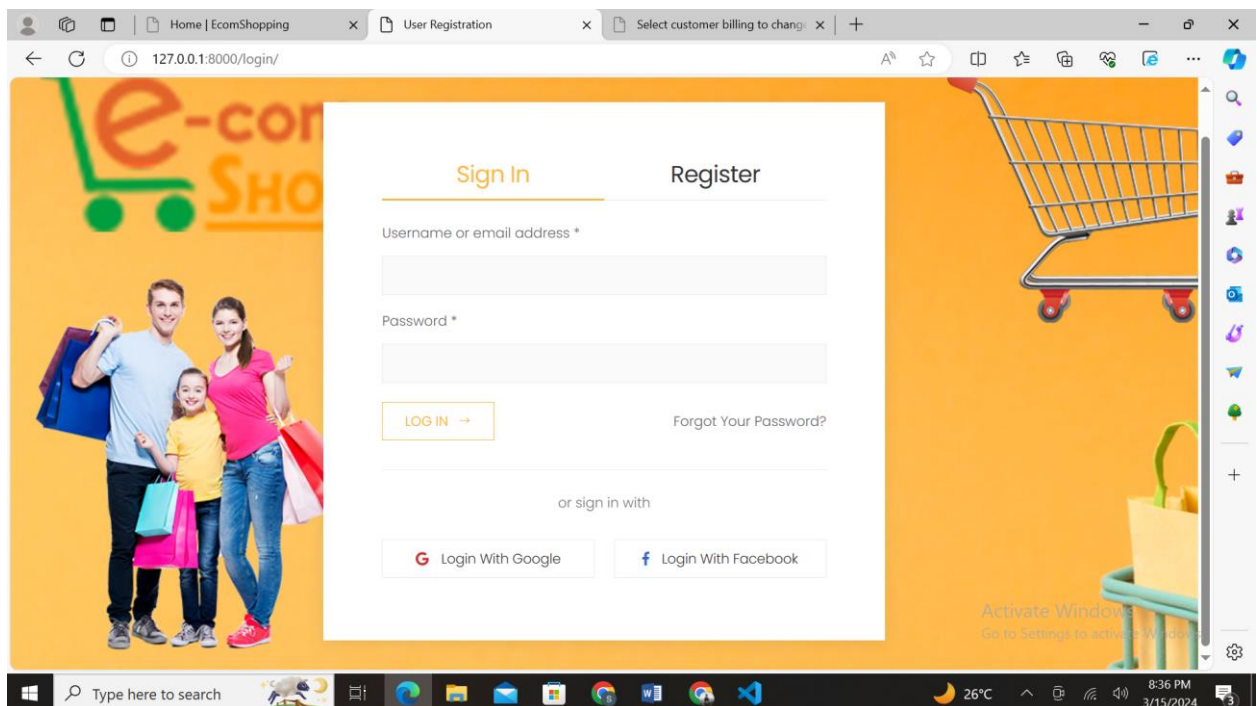


Figure 20 user sign in

Home Page:

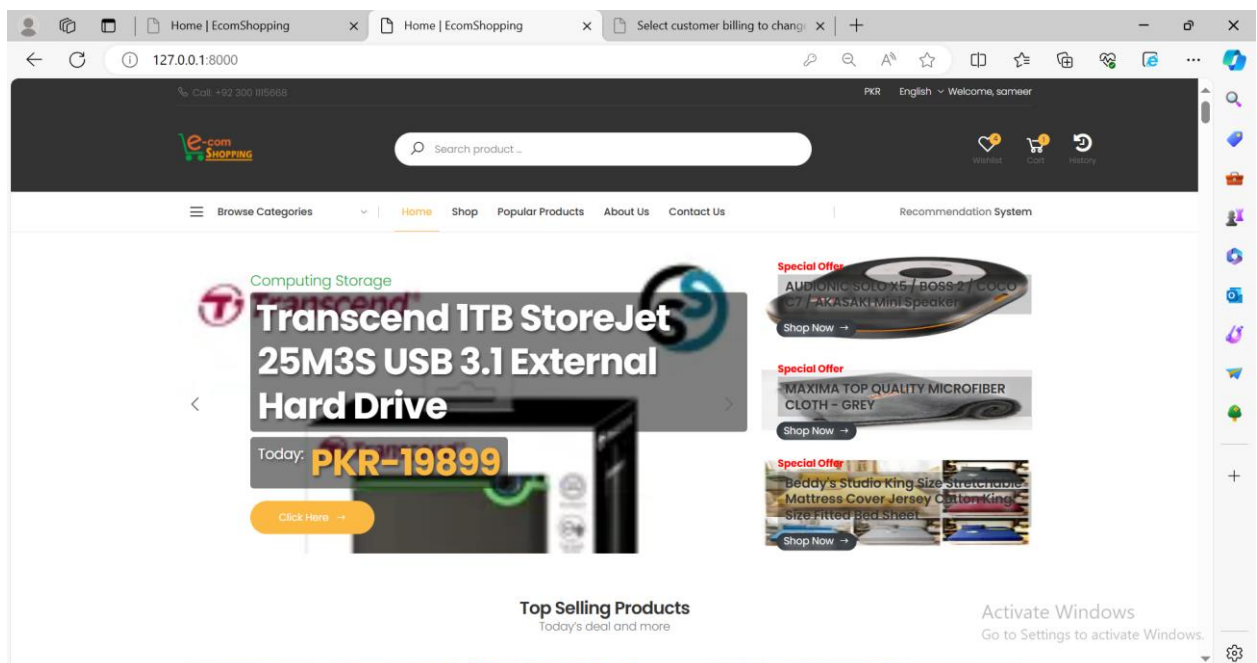
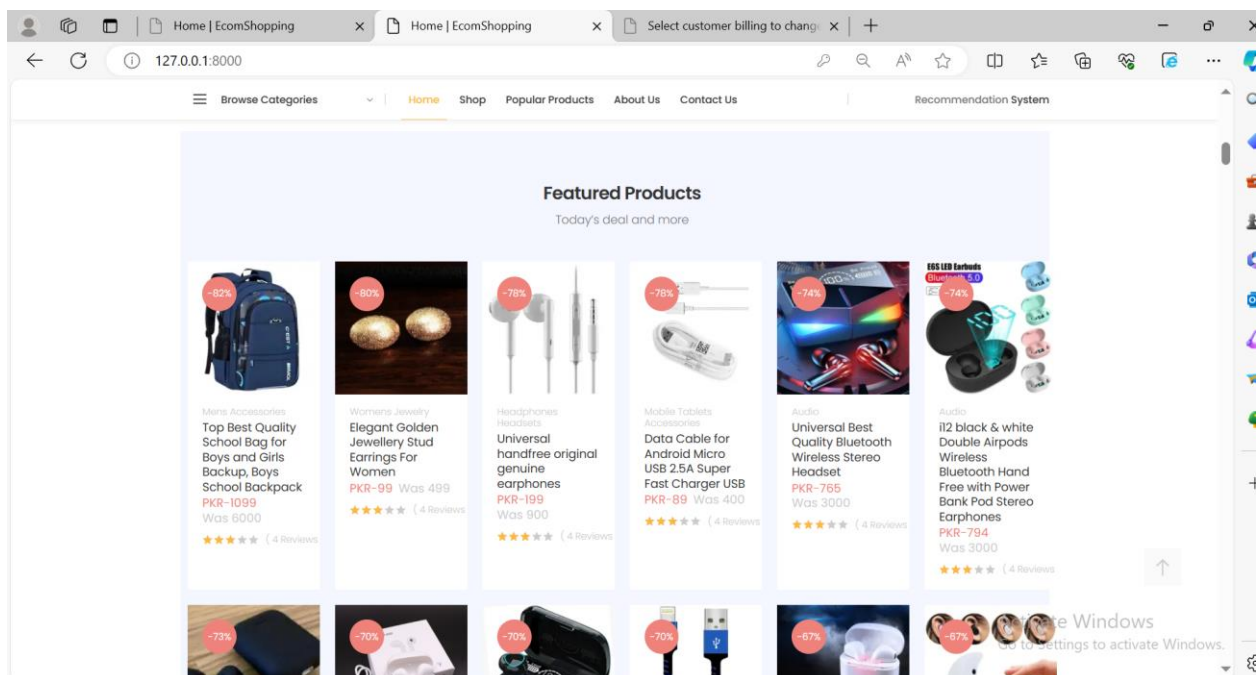
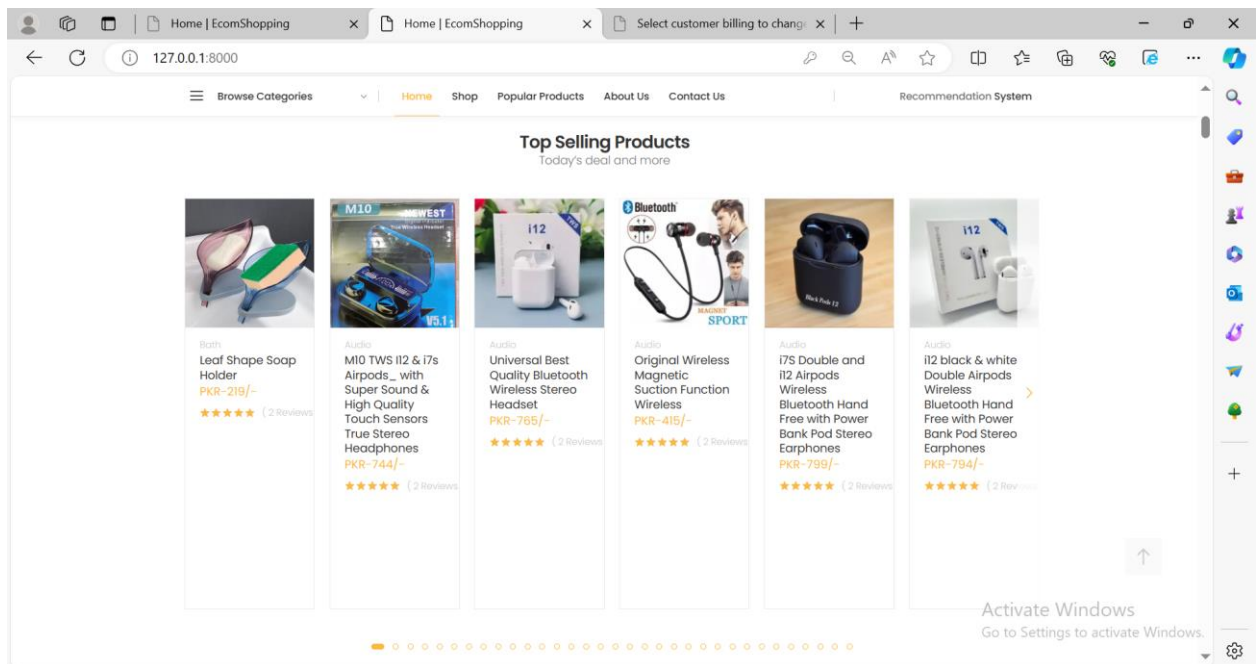
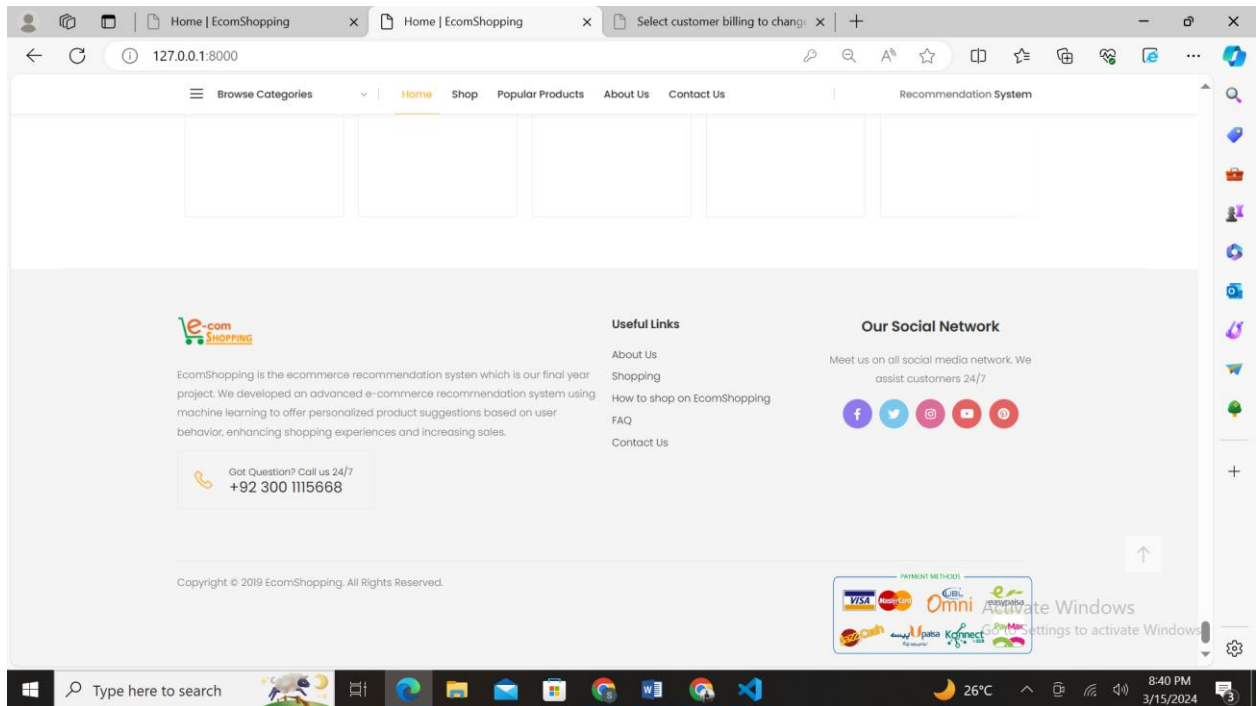


Figure 21 home page





Search List:

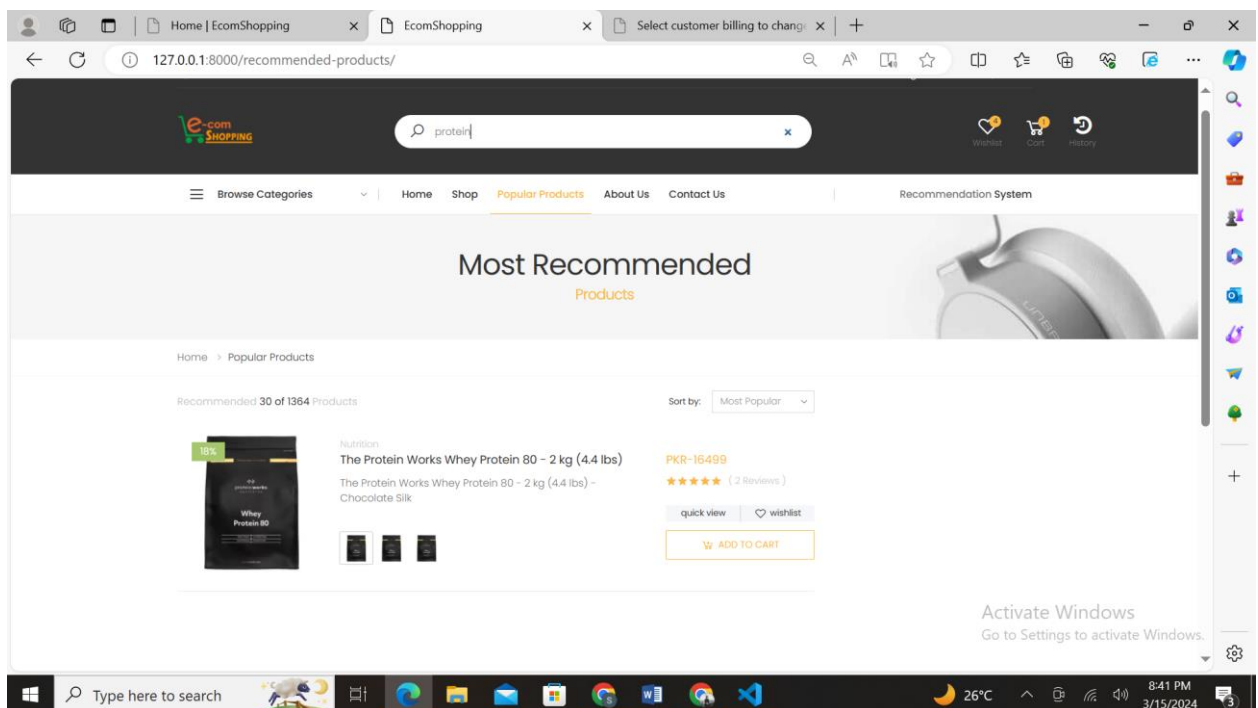


Figure 22 search list

View Categories:

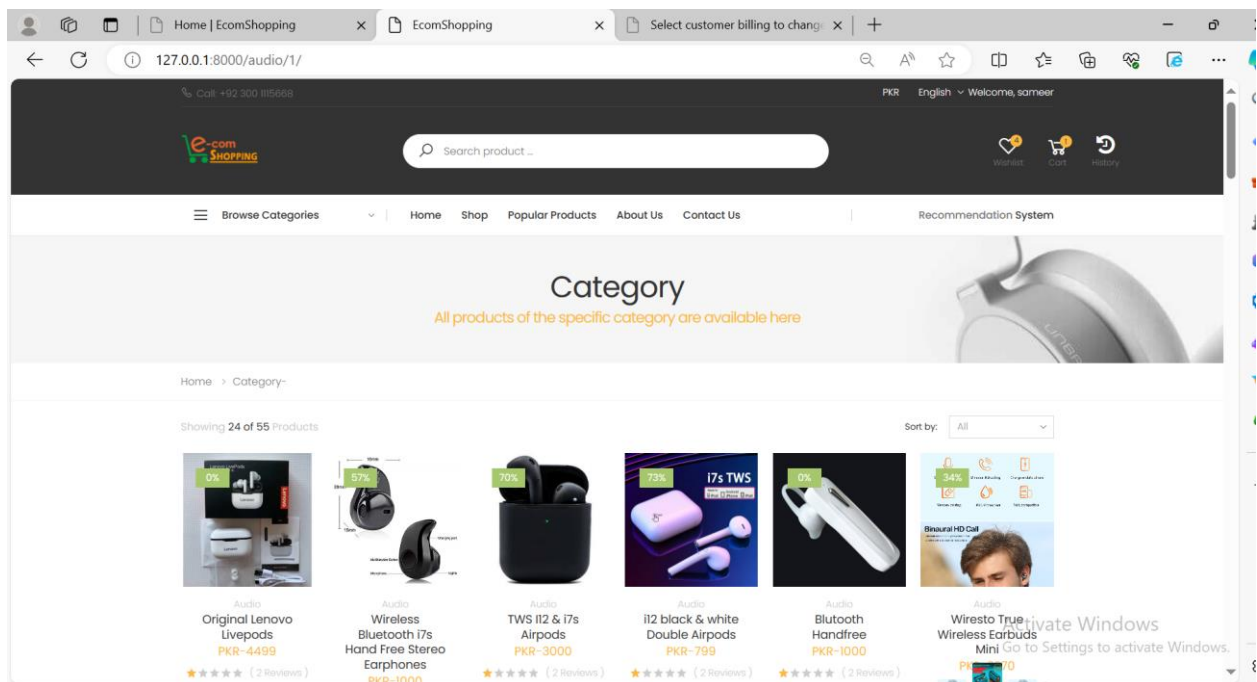


Figure 23 view categories

Wish list Page:

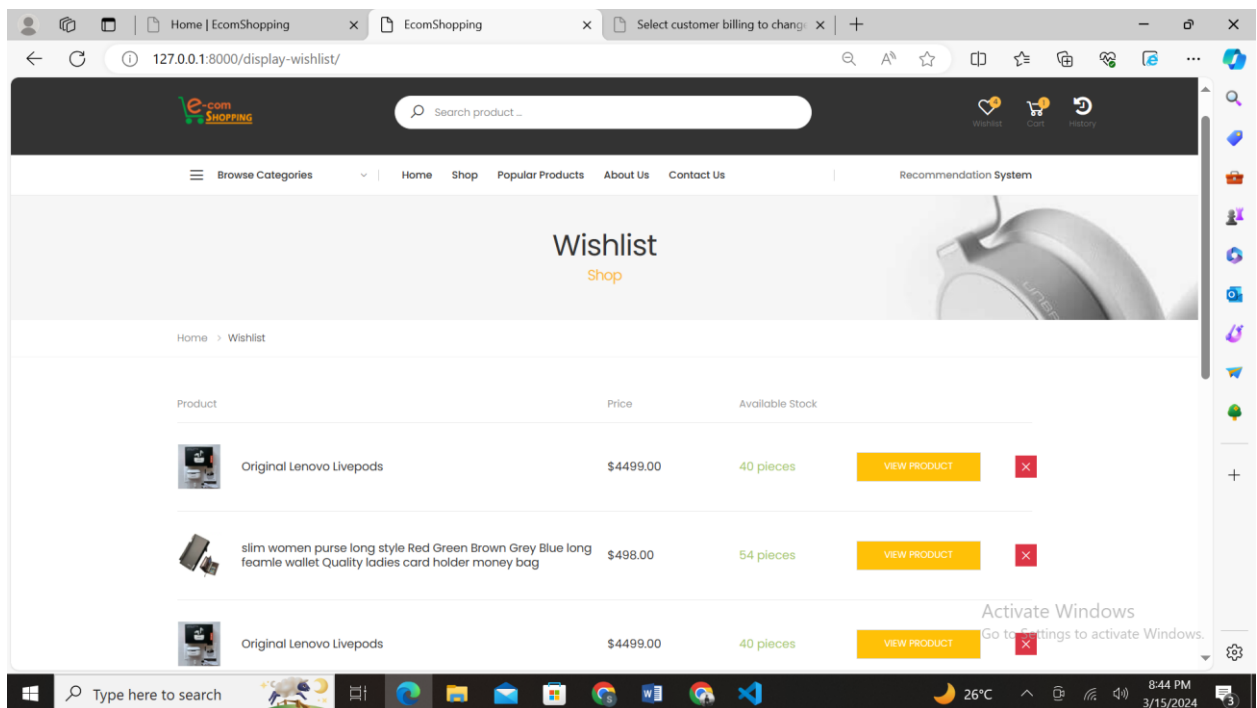


Figure 24 wish list page

Product detail:

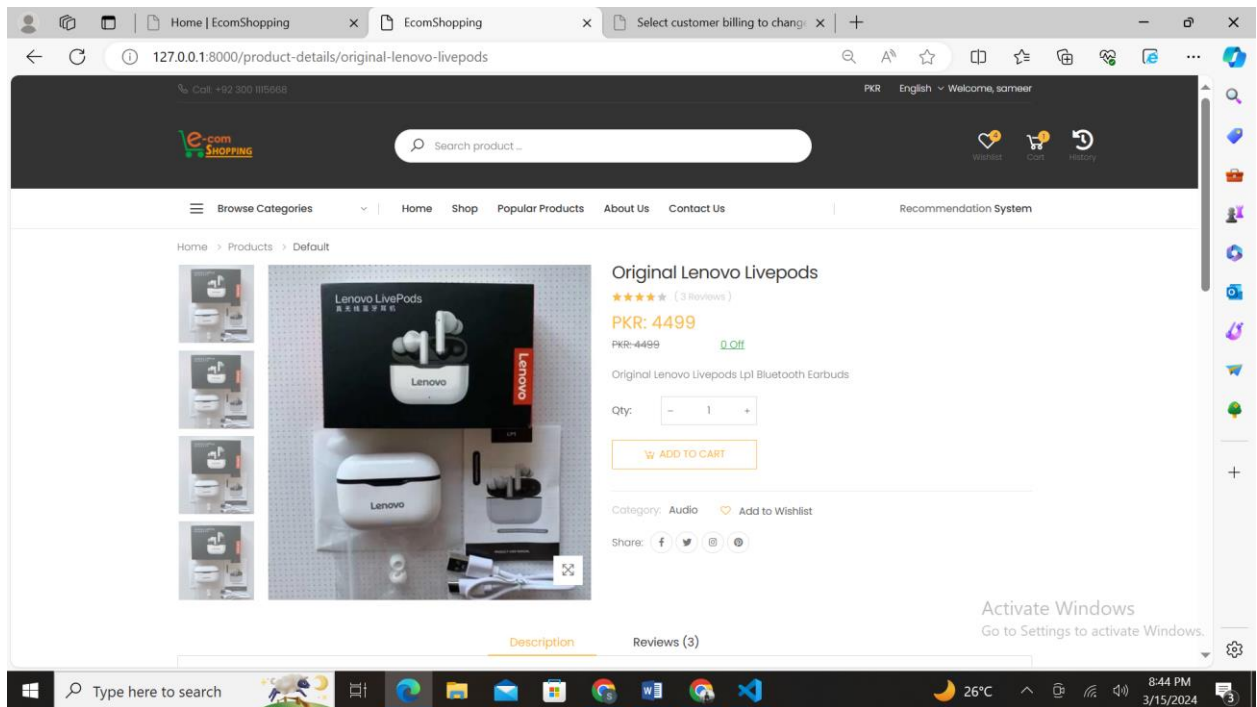


Figure 25 product detail

User Profile:

User profile showing at the top right corner of page.

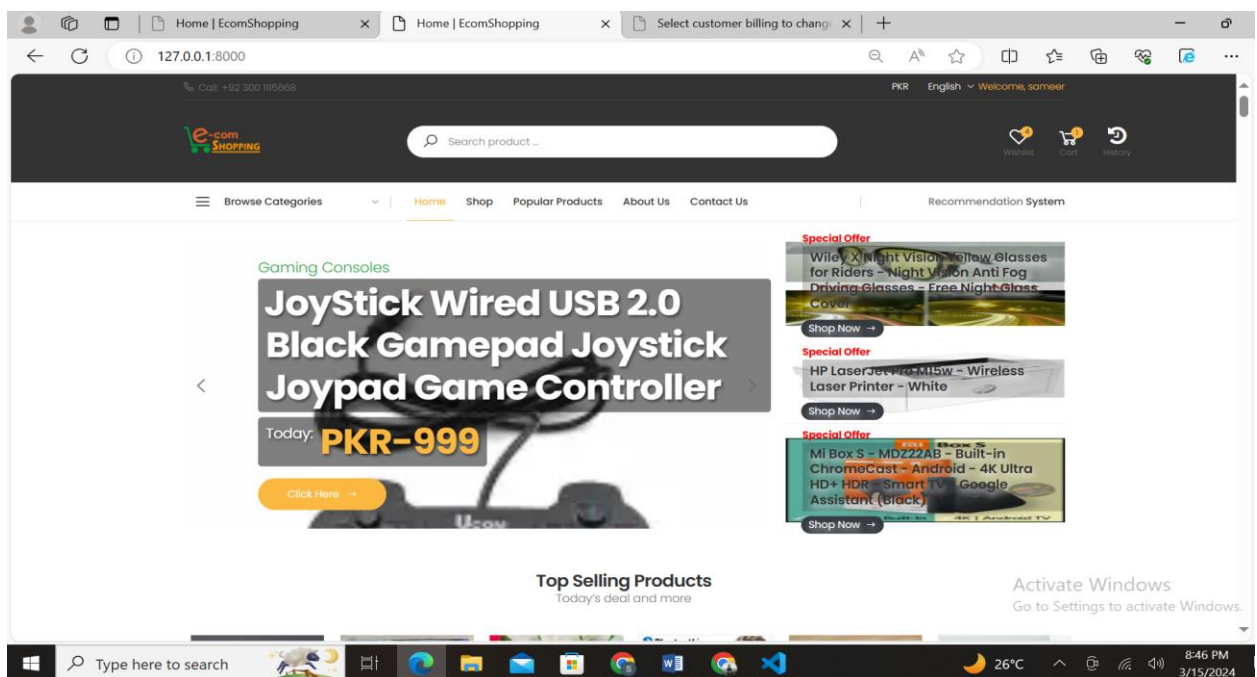


Figure 26 user profile

Rating/Reviews page:

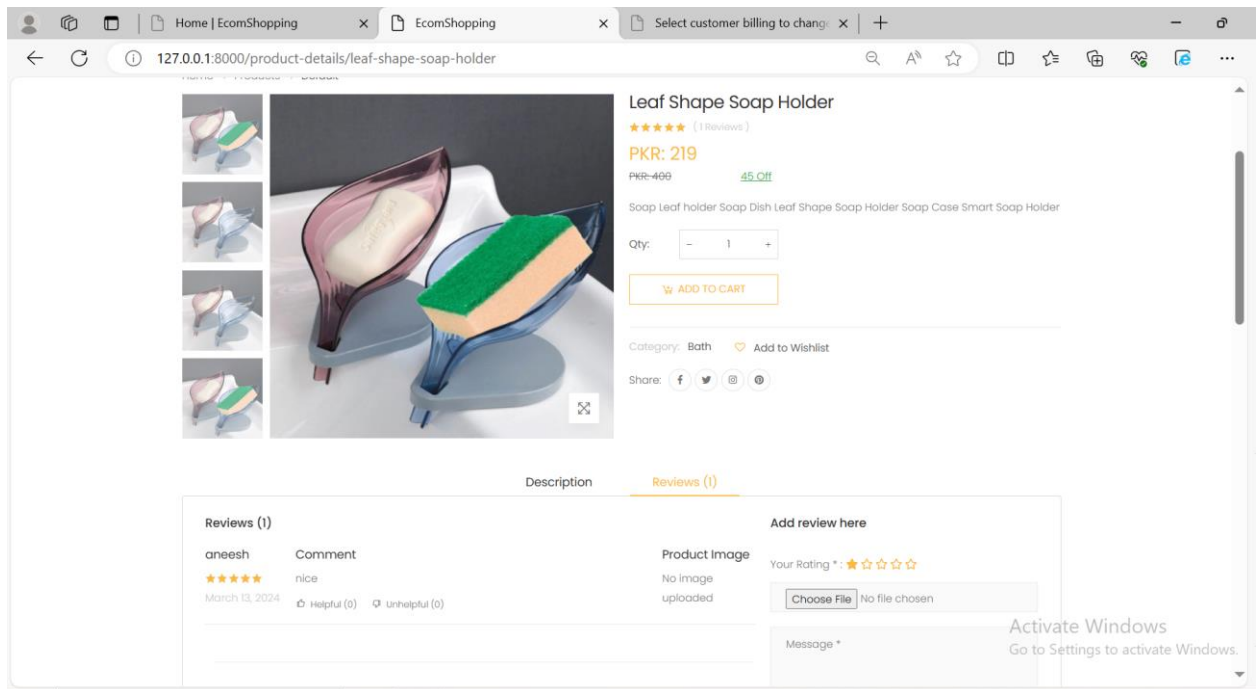


Figure 27 rating/review page

Chapter 7 Testing And Evaluation

Different testing and evaluation are done in this section.

7.1.1 Invalid Credential:

I have used following criteria to test the system.

1. Password wrong:

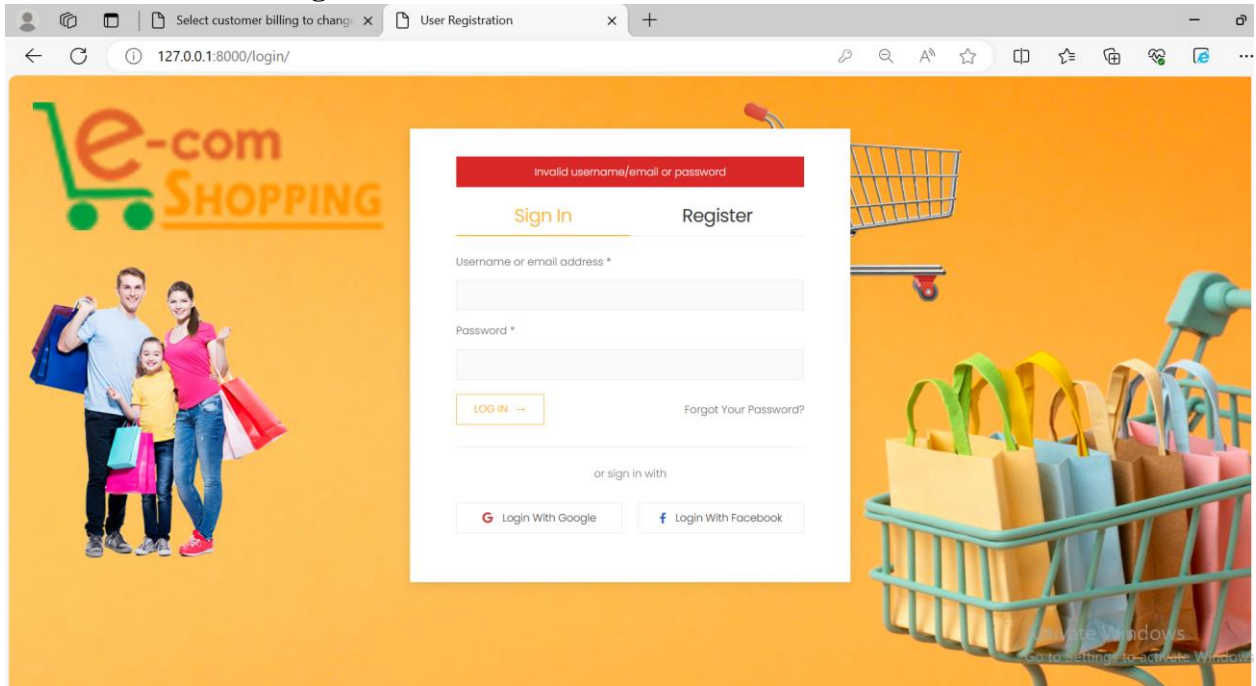


Figure 28 password wrong

User Already Exist:

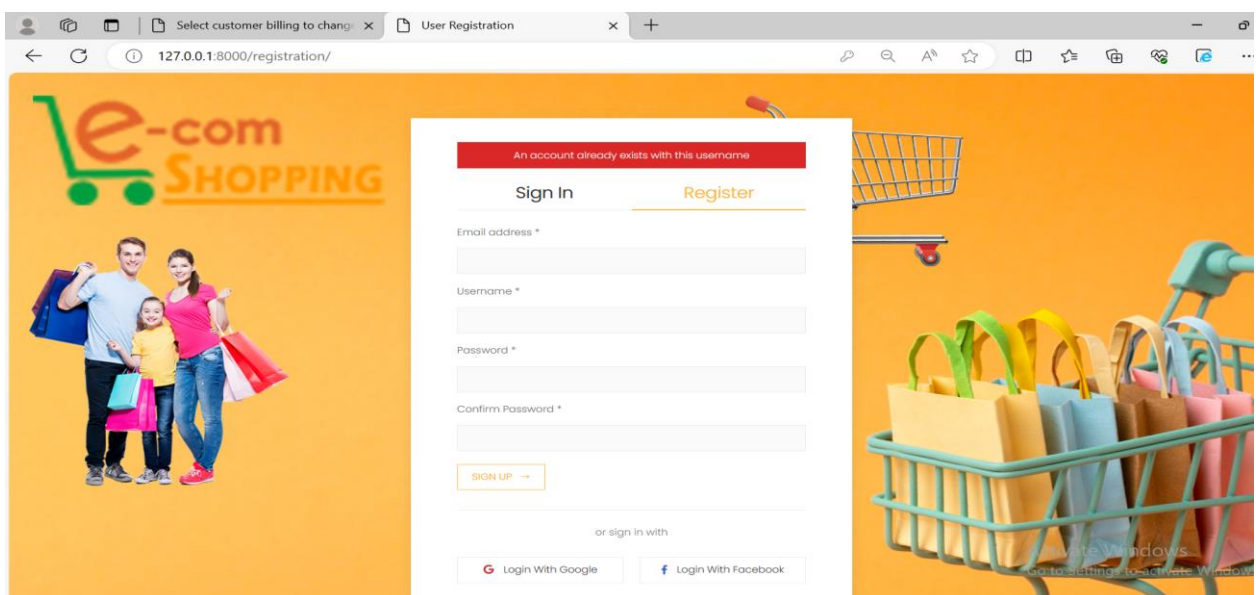


Figure 29 user already exist

Testing of Recommended Products:

Most recommended products are showing in popular products page. The limit of recommendation product is 30, the recommended product will be change every time, it will show different recommendation product every time.

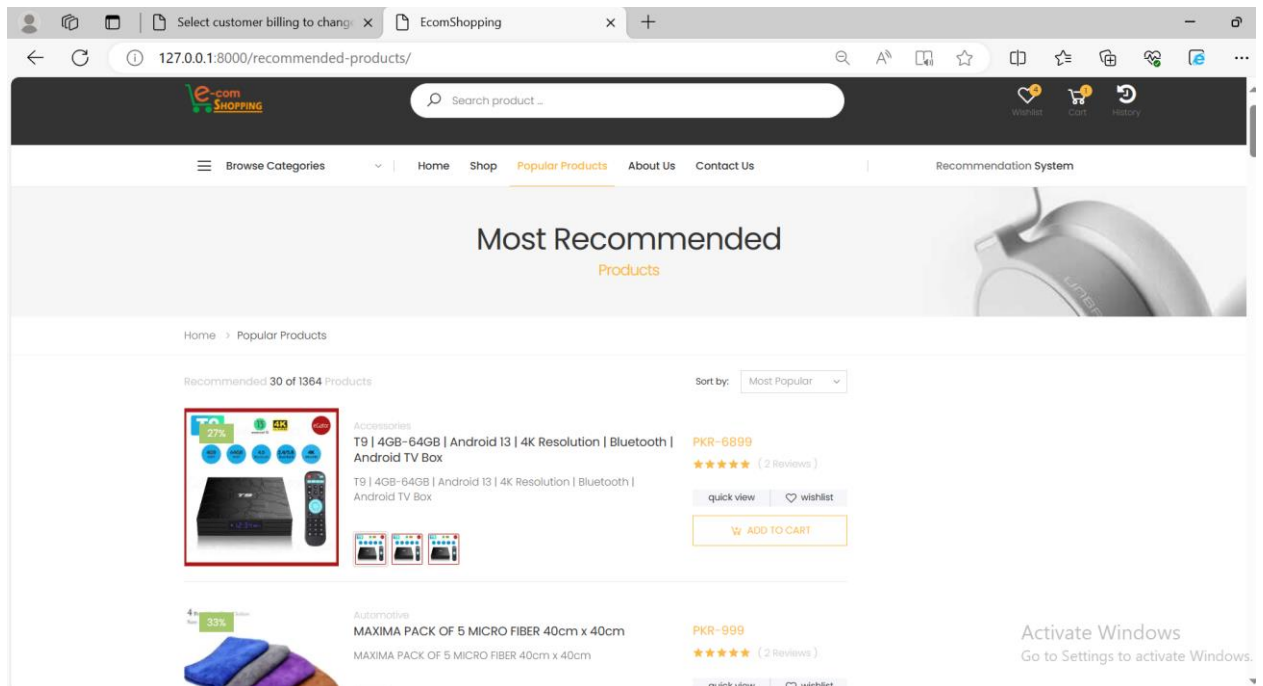


Figure 30 Testing of recommended products

7.2 Academic Question:

The main motto of creating a recommendation system in an e-commerce site using a hybrid model is to enhance the shopping experience for users by providing personalized and relevant product recommendations. By analyzing user behavior, preferences, and historical data, the hybrid recommendation system combines the strengths of different recommendation techniques, such as collaborative filtering and content-based filtering, to offer more accurate and diverse recommendations. Ultimately, the goal is to increase user engagement, satisfaction, and ultimately, drive sales for the e-commerce platform.

Chapter 8 Conclusion And Future Work

In this final semester, a full-fledged ecommerce system with different products from different categories and powerful recommendation system is integrated. Some of the work for future work is to extend the search features and use different filters to the system. Trending list can be generated based upon the popularity of the product in certain period of time in certain area. To increase the sell, flash sell and promo code for certain discount must be integrated. Password strength checker can also be integrated for better security. The option for language can be increased in future to sell more product to the native people of different community. There are many possibilities for the development of the system. Just like other software, this software also has a lot of unseen bug. I will regularly fix and upgrade the software during maintenance and deployment of the system in real life.

8.1 Critical evaluation:

Recommendation systems are the hot topic in online big tech. Constantly, recommendation systems are changing to user's behavior in the system. The recommendation systems are of different types as described in literature review part. The matrix is used with user's and their particular rating in product in this system. Most of the ecommerce site uses rating as one of the main components to get the user's preferences on particular topic. So, I did the same thing. I used the rating as the main component for determining or predicting the rating of the particular user. Apart of rating, other implicit features such as like, comment, purchase record, purchase feedback etc. can also be used to recommend products more accurately.

Natural language processing can also be used in comment section of product to detect the user's preferences on certain products. This system does not have function of editing the review and cannot even reply to the comment. To work recommendation part of this system, the system must not delete any product and users from database since, foreign key of product i.e. product_id and foreign key of user i.e. user_id is used in separate review table of database. Like and dislike system can also be used instead of rating system. Recommendation can also be given to message section. Message replying can also be automated.

8.2 Appendices:

Appendix A: Dataset Information

The dataset used in this project is sourced from Daraz (Alibaba), a prominent e-commerce platform. It contains information about various products available for purchase on the platform. The dataset includes details such as product names, categories, prices, descriptions, and ratings.

Appendix B: Data Preprocessing

Before using the dataset for training the recommendation system, several preprocessing steps were performed. This included handling missing values, removing duplicates, and standardizing the data format to ensure compatibility with the recommendation algorithms.

Appendix C: Model Architecture

The hybrid recommendation system employs a combination of collaborative filtering and content-based filtering techniques. This section provides a detailed overview of the model architecture, including the algorithms used, feature engineering methods, and integration of machine learning models.

Appendix D: Glossary of Terms

A glossary containing definitions of technical terms, acronyms, and concepts used throughout the report is provided.

Appendix E: User Interface Screenshots

Screenshots of the user interface of the e-commerce store recommendation system are presented.

Appendix F: Dataset Access

For reference, the Daraz (Alibaba) dataset used in this project.

Appendix E: Implementation Details

The implementation of the recommendation system, including programming languages, frameworks, and libraries that are used provided in this report.

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