**System Requirements**

**<Project Code>:<Project Name>**

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**Table of Contents**

[1.](#_gjdgxs) Introduction 3

[2.](#_30j0zll) System Actors 4

[3.](#_1fob9te) Functional Requirements 5

[4.](#_3znysh7) Non-functional Requirements / Quality Attributes 6

[5.](#_tyjcwt) Security Requirements 7

[6.](#_3dy6vkm) Who Did What? 8

[7.](#_1t3h5sf) Review checklist 8

# Introduction

The AI-driven Personalized Clothing Recommendation Platform aims to enhance the online shopping experience for Pakistani consumers by bringing together local clothing brands on a single platform. This allows users to explore clothing from various brands with ease and convenience. The platform will focus on showcasing **at least 10 local Pakistani clothing brands**, providing users with a curated selection of their favorite products. This approach caters specifically to the local fashion market, giving shoppers access to multiple brands in one place.

**Main Incentive for Shoppers** The platform’s primary benefit is convenience. Users can find their preferred clothing items from different brands all in one location, eliminating the need to visit multiple websites. The experience will be personalized, offering tailored suggestions that align with their style and preferences.

**AI-Powered Personalization** The recommendation system will be powered by an **AI model** that learns from users’ previous purchases, browsing history, and personal taste. This data-driven approach allows for highly relevant, personalized product suggestions, making the shopping experience more enjoyable and efficient.

**Future Scope** The platform also has the potential to generate revenue through **affiliate marketing**. By partnering with local brands, the platform can earn commissions for purchases made through the site. This creates a mutually beneficial relationship between the platform and the brands, helping to drive visibility and sales for both parties.

Ultimately, the goal is to provide a **seamless, personalized, and engaging shopping experience** for Pakistani consumers. By offering a convenient, **AI-enhanced** platform, the project will simplify the process of discovering and purchasing clothing from a variety of local brands.

# System Actors

| **Actor Name** | **Description** |
| --- | --- |
| End User (Shopper) | The primary actor, the shopper, interacts with the virtual shopping assistant to browse, search, and receive personalized product recommendations. They provide inputs through queries, wish lists, and purchase history, enabling the system to tailor suggestions based on their preferences. |
| E-commerce Platforms | These represent local and international shopping brands that the assistant connects with. The platforms provide links to their product pages, along with details like descriptions, prices, and availability. |
| Admin/Developer | The system administrator or developer manages platform operations, monitors system performance, ensures API integrations, and updates recommendation algorithms. They also address user feedback, maintain data privacy, and scale the platform for growing user and brand integration. |
| Data Sources | The data sources combine real-time information on fashion trends from sources like social media, blogs, and external platforms with natural language processing capabilities. It helps the system not only suggest trending products based on current styles and consumer preferences but also understand and process user queries in conversational language. By learning from user interactions, it refines recommendations and enhances search accuracy, delivering personalized and trend-aware suggestions. |

# Functional Requirements

| **Requirements** | |
| --- | --- |
| **Sr#** | **End User (Shopper) Requirement** |
| 1 | **As an end user,** I want to be able to create an account with my email or social media profiles. |
| 2 | **As an end user,** I want to be able to log into my account. |
| 3 | **As an end user,** I want to be able to update my personal information, preferences, and shopping history in my profile. |
| 4 | **As an end user,** I want the system to suggest personalized product recommendations based on my preferences and past purchases. |
| 5 | **As an end user,** I want to search for products using natural language queries (e.g., “Show me affordable jeans”). |
| 6 | **As an end user,** I want the system to filter products based on criteria like price, brand, and category (e.g.,T-Shirt, Trousers). |
| 7 | **As an end user,** I want the system to notify me of promotions, sales, or discounts on products I’ve browsed or shown interest in. |
| 8 | **As an end user,** I want to receive personalized notifications for new arrivals or restocked items based on my previous interactions. |
| 9 | **As an end user,** I want to be able to like or dislike, so the system can refine future recommendations. |
| 10 | **As an end user,** I want to receive real-time updates on product availability and stock levels from e-commerce platforms. |
| 11 | **As an end user,** I want the system to provide style advice and recommend trending products relevant to my preferences. |
| 12 | **As an end user,** I want to be able to save products to a wishlist for future reference. |
| 13 | **As an end user,** I want to be able to track my purchase history through the platform. |
| 14 | **As an end user,** I want to compare similar products from different platforms based on price, availability, material used, style etc. before making a purchase decision. [Optional] |
| 15 | **As an end user,** I want to share product recommendations or my wishlist with friends via social media or messaging apps. |

|  | **E-commerce Platform Integration Requirement** |
| --- | --- |
| 16 | **As an e-commerce platform,** I want the system to retrieve product data like descriptions, reviews, prices, and availability through APIs or web scraping. |
| 17 | **As an e-commerce platform,** I want the system to display accurate and updated product details in real-time to users. |
| 18 | **As an e-commerce platform,** I want the system to allow seamless integration of promotional campaigns and deals for products. |
| 19 | **As an e-commerce platform,** I want the system to provide redirection links to product pages, where users can complete purchases. |
| 20 | **As an e-commerce platform,** I want the system to generate user behavior analytics reports, helping us understand purchasing patterns and optimize our offerings. |
| 21 | **As an e-commerce platform,** I want the system to aggregate data from multiple platforms to provide similar products’ comparison, allowing users to compare them based on price, material quality, style, etc. [Optional] |

|  | **Admin/Developer Requirement** |
| --- | --- |
| 22 | **As an admin,** I want to manage user accounts, including handling registration, authentication, and user permissions. |
| 22 | **As an admin,** I want to be able to monitor system performance and ensure smooth integrations with e-commerce platforms. |
| 23 | **As an admin,** I want to be able to address user feedback, including bug reports, and deploy system fixes quickly. |
| 24 | **As an admin,** I want the system to be scalable to accommodate more users, brands, and e-commerce platforms over time. |
| 25 | **As an admin,** I want to ensure user data privacy and manage data-sharing consent from users and platforms. |
| 26 | **As an admin,** I want to update recommendation algorithms based on feedback and system performance data. |
| 27 | **As an admin,** I want to add, remove, or update brand information, such as logos, descriptions, and catalogs. |

|  | **Data Source Integration Requirement** |
| --- | --- |
| 27 | **As a trend data source,** I want the system to gather trend-related data from social media platforms and fashion blogs to suggest trending products |
| 28 | **As an NLP data source,** I want the system to learn from user interactions and refine its ability to understand user queries and intents over time. |
| 29 | **As a trend data source,** I want to detect and suggest seasonal trends, like festive or weather-based clothing preferences. |
| 30 | **As a trend data source,** I want to analyze product views, wish lists, and cart additions to determine which products are gaining popularity. |

# Non-functional Requirements / Quality Attributes

| **Sr#** | **Requirements** |
| --- | --- |
| 1 | **Scalability:**   * The system must be capable of handling at least 10,000 concurrent user interactions without degradation in performance. |
| 2 | **Response Time:**   * The system should provide product recommendations within 2 seconds of receiving a user query. |
| 3 | **Data Storage:**   * The system should be able to store and manage up to 1 TB of user and product data without performance impact. |
| 4 | **System Availability:**   * The system must maintain 99.9% uptime, with scheduled maintenance windows not exceeding 1 hour per month. |
| 5 | **Error Handling:**   * The system should have automated error logging and alerting mechanisms, and errors should be logged with a severity level and timestamp for analysis. |
| 6 | **Security:**   * All user data must be encrypted using at least AES-256 encryption both at rest and in transit. |
| 7 | **Compliance:**   * The system should comply with GDPR and CCPA regulations for data privacy and user consent. |
| 8 | **Integration Latency:**   * The real-time integration with e-commerce platforms should have a latency of no more than 1 second for updating product availability and prices. |
| 9      10 | **Model Accuracy:**   * The recommendation engine should achieve a precision score of at least 80% in product suggestions based on user interactions.   **NLP Accuracy:**   * The NLP model should achieve an F1 score of at least 75% in understanding and processing user queries. |
| 11 | **User Interface Performance:**   * The web application should load within 3 seconds on standard broadband connections. |
| 12 | **Data Update Frequency:**   * The product data and trend information should be updated at least once every hour to reflect the latest information. |
| 13 | **Backup and Recovery:**   * The system should perform automated backups every 24 hours and be able to restore to the last backup point within 30 minutes of a data loss incident. |
| 14       15 | **User Interaction Limits:**   * The system should be capable of handling up to 1 million user queries and interactions per day.   **Resource Utilization:**   * The application servers should not exceed 75% CPU utilization under peak load conditions. |
| 16 | **Compatibility:**   * **Requirement:** The web application must be compatible with the latest versions of Chrome, Firefox, Safari, and Edge. |
| 17 | **Data Handling Capacity:**   * Requirement: The system must be able to handle a minimum of 100,000 data transactions per hour without performance degradation. |
| 18 | **Load Distribution:**   * Requirement: The load balancer should evenly distribute incoming requests across at least three application servers. |
| 19 | **High Availability:**   * Requirement: The system must maintain high availability with no more than 5 minutes of downtime during a load balancer failure. |

# Security Requirements

| **Sr#** | **Security Risks** | **Potential Losses** | **Controls** |
| --- | --- | --- | --- |
| 1 | Broken Access Control : Users might be able to access, control, and manipulate unauthorized administrative functions and other users’ data. This arises due to improper role-based access control or misconfigured permissions. | Unauthorized access and manipulation of sensitive site and user data can lead to reputation damage and concurrent financial loss due to revoked trust in the company. | Use of strict Role Based Access Control (RABC) protocols, and thorough audit logs to monitor access and behavior of different actors. |
| 2 | Cryptographic Failures (Sensitive Data Exposure): As the platform will store sensitive user data, including but no limited to: personal information, shopping history, and potentially payment details, improper encryption or lack of security measures during data transmission could lead to data breaches. | User trust damage, (financial) penalties due to non-compliance with regulations), User filed lawsuits, and loss of business credibility. | Implementing robust encryption protocols (for instance: AES-256) for both data at store, and in transit on top of secure API Integration/ communication with third party platforms. Multi-Factor Authentication (MFA) can be deployed for further solidification. |
| 3 | SQL Injection Attacks: The platform’s interactions with its database can be vulnerable to SQL injection attacks if the input methods are not screened and properly validated. This could allow attackers to steal or manipulate sensitive data. | Data theft and manipulation can lead to unauthorized changes to the system, which can incur financial loss in terms of lost business and penalties, as there is loss of user confidence in the platform. Potential service disruption further damages the business’s reputation. | Use of prepared or parameterized queries for database interactions.  Implement input validation and sanitation.  Conduct regular security audits to screen system vulnerabilities. |

# Who Did What?

| **Name of the Team Member** | **Tasks done** |
| --- | --- |
| Zainab Fatima | Introduction |
| Syed Messam Ali | Non-functional Requirements |
| Husnain Ali | System Actors & Functional Requirements  [End User (Shopper) + E-commerce Platform] |
| Musa Aftab Ahmed | Security Requirements |
| Ahmad Jabbar | System Actors & Functional Requirements  [Admin Developer and Data resources] |

# Review checklist

| **Section** **Title** | **Reviewer Name(s)** |
| --- | --- |
| Introduction | Husnain Ali, Ahmad Jabbar |
| Actors | Musa Aftab |
| Functional Requirements | Zainab Fatima, Messam Ali |
| Non-functional requirements | Husnain Ali, Zainab Fatima |
| Security Requirements | Ahmad Jabbar, Messam Ali |