Software Requirements Specification

for

E Commerce Recommendation Engine

**Infosys Springboard**

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# Introduction

## Purpose

The primary purpose of an E-commerce Recommendation Engine is to enhance the shopping experience for users and Improve Cross-selling and Up-selling Opportunities for businesses by providing personalized product recommendations tailored to their interests, preferences, and past behaviors.

**Here are some specific purposes:**

* Increase Sales
* Improve User Engagement
* Enhance Customer Satisfaction
* Personalize the Shopping Experience>

## Intended Audience

In an E-commerce recommendation engine,The intended audience are the users who are using The E-Commerce platform.those users can be categorized into various types based on their behavior, preferences, and interactions with the platform.

**some common types of users are :**

* New Users
* Returning Users
* Casual Browsers
* Regular Shoppers
* Deal Hunters
* Brand Loyalists
* Trend Followers
* Category Enthusiasts

## Project Scope

An E-commerce recommendation engine serves several benefits, objectives, and goals for both businesses and users:

* Improved Customer Satisfaction
* Cross-selling and Up-selling Opportunities
* Reduced Decision Fatigue
* Increased Revenue
* Data Collection and Analysis
* Adaptability
* Personalization
* Customization*>*

# Overall Description

## Product Perspective

The E-commerce Recommendation Engine is a standalone software system designed to enhance the user experience and increase sales on e-commerce platforms. It operates as an integral component within the larger e-commerce platform ecosystem, providing personalized product recommendations to users based on their browsing and purchase history. While the recommendation engine functions independently, it integrates seamlessly with the existing frontend and backend systems of the e-commerce platform.

The recommendation engine analyzes user data, including browsing history, purchase history, and preferences, to generate relevant product recommendations in real-time. These recommendations are presented to users within the e-commerce platform interface, enhancing the shopping experience and driving additional sales.

## Product Features

The E-commerce Recommendation Engine provides the following major features:

* **Personalized Product Recommendations:** Analyzes user data to generate personalized product recommendations based on browsing and purchase history.
* **Real-time Recommendation Generation:** Delivers recommendations to users in real-time as they browse or interact with the e-commerce platform.
* **Integration with E-commerce Platform:** Seamlessly integrates with the frontend and backend systems of the e-commerce platform to deliver recommendations within the platform interface.
* **User Preferences Management:** Allows users to manage their preferences and provide feedback on recommended products.
* **Trending Products Display:** Highlights trending products and popular items to users, based on current market trends and user preferences.
* **Related Products Suggestions:** Suggests related or complementary products to users based on their current selection or browsing history.
* **Seasonal or Event-based Recommendations:** Provides recommendations tailored to specific seasons, holidays, or events, such as Valentine's Day gifts or back-to-school essentials.
* **Cross-selling and Upselling Opportunities:** Identifies opportunities for cross-selling and upselling by recommending additional products that complement or enhance the user's current selection.
* **Flexible Recommendation Widgets:** Offers customizable recommendation widgets that can be easily integrated into different sections of the e-commerce platform, such as product pages, cart pages, or checkout flows.
* **Performance Analytics Dashboard:** Provides administrators with a dashboard to track the performance of the recommendation engine, including key metrics such as click-through rates, conversion rates, and revenue generated from recommended products.

## User Classes and Characteristics

* **New Users:** Individuals who have recently joined the platform and are exploring its features for the first time.
* **Returning Users**: Customers who have previously engaged with the platform and are revisiting to make additional purchases or explore new offerings.
* **Casual Browsers:** Users who intermittently visit the platform without a specific intent to make a purchase, often browsing out of curiosity or interest.
* **Regular Shoppers:** Customers who frequently engage with the platform, making purchases on a consistent basis.
* **Deal Hunters:** Users who actively seek out discounts, promotions, and special offers while browsing and purchasing products.
* **Brand Loyalists:** Customers who consistently prefer and purchase products from specific brands or manufacturers.
* **Trend Followers**: Individuals who are influenced by current trends and seek out products that align with popular styles, preferences, or cultural movements.
* **Category Enthusiasts**: Users who are passionate about specific product categories or niches, often seeking out new releases, innovations, or specialized offerings within those categories.

## Design and Implementation Constraints

* **Regulatory Compliance:** Adhere to data protection regulations and privacy laws.
* **Data Accessibility:** Ensure availability of relevant datasets for analysis and modeling.
* **Data preprocessing:**It is important to have proper cleaning,transforming and manipulation before starting with the project.
* **Data Visualisation:** We need to select the correct approach of having perfect visualization to get proper insights.
* **Algorithm Selection**: Choose appropriate machine learning algorithms suited for the task.
* **Model Interpretability:** Aim for models that are interpretable and explainable for stakeholders.
* **Computational Resources:** Consider availability of computational resources for training and inference.
* **Scalability:** Design the solution to scale with increasing data volume and user demand and iteratively it will improve through continuous feedback.
* **Performance Optimization:** Optimize algorithms and processes for efficiency and speed.
* **Model Deployment:** Implement robust deployment pipelines for deploying trained models into production environments.
* **Monitoring and Maintenance:** Set up monitoring systems to track model performance and ensure timely maintenance.

## Assumptions and Dependencies:

* **Data Quality:** Availability of high-quality and relevant data for analysis and model training, aligned with the project's aim of providing personalized recommendations to users.
* **Stakeholder Collaboration**: The active collaboration with **domain experts and stakeholders** to define project objectives and validate recommendation strategies that best serve users' needs and preferences.
* **Infrastructure Availability:** Access to necessary **computational resources and infrastructure** for developing and deploying machine learning models to enhance user experience and engagement on the platform.
* **Model Interpretability:** Importance of developing interpretable models to **ensure transparency and user trust** in recommendation outcomes, supporting the project's goal of delivering valuable and relevant recommendations to users.
* **External Tool Dependencies:** Dependency on **external tools and libraries** for data preprocessing, model development, and deployment to facilitate leveraging advanced analytics to enhance user satisfaction and retention.
* **Project Aim Alignment:** The project aims to enhance **user satisfaction, engagement, and loyalty** by providing personalized recommendations tailored to individual preferences and behaviors, aligning with the platform's objectives.
* **User Benefit Assumption:** The successful implementation of the project resulting in tangible benefits for users, such as **discovering relevant products more efficiently, making informed purchase decisions, and enjoying a more personalized and satisfying shopping experience** overall.

# Functional Requirements

**3.1 Data Collection:-** Without data we can’t generate recommendations. So we need data. We will write a Python program using libraries like BeautifulSoup or Scrapy to scrape product information from popular e-commerce websites. For example, we could scrape data such as the product name, price, customer reviews, and ratings.

**3.2 Data Preprocessing:-** We will clean and preprocess the collected data to ensure its quality and consistency. This may involve handling missing values, removing duplicates, normalizing data, and encoding categorical variables. We can use python libraries "numpy" and "pandas" for data cleaning and preprocessing.

**3.3 Recommendation generation :-** For recommendation generation we will use different machine learning algorithms such as collaborative filtering, content-based filtering based on data available. collaborative filtering based on users having similar interest and content based filtering based on characteristics of the product such as category, brand, price, color, size.

**3.4 Recommendation display:-** After generating recommendation. we have to display recommendations, for that we are going to build a simple user interface that allows users to receive recommendations.

**3.5 Data insights:-** We will use python libraries such as "Plotly", "Seaborn", "matplotlib" for creating data visualization across different parameters to gain insights from data, which helps to manage inventory, observe trends, improve sales, and understand market behavior.

# Non functional Requirements

**4.1. Performance:**

The system should respond to user requests for recommendations within an acceptable time frame, typically milliseconds to a few seconds.

**4.2. Reliability:**

The system should provide accurate and reliable recommendations, handle errors, and recover them quickly.

**4.3. Security:**

Data collection, storage, and processing will comply with relevant regulations such as GDPR(General Data Protection Regulation) and CCPA(Central Consumer Protection Authority) to ensure user privacy and data protection.

**4.4. Adaptability:**

The Recommendation Engine should be able to adapt to changing user preferences and trends over time and the algorithm that is present in it should be flexible and adjustable to any type of data.

**4.5. Scalability:**

The system should be able to handle a growing number of users, products, and transactions without a significant decrease in performance and should scale horizontally to accommodate increased traffic and data volume.

**4.6. Ethical:**

The system will prioritize transparency, fairness, and diversity in recommendation generation, avoiding biased or discriminatory content. Users will have control over their data and preferences, promoting trust and accountability in the system.

# 5. Constraints

**5.1.** **Data Integrity constraint:**

An e-commerce recommendation system serves as a bridge between customers and the management, ensuring integrity between both parties. It should continuously update its database to maintain accurate information.

**5.2. Data quality and availability:**

Constraints related to the quality and availability of data may impact the accuracy and effectiveness of the recommendation system. Incomplete or inaccurate data can lead to suboptimal recommendations and user dissatisfaction.

**5.3. User privacy:**

E-commerce platforms must keep user data safe by using strong security measures. This includes protecting the data used by the recommendation system from unauthorized access or loss.

**5.4. Scalability:**

System should handle more users without slowing down. This ensures a smooth and responsive experience for users, even when there's a lot of activity on the platform.

**5.5. Recommendation for users:**

**For new users:**

The recommendation system needs to update product suggestions based on the interests and browsing history of new users, ensuring that recommendations align with their preferences.

**For existing users:**

E-commerce platforms need to offer a variety of recommendation strategies beyond popular items to cater to diverse user needs effectively.