Tribhuvan University

Faculty of Humanities and Social Sciences

Sneaker Head

(Sneaker Recommendation System Using Content Based Algorithm)

A project report

Submitted to

Department of Computer Application

Asian College of Higher Studies

In partial fulfillment of the requirements for the Bachelors in Computer Application

Submitted by

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April 11, 2025

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Tables of Contents

Tables of Figures

CHAPTER 1 INTRODUCTION

1.1 Introduction

As part of this project I am building a personalized e-commerce platform for sneakers based on an content-based filtering algorithm** which recommends products based on user's preferences. Users can browse and search, filter sneakers by size, color, brand, and price. Users can also manage their profiles, follow orders, save products to a wish list, and get notifications for sales or price drops. Users can rate and review products as well. Admins will be responsible for product listings, orders, and promotions.

The website is business to consumer model which means we sell goods or services to an individual consumer(e.g. You buy a pair of shoes from an online retailer). Since it is a small business and I am starting the products at moderate quantity and the delivery service is not yet introduced. The website offers different shopping categories like Men section, Women section etc.Any product can be bought within the offered price range. Users can easily place the products in the cart and the cart design can be very simple and intuitive. [1]

1.2 Problem Statement

Many e-commerce sites sell various other products and services, but not all of them are focused on just selling sneakers. There are many difficulties to navigate several large e-commerce websites and find the specific type of sneaker you're looking for. What's more is that sometimes you'll have to hunt through other products such as apparel and accessories that don't directly relate to the product that you're looking for. This means people experience a low-quality shopping experience.

To address these issues the project wants to develop a specific website only for sneakers. In addition to this a user-focused and easy to use shopping experience is planned: a sophisticated filtering, search and recommendation feature and the recommendations would be made on a per-user basis.

1.3 Project Objectives

The main objective of this project is to create a personalized sneaker e-commerce platform that enhances the shopping experience for users.

- To build web-based personalized sneaker recommendations based on user preferences.
- To add the features like browse, search, and filter sneakers by various attributes such as size, color, brand, and price.
- To build the functionality to manage their profiles, track orders, and save products to their wish-list.
- To make the feature users to rate and review products
- To provide admins with tools to manage product listings, orders, and user management
- To make payment system using esewa payement integration

1.4 Scope and Limitations

1.4.1 Scope :

1. Sneaker browsing and shopping experience for users.
2. Personalized recommendations based on user preferences and behavior.
3. Users can filter sneakers by size, brand, color, and price for product discovery.
4. Real-time order tracking and management for users.
5. Admins can easily manage product listings, orders, and user management.
6. Secure payment gateway for smooth and safe transactions.
7. Users can save products to a wish-list and set price alerts for future purchases.

1.4.2 limitations :

1. The platform operates only online and requires internet access.
2. No in-person transactions; all payments are made through the integrated payment gateway.
3. No automatic notifications for new products or promotions, users must manually check for updates.

4. The platform only supports sneakers, and does not include other types of products at this time.
5. There is a single administrator account responsible for managing the system.

CHAPTER 2 LITERATURE REVIEW

The Electronic Commerce, or E-commerce, industry is one of the most enlightened sectors of the economy. The industry is growing very rapidly, so data collection and estimation are particularly difficult. Therefore, one has to rely largely on research by both government and private organization.

According to the U.S. Survey Department, manufacturing sector is the largest supplier to e-commerce sales which has 47.4% of their total shipments, followed by vendors which is having 28.6% of their total sales. These two sectors make the business-to-business group Electronic commerce is generally considered to be the sales feature of e-business. It also consists of the exchange of data to facilitate the financing and payment aspects of business transactions. This is an active and resourceful way of communicating within an organization and one of the most operative and useful ways of leading business. [2]

E-commerce today gained so much popularity because its essential technologies are worked out at huge steps. We are even offered to feel the product to better understand its shape, size and quality. In these benefits why to go out somewhere else when all you have to do is make an order, choose the delivery method, put up your feet and wait till the order is supplied right to your door-step. [3]

According to Monsuwe there are five external factors to understand consumer's intention to purchase in the internet which is the consumer personality, situational factors, product characteristics, previous online shopping experiences and the trust in online shopping. Consumer's trait includes their demographic factors such as age, income, gender and educational level will lead them to have the intention to shop online. For age factor, consumers that are aged under 25 has more potential to shop in online because of their interest in using new technologies to search for product information and compare and evaluate alternatives. For educational level, higher educated consumers are more likely to use the internet for their shopping medium because they are more computer literate. Product characteristic is also another factor that will influence the consumer's intention to purchase in the internet. Product characteristic can be tangible or intangible; standardized or customized. In an online context, lower tangibility of a product is caused by the lack of physical contact and assistance in the shopping process; consumer's intention to shop on

the internet will be low when there is a need to seek advice from a salesperson regarding the considered product. Products such as car, computers, perfume, perfume or lotion has the lower potential to be purchased by the consumer because it requires more personal knowledge and experience. [4]

CHAPTER 3 SYSTEM ANALYSIS AND DESIGN
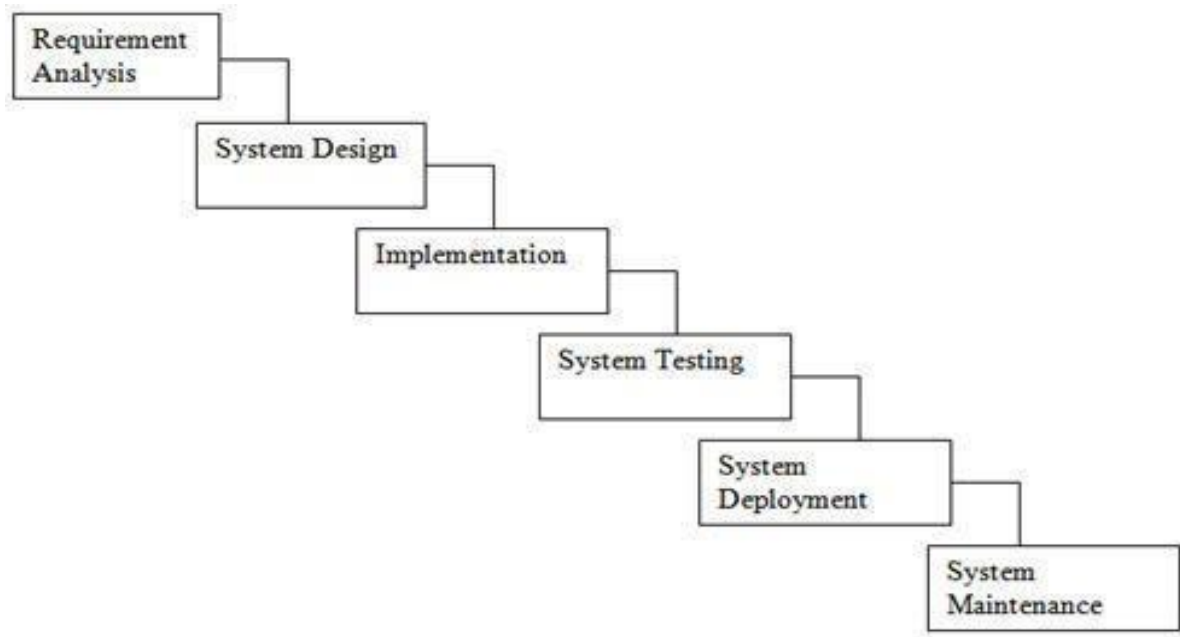
3.1 System Analysis

Considering the fact that this project involves design and implementation of a software system regardless that is wen-based, it will be important to mention and consider some models used in software development and deployment, some general models of software development are namely:

- The Waterfall approach: It represents activities in requirements, specifications, design,implementation and testing. All these as separate processes.

- Incremental / Evolutionary development: It involves a rapid development of the specifications and then refined later for the customer.

- Formal transformation: This approach is based on setting and producing a mathematical specification for the system to meet.

- System assembly from reusable components: This approach assumes that part of the system already exists. This model is focused on integration.

After reading though all these models. The waterfall model fits the development of this website. The main aim of using this approach is we can focus on each part of the model during development and come back to it if need be. The project can easily broken down into different parts based on this model,sequential project management approach where each phase (requirements, design, implementation, testing, deployment, and maintenance) must be completed before the next begins, making it suitable for projects with clear, fixed requirements and predictable outcomes. However, it offers limited flexibility since it does not easily accommodate changes once the development has begun. Overall, the Waterfall model is best suited for projects where the goals, requirements, and solutions are clearly understood from the start.

This is the model that will be used to develop the E-Commerce system. However, feedback loops will be allowed during the whole software development process. The model chosen for this project has to favors two developers for a project. Because we are the only ones who are going to implement this project. We find this model suitable for me to follow.

-Process has been illustrated below on figure showing top-down development

Figure 3.1 Waterfall model

3.1.1 Requirement Analysis

Requirement analysis is done while developing a system and before implementing it, it is necessary to analyze the whole system requirement. It is categories into mainly two parts:

   i. Functional requirements

   ii. Non-functional requirements

For any system, there are functional and non-functional requirements to be considered while determining the requirements of the system. The functional requirements are user "visible" features that are typically initiated by stakeholders of the system, such as generate report, login, and sign up. On the other hand, nonfunctional requirements are requirements that describe how the system will do what it is supposed to do, for example, Usability, Reliability & Availability, Performance, Security and maintainability.

i. Functional requirement The requirement that has been used in the project as the functional requirements generally includes the function such as inputs, the processing and the final output. The functional requirements in the project are mentioned below.

1. User Module

● User can register and login the system.

● Users can look at their cart detail.

● User can get cart detail after updating each products.

● User can logout from the system after completion of transaction.

2. Admin Module

● Admin can login the system.

● Admin can add and delete products.

● Admin can see the registered users.

● Admin has the privilege to delete the user

ii. Non -Functional Requirement The non-functional requirement specifies how the system works. The non-functional requirements included in the project are:

1. System uses different database for storing the attribute for each entity.

2. User can see the transaction detail after performing transaction.

3.1.2 Feasibility Analysis

i. Technical Feasibility:
● The UI of our project is very simple.
● User will require internet browser and internet to use it
● It will run on many existing web browsers with the latest versions and even in the smart phones.

Recommended Software
● **VS Code**
● **MySQL**
● **WP Local**

ii. Operational Feasibility

These include the reliability, maintainability, usability, support-ability. The proposed system is operationally feasible as it is reliable for all type of user i.e whether or not the user has the knowledge of computer or not. The proposed system is supported for a small to large-scale organization. It is simple and easy to use due to simple user interface and its operational feasible.

iii. Economic Feasibility

Before the development of a system, the proposed system should be studied whether or not it is within the budget estimated by the organization. The project that we are developing is within the cost estimation of the organization. The project cost is less and no more burdens are needed. The system development does not have any requirement of expensive hardware and software. The platform are open sources and the resources required for the project are also open source. Hence the project is said to be economically feasibility.

iv. Schedule Feasibility

The purposed system is scheduling feasible as it does not require more time for the development phase. The data collection takes more time to collect the data about various products and their quality. After data is collected, the other development phase can be within a month. Gantt charts. It is a useful way of showing what work is scheduled to be done on a specific day. It can also help you view the start and end dates of a project in one simple chart. In my project, I used PowerPoint for developing the Gantt chart which is shown below in the figure [4]

3.2 Gnatt chart
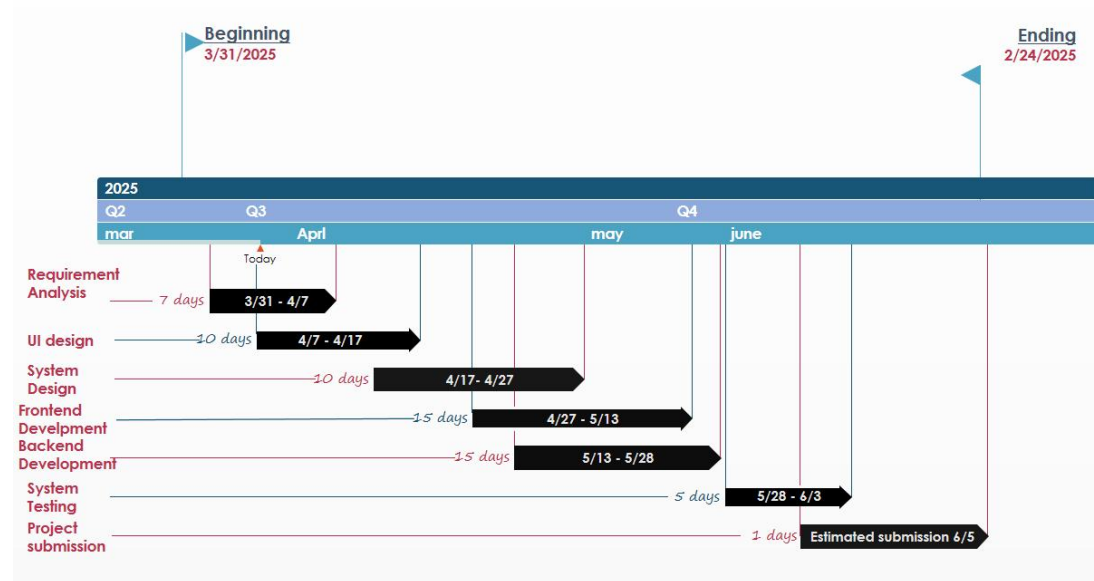
Figure 3.2 Project Gnatt chart

This Gantt chart outlines the timeline and phases of a project scheduled from late March to early June 2025. The project begins with the "Requirement Analysis" phase, which spans 7 days from March 31 to April 7. Following this, both the "UI Design" and "System Design" phases run in parallel from April 7 to April 17, each lasting 10 days. Once these are completed, "Front-end Development" begins and continues from April 17 to April 27, lasting approximately 5 days. This is immediately followed by "Back-end Development," which runs from April 27 to May 13, covering a period of about 15 days. After back-end work, the "System Testing" phase takes place from May 28 to June 3, lasting 5 days. The final step in the timeline is the "Project Submission," which is scheduled for June 5, marked with a red dot to highlight its importance. The chart visually represents task duration, overlaps, and dependencies, providing a clear view of the project's workflow and estimated completion date.

3.2 Algorithm :

Content-based filtering is a recommendation method that suggests Sneakers to users based on the attributes and characteristics of the products they have previously shown interest in. This approach utilizes the features of shoes and sneakers (such as brand, type, material, color, style, etc.) to recommend items that match a user's preferences. Unlike collaborative filtering, which relies on user behavior, content-based filtering focuses on

12

the individual user's past interactions and product attributes to generate personalized recommendations.

3.2.1 How Content-Based Filtering Works:

Content-based filtering assumes that if a user has shown a preference for certain sneakers in the past, they are likely to prefer items with similar characteristics in the future. The recommendation process involves analyzing product features of shoes or sneakers that a user has interacted with, and then finding other products with matching or similar attributes.Content-based filtering works by recommending items to users based on the features of items they previously liked or interacted with, matching those features with similar ones in other items.

Here's how content-based filtering works for a **Sneakers Recommendation System**:

1. **Product Feature Extraction**:

- The system extracts features from sneakers, such as brand, material (e.g., leather, mesh, synthetic), color, type (e.g., running shoes, casual sneakers, sports shoes), size range, comfort level, and design.
- Example: If a user has bought or liked sneakers made from breathable mesh material and in a specific color like black, the system may recommend similar sneakers with the same material or color.

2. **User Profile Creation**:

- The system creates a profile for each user based on the sneakers they have shown interest in, whether through clicks, views, purchases, or ratings. The profile captures preferences in terms of shoe brand, material, color, type, and style.
- Example: If a user tends to purchase running shoes from specific brands like Nike or Adidas, the user profile will prioritize those brands when generating recommendations.

2.3.3 Challenges of Content Based Filtering Algorithm

1. **Limited Variety**: Since content-based filtering recommends sneakers that are similar to those a user has already interacted with, there's a risk of limiting the diversity of recommendations. This could result in the user being shown only shoes within a narrow range of their preferences.

2. **Over-fitting**: The system may overly focus on sneakers that are too similar to what the user has previously liked, making it difficult to introduce new styles, types, or brands that the user might enjoy but has not yet explored.

3. **Feature Representation**: Effectively capturing and representing sneaker attributes (such as comfort, material, style) is crucial. Inaccurate or insufficient feature descriptions can lead to poor or irrelevant recommendations. For example, if the material of a sneaker is not clearly defined, the system might miss recommending similar products based on this key feature.

4. **Cold Start Problem**: For new users or newly added sneakers with little interaction data, the system may struggle to make accurate recommendations. New users who have not yet interacted with products on the site may receive generic recommendations based on available product features.

5. **User Profiling**: Creating accurate user profiles can be tricky, especially if a user has a broad range of interests (e.g., buying both casual sneakers and high-performance running shoes). The system must effectively balance these diverse preferences to make more nuanced recommendations.
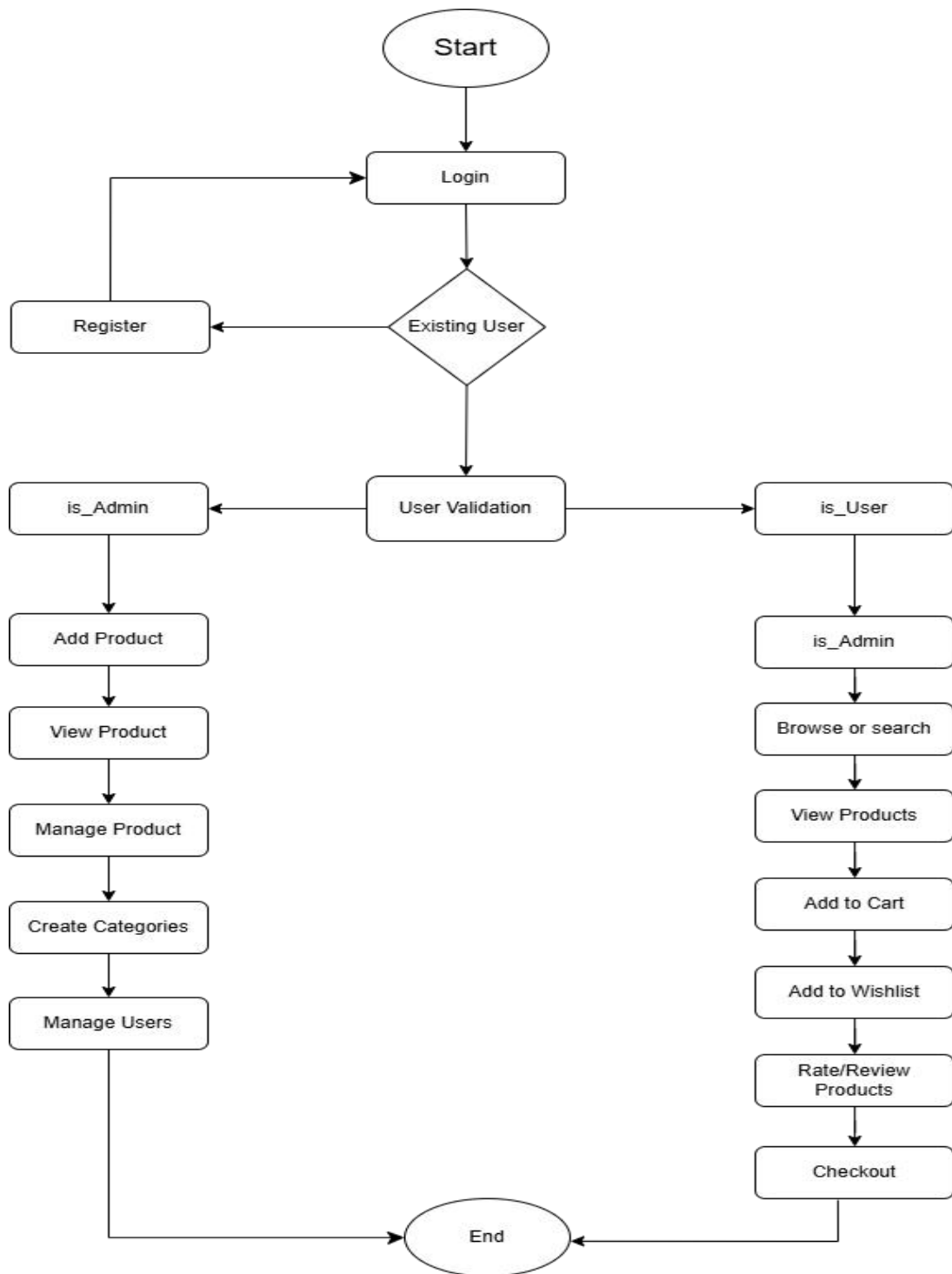
3.3 Flow Chart

Figure 3.3 Flowchart of SneakerHead

3.4 Use Case Diagram

Figure 3.4 Use Case diagram of Sneaker

3.5 Tools

The various system tools that will be use in developing both the front-end and back-end of the project are being discussed in this chapter.

● **Front-end**

Bootstrap, HTML5, CSS3, and JavaScript are used for developing the front-end.

● **HTML5 (Hyper Text Markup Language)**

HTML is a syntax used to format a text document on the web.

● **CSS3 (Cascading Style Sheets)**

CSS is a style sheet language used for describing the look and formatting of a document written in a markup language.

● **Java Script V8 8.9.255.25**

Java Script is a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. Java Script is used to create popup windows displaying different alerts in the system like "Added to cart successfully", "Login successful", "Purchase successfully"etc.

● **Back-end**

The back-end is implemented using PHP and MySQL. MySQL is used to design the database.

● **PHP**

PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language.

● **MySQL 8.0.22**

MySQL is the world's second most widely used open-source relational database management system (RDBMS). The SQL phrase stands for Structured Query Language.

MySQL is also used in many high-profile, large-scale websites, including Google etc.

Expected Outcome

- **Personalized Sneaker Recommendation**s – Users will receive sneaker suggestions based on their preferences, such as brand, color, material, and style.

- **Improved User Experience** – The system will provide an intuitive and interactive interface, making it easier for users to find suitable shoes.

- **Efficient Content-Based Filtering System** – The recommendation algorithm will analyze sneaker attributes to deliver relevant suggestions.

- **Scalability and Flexibility** – The system can be expanded to accommodate more sneaker categories and brands in the future.

- **Efficient Data Processing** – The system will efficiently handle and process user preferences and shoe attributes to provide fast recommendations.

- **Cold Start Handling** – The system will include a method to recommend trending or popular sneaker for new users without prior data.

- **Integration with E-Commerce Platforms** – The recommendation system can be integrated with online stores to enhance the shopping experience.

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