PCS254- Human Centred Computing Lab

Cognitive Price Comparison

PCS254- Human Centred Computing Project Report

Mid-Semester Evaluation

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1. Introduction and Project Overview

1.1 Background and Motivation

In today's competitive e-commerce landscape, consumers are increasingly looking for the best deals across multiple online retailers. The Cognitive Price Comparison project leverages advanced AI and cognitive computing techniques to not only aggregate price data but also to analyze user reviews, historical pricing trends, and market dynamics. This innovative approach helps users make informed purchasing decisions and empowers businesses with actionable insights.

1.2 Objectives

- **Accurate Price Aggregation:** Seamlessly gather price data across various platforms.
- **User-Centric Comparison:** Present intuitive, comparisons enriched with user ratings and reviews.
- **Cognitive Insights:** Utilize AI to check fake reviews and scraping data to figure out pricing trends and highlight the best deals dynamically.
- **Business Impact:** Enhance customer satisfaction and drive conversion by ensuring price transparency.

1.3 Scope and Business Impact

This project covers end-to-end solution development—from data collection and processing to real-time comparison and recommendation. The system not only benefits end-users by simplifying decision-making but also assists retailers in competitive pricing analysis, thereby influencing market strategies.

2. Requirements Specification Phase

2.1 Hardware and Software Requirements

Hardware Requirements

- **Computer Specifications:**
    - **Processor (CPU):**
        - *Minimum:* Intel Core i3 / AMD Ryzen 3
        - *Recommended:* Intel Core i5 / AMD Ryzen 5 or higher with multi-core support
    - **RAM:**
        - *Minimum:* 8 GB
        - *Recommended:* 16 GB or more for handling multiple simultaneous tasks
    - **Storage:**
        - *Minimum:* 256 GB SSD

        - *Recommended:* 512 GB SSD or higher to ensure faster read/write speeds
    - **Display:**
        - Minimum resolution: 1920x1080 (Full HD) with potential for multi-monitor setups to boost productivity.
- **Peripheral Devices:**
    - Ergonomic keyboard and mouse
    - External storage or cloud-based backup solutions

Software Requirements

- **Operating System:** Windows or macOS
- **Development Environment:**
    - Visual Studio Code or any preferred IDE supporting web development
- **Version Control:**
    - Git (along with interfaces like GitHub Desktop or GitKraken)
- **Browser:**
    - Latest versions of Google Chrome, Mozilla Firefox, or Microsoft Edge with integrated developer tools

2.2 Stakeholder Requirements and Prototypes (TDD)

Project Goal:
Develop a robust, user-friendly web application that allows users to compare product prices across multiple online retailers by leveraging both traditional scraping/APIs and cognitive AI analysis for enhanced decision-making.

Key Functional Requirements:

- **Product Search and Filtering:**
    - Search based on categories and compare features such as product name, price range, and ratings, reviews.
    - Display results in an interactive grid highlighting best deals.
- **Price Comparison and Highlighting:**
    - Compare product pricing, delivery costs, and vendor details side-by-side.
    - Emphasize the lowest price through visual cues.
- **User Reviews and Sentiment Analysis:**
    - Integrate user feedback and ratings into the comparison to provide qualitative insights.
    - Find the genuine reviews of the product posted on the respective ecommerce platforms.

- **Account Management:**
    - Enable user registration, login, and secure session management with password recovery options.
- **Responsive and Adaptive UI:**
    - Ensure the interface is mobile-friendly and supports various device sizes.

Test-Driven Development (TDD) Approach:

- Define test cases for each functionality (e.g., search accuracy, filter integration, account management).
- Iteratively develop and test features to ensure reliable performance and robust error handling.

2.3 Detailed User Stories and Acceptance Criteria

User Story 1: Compare Product Prices Across Retailers

- **As a user,** I want to view a detailed comparison of prices across multiple online retailers so that I can choose the best option.
- **Acceptance Criteria:**
    - On selecting a product, the application displays a table listing vendor names, prices, ratings and reviews.

User Story 2: Highlight Lowest Price

- **As a user,** I want the lowest price clearly highlighted to easily identify the most cost-effective option.
- **Acceptance Criteria:**
    - The comparison listings distinctly marks the product with the lowest price.

User Story 3: View Product Reviews and Ratings

- **As a user,** I want to access detailed reviews and ratings for each product to make informed decisions.
- **Acceptance Criteria:**
    - Product details page includes an aggregated review score and individual feedback comments.

User Story 4: Secure Account Management

- **As a user,** I want to securely create and manage my account so that my data remains safe and accessible.

3. Architectural and System Design

3.1 Architectural Design and Module Structure

The system architecture is modular, facilitating separation of concerns and scalability. Key modules include:

- **Data Acquisition Module:**
    - Web scraping components (using BeautifulSoup, requests) and API integrations.
- **Data Processing and Storage Module:**
    - Databases (SQLite for initial deployment or MySQL/PostgreSQL for larger scale) to store product information and historical data.
- **Comparison Engine:**
    - Algorithms to analyze and compare prices, including dynamic highlighting of best deals.
- **User Interface Module:**
    - Frontend built using HTML, CSS, JavaScript (React/Bootstrap options available for responsive design).
- **Security and Session Management Module:**
    - Implements encryption, secure login, and role-based access control.

3.2 Screen and GUI Layout Design

- **Homepage:**
    - Prominent search bar, filter panel, and summary of featured products.
- **Product Detail Page:**
    - Comprehensive display of product images, pricing details, user reviews, and dynamic recommendations.
- **User Dashboard:**
    - Account management, order history, and personalized recommendations.
- **Responsive Design:**
    - Mobile-first layout ensuring seamless experience across devices.

3.3 Navigational Design (Flow Diagrams)

- **Hierarchical Navigation:**
    - Clearly defined navigation flow from the home page to product search, details, and user account sections.
- **Interactive Flow Diagrams:**

- Visual representations for both user and admin functionalities, ensuring smooth transitions and usability.

4. Detailed Design and Implementation Strategy

4.1 Use Case Diagrams and System Interactions

- **User Use Cases:**
  - Detailed diagrams for product search, price comparison, review viewing, and account management.
- **Admin Use Cases:**
  - Diagrams covering system monitoring, data updates, and user management.

4.2 Design Rationale – GIBIS and QOC Analysis

- **GIBIS Analysis:**
  - **Goals:** Provide accurate, user-friendly price comparisons.
  - **Issues:** Handling dynamic pricing and data inconsistencies.
  - **Benefits:** Enhanced user satisfaction and increased conversion rates.
  - **Implications:** Requires robust data integration and frequent updates.
  - **Strategies:** Continuous model retraining and real-time data synchronization.
- **QOC Analysis:**
  - **Questions:** How can we efficiently aggregate and compare pricing data?
  - **Options:** Using web scraping vs. API integration.
  - **Criteria:** Accuracy, speed, and scalability.

4.3 GUI Prototypes and Wireframes

- Initial sketches and digital wireframes outlining the layout of key screens are developed and refined through iterative testing.
- Emphasis on user experience, clarity, and visual hierarchy.

4.4 Integration with Data Sources and APIs

- **Data Integration:**
  - Employ RESTful APIs and real-time data feeds for up-to-date pricing information.
- **Third-Party Tools:**
  - Integrate with external services for enhanced functionalities such as sentiment analysis on user reviews.

5. Advanced Features and Future Enhancements

5.1 AI and Machine Learning Integration

- **Cognitive Analysis:**
    - Implement machine learning models to predict pricing trends, analyze user sentiment, and provide personalized recommendations.
- **Continuous Improvement:**
    - Use feedback loops and user behavior data for ongoing model retraining and performance optimization.

5.2 Dynamic Pricing and Real-Time Analytics

- **Real-Time Data Processing:**
    - Leverage modern data streaming and processing techniques to provide users with the most current price comparisons.
- **Dashboard Analytics:**
    - Interactive dashboards for both users and administrators to monitor market trends and performance metrics.

5.3 Scalability, Security, and Compliance Considerations

- **Scalability:**
    - Cloud-based storage and processing to accommodate growing datasets and user traffic.
- **Security:**
    - Advanced encryption, secure API gateways, and adherence to data protection regulations.
- **Compliance:**
    - Ensure compliance with relevant e-commerce and data privacy laws (e.g., GDPR, CCPA).

6. Conclusion and Future Scope

6.1 Summary of Outcomes

The Cognitive Price Comparison project aims to revolutionize how consumers access pricing information by combining traditional data collection methods with cognitive computing. The system is designed to be robust, scalable, and user-friendly while maintaining high standards of security and data accuracy.

6.2 Potential for Expansion and Commercial Impact

- **Expansion:**
    - Incorporating more e-commerce platforms and integrating advanced analytics for market insights.
- **Commercial Impact:**
    - Enhanced decision-making for consumers, increased competitiveness for retailers, and valuable market intelligence.

6.3 Next Steps

- Finalize prototype testing with a pilot user group.
- Deploy the system in a controlled environment and gather feedback.
- Gradually scale the system based on user adoption and performance metrics.

1.2 User stories for all the required functions in the system

Frontend:

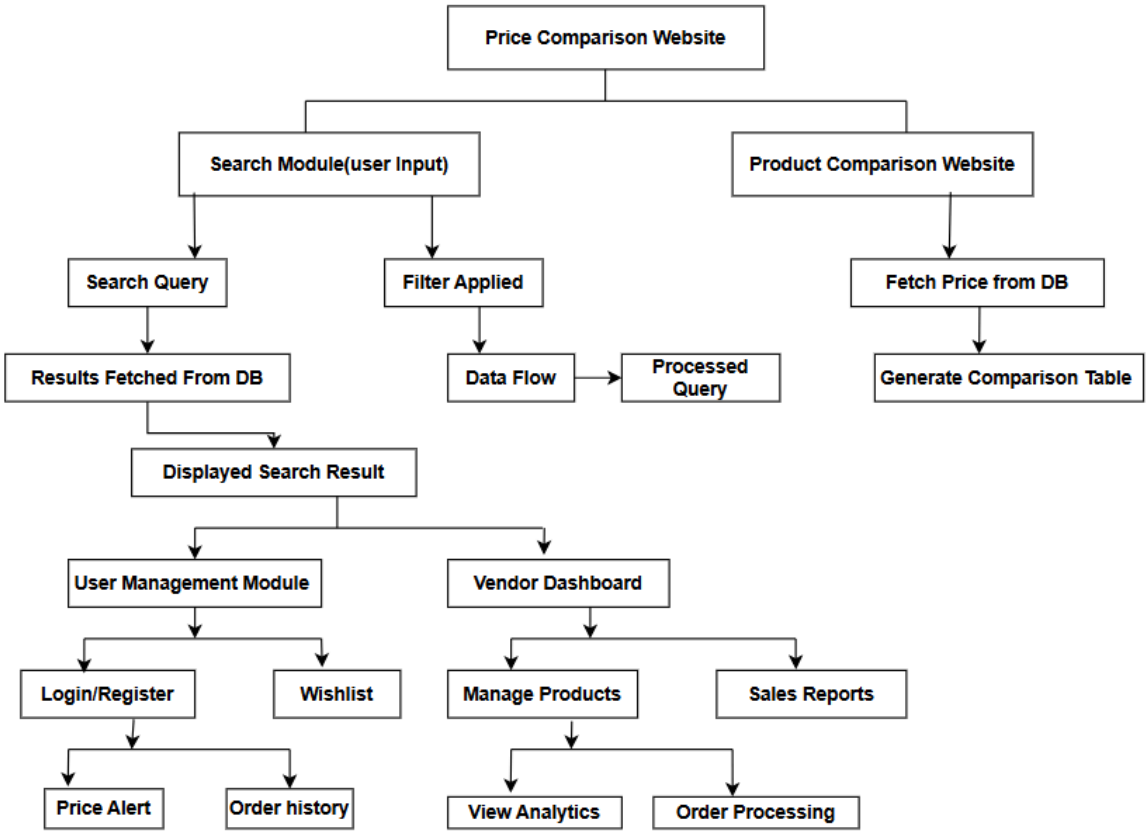
Title: **Compare Mobile Phone Prices**	**Priority: High**	**Estimate: 5 Story Points**
User Story: As a user, I want to compare mobile phone prices across different e-commerce platforms, so that I can find the best deal and save money.	High	5 Story Points
Acceptance Criteria: ● **Given** that a user searches for a specific mobile phone model, ● **When** they enter the model name (e.g., "Redmi 14") in the search bar, ● **Then** the website should display a list of prices from multiple platforms like Amazon and Flipkart along with specifications and offers.	High	3 Story Points

Backend:

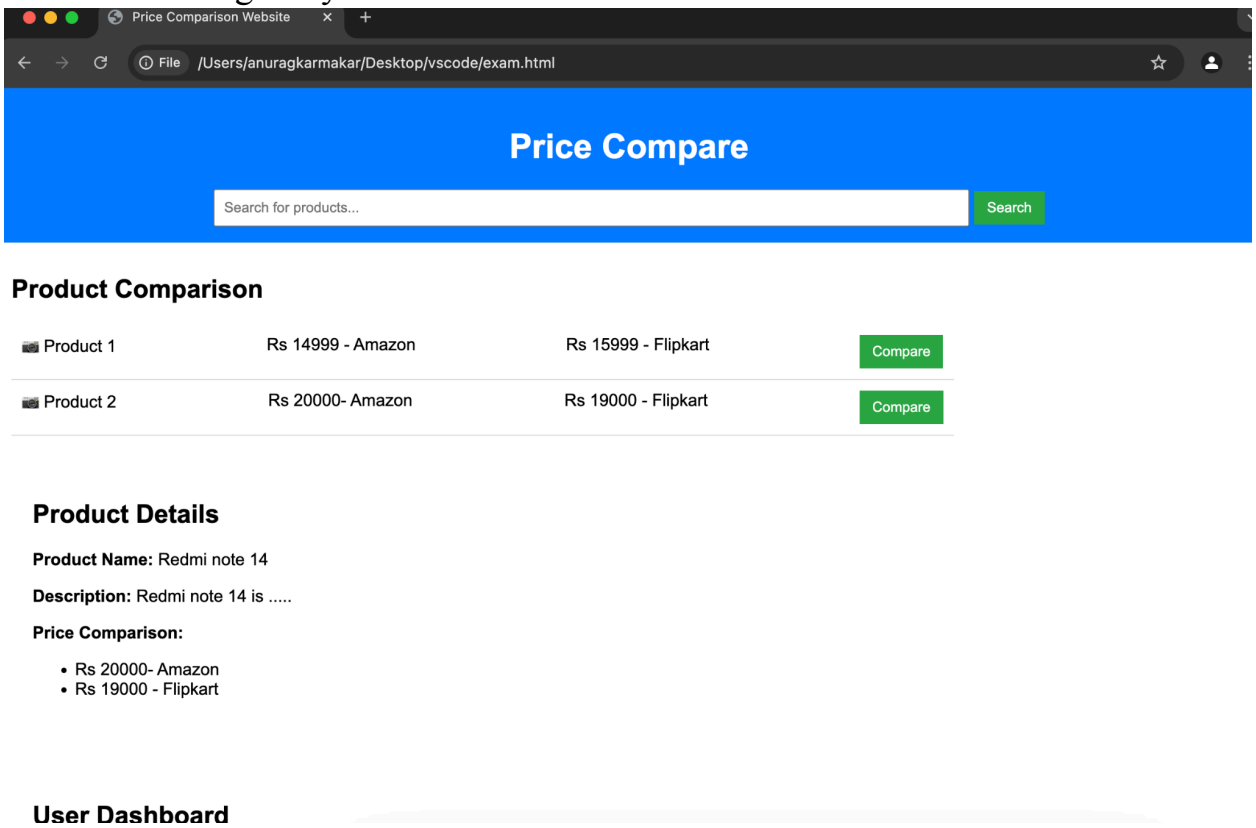
Confirmation: ● The search bar correctly retrieves product details. ● Prices from multiple platforms (Amazon, Flipkart, etc.) are displayed. ● Product specifications and deals are accurately fetched. ● The UI is responsive and displays results clearly.
Failure: ● The search does not return any results for valid product names. ● Incorrect or outdated prices are displayed. ● Prices from some platforms are missing due to API issues. ● Slow loading time affects user experience. ● UI formatting issues cause misalignment of product details.

2. Architectural Design

2.1 Module Structure Chart

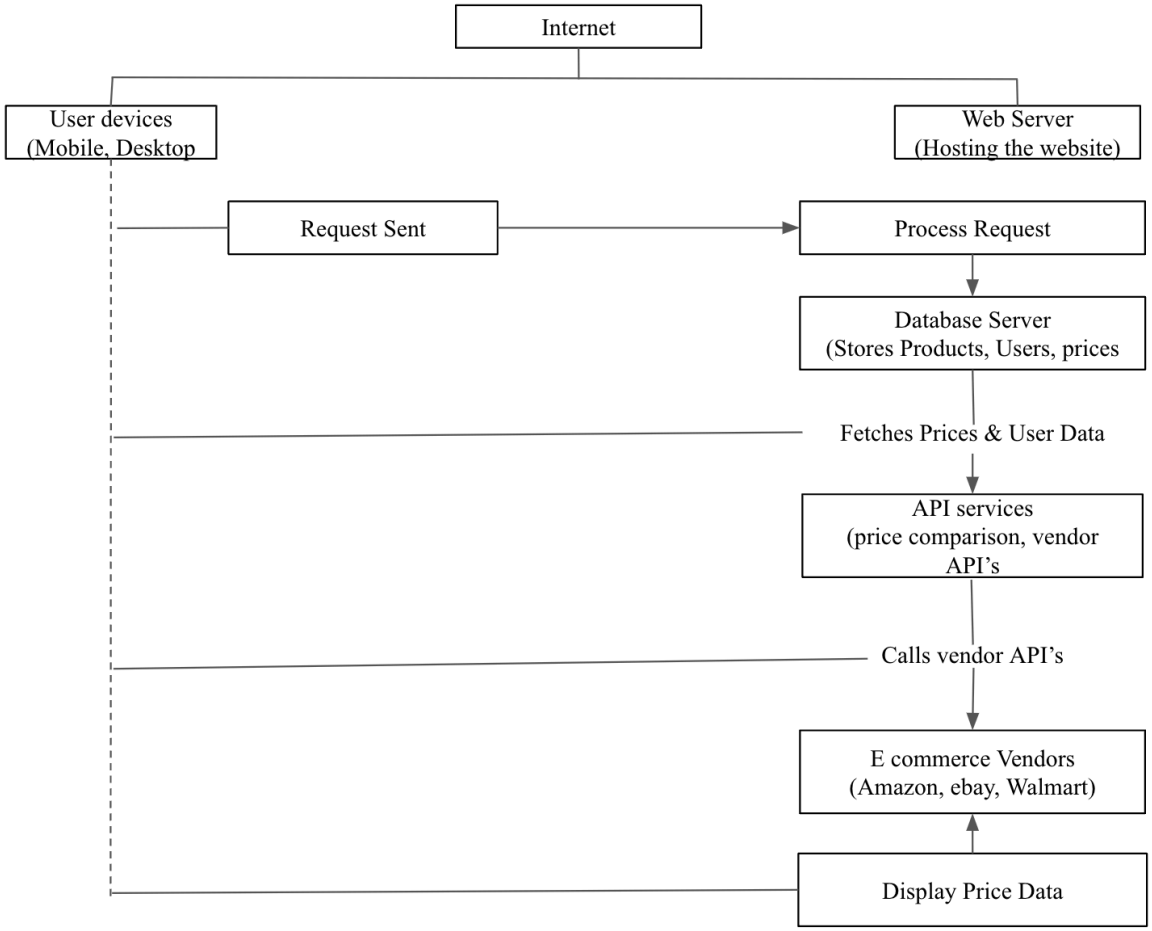


2.2 Screen Design Layout of GUI

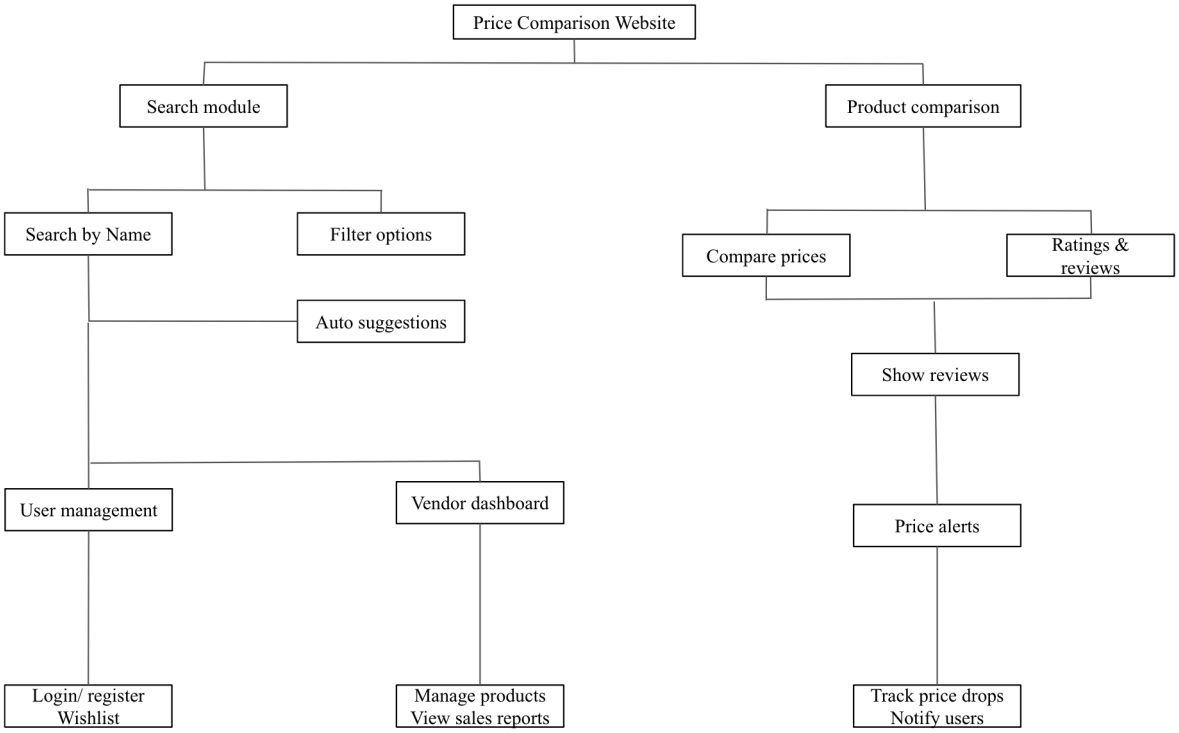


2.3 Navigational Design (Hierarchical Diagram / Network Diagram)

Hierarchical Design

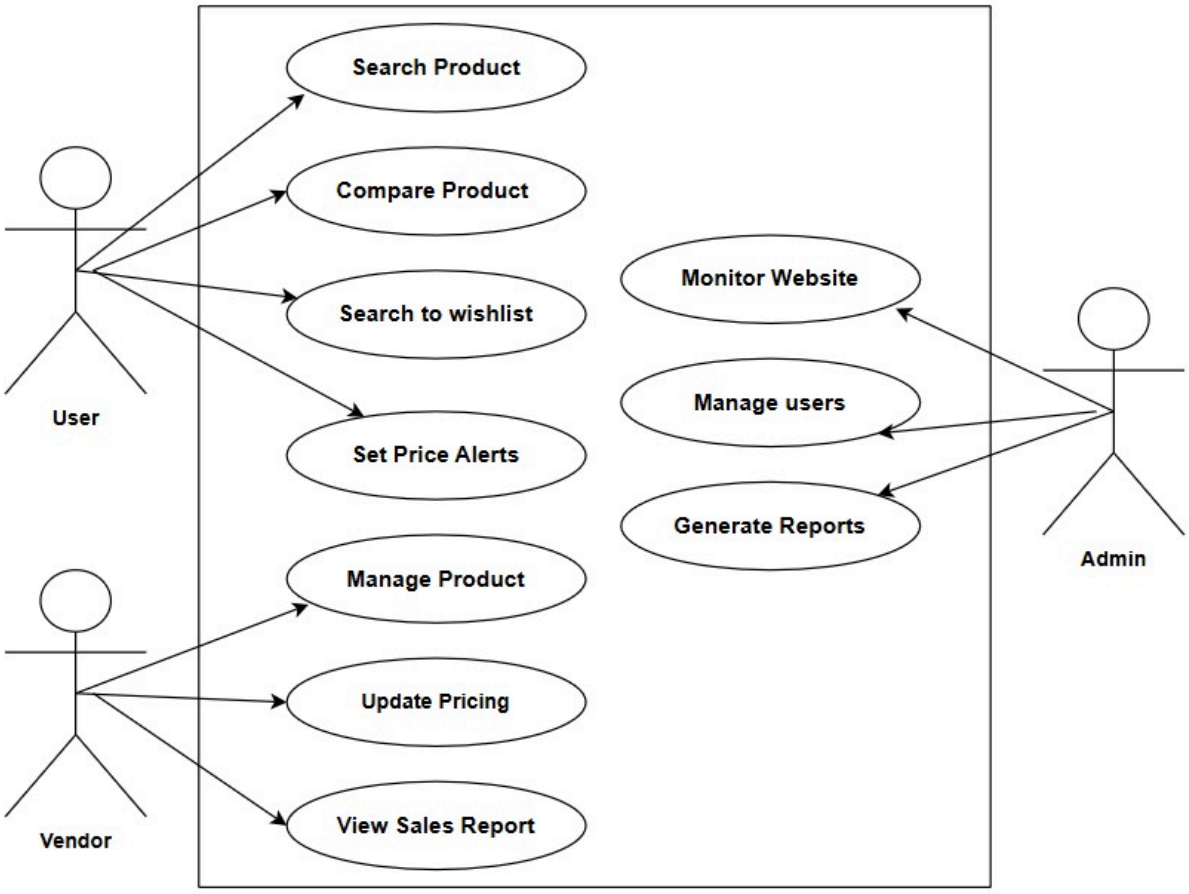


Network Diagram

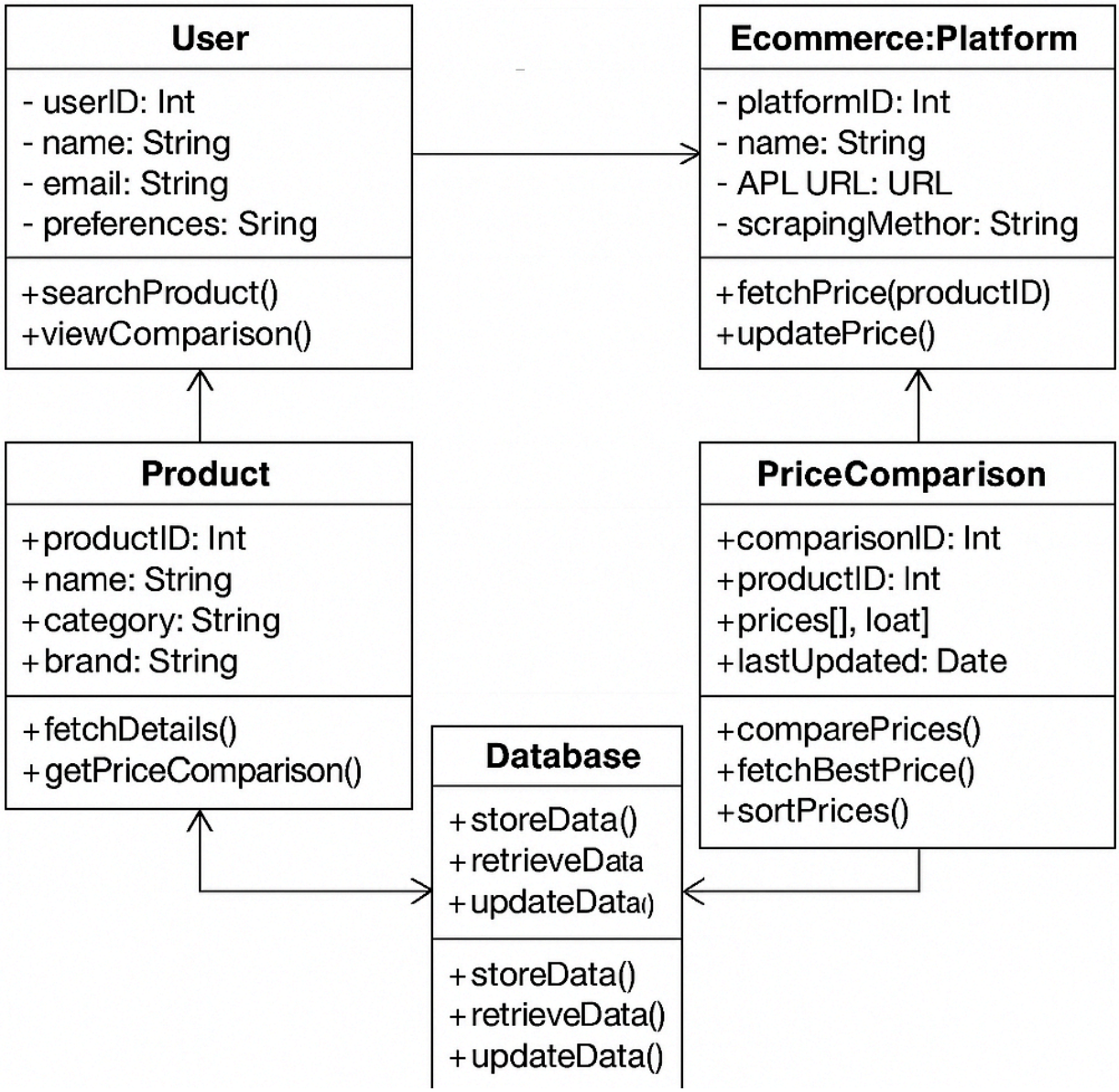


3. Detailed Design

3.1 Use Case Diagram

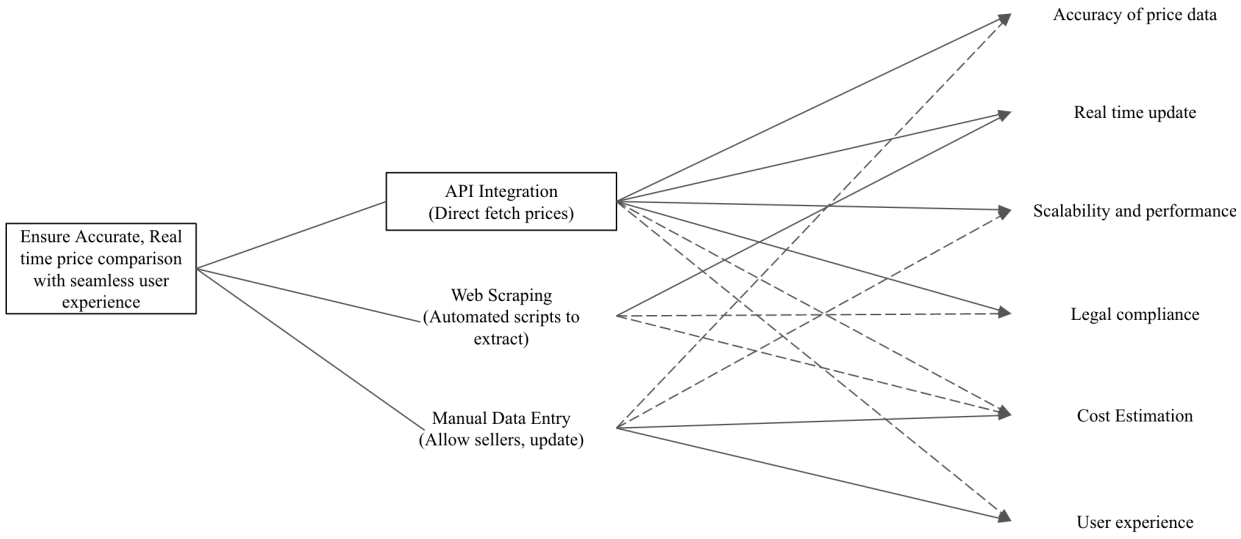


3.2 Class Diagram

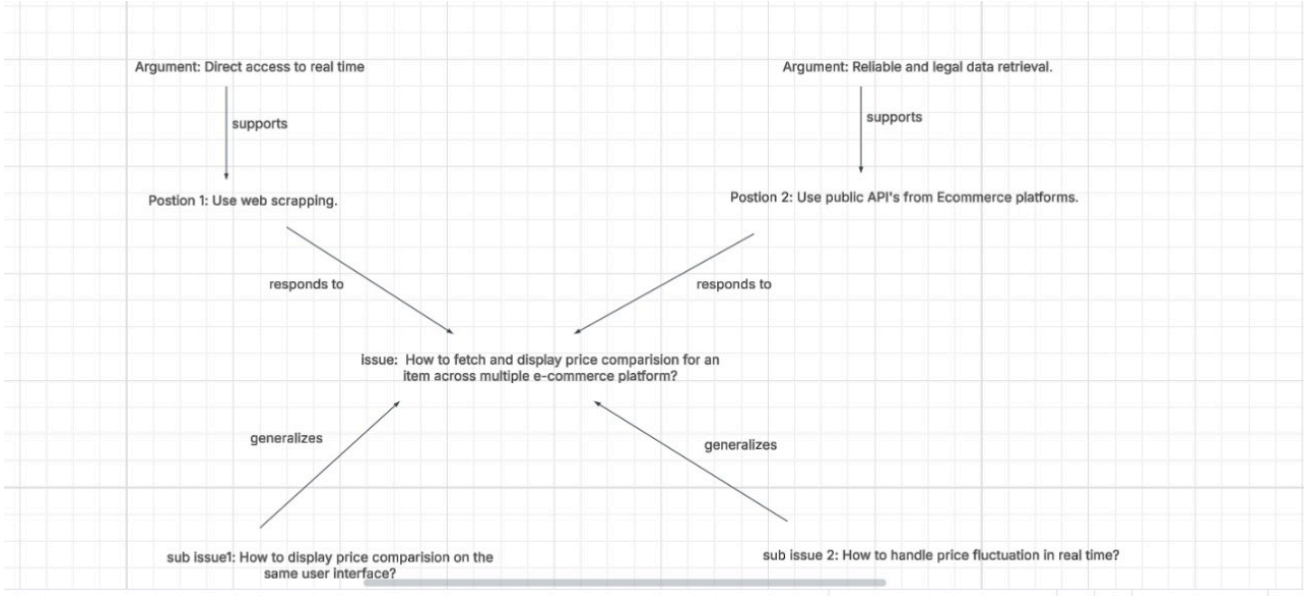


3.3 Design Rationale – GIBIS and QOC representation

QOC



GIBIS



4. GUI Design (Screenshots)

Price Comparison

Redmi Note 14 5G (Mystique White, 8GB RAM 128GB Storage) selected for Comparison

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AMAZON-DETAILS:-

📌 Amazon Title: **Redmi Note 14 5G (Mystique White, 8GB RAM 128GB Storage) | Global Debut MTK Dimensity 7025 Ultra | 2100 nits Segment Brightest 120Hz AMOLED | 50MP Sony LYT 600 OIS+EIS Triple Camera**

📌 Amazon Price: **18,998.**

📌 Amazon Rating: **3.7 out of 5 stars**

📌 BUY URL: https://www.amazon.in/Redmi-Note-14-5G-Dimensity/dp/B0DPFV3T4V?th=1

FLIPKART-DETAILS:-

📌 Flipkart Title: **REDMI Note 14 5G (Mystique White, 128 GB) (8 GB RAM)**

📌 Flipkart Price: **₹18,269**

📌 Flipkart Rating: **4.2**

📌 BUY URL: https://www.flipkart.com/redmi-note-14-5g-mystique-white-128-gb/p/itm721548515fde2?pid=MOBH78KTV8NBYHTH&lid=LSTMOBH78KTV8NBYHTHKYZXD7&marketplace=FLIPKART

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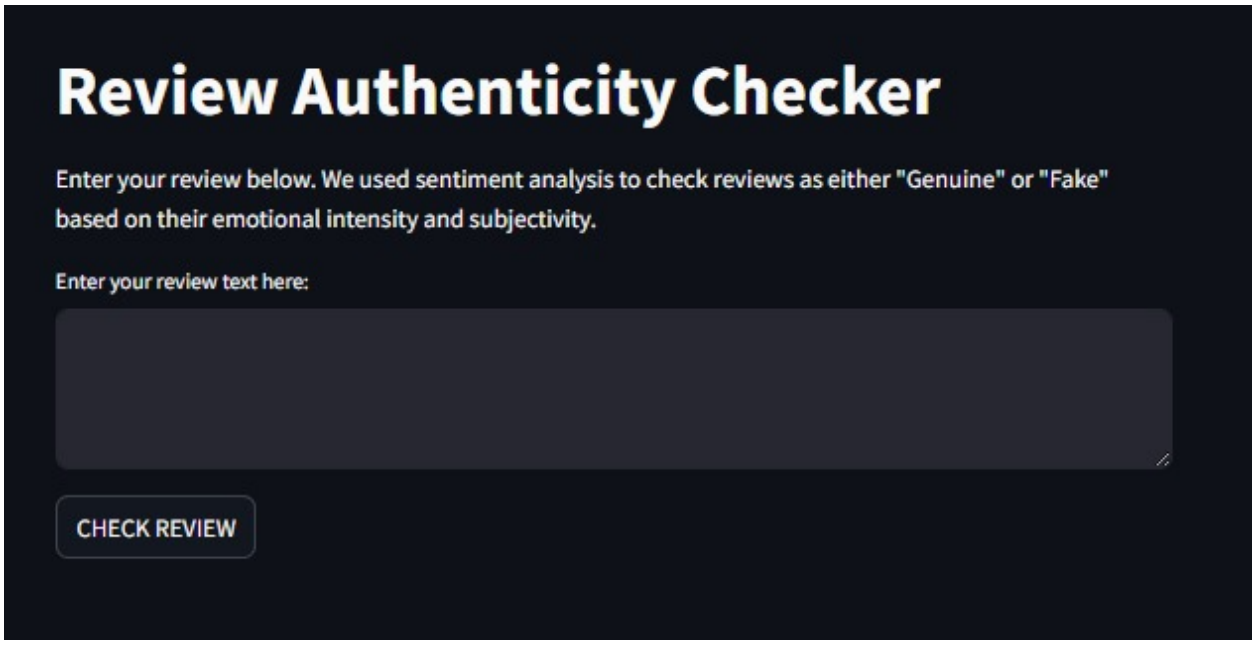
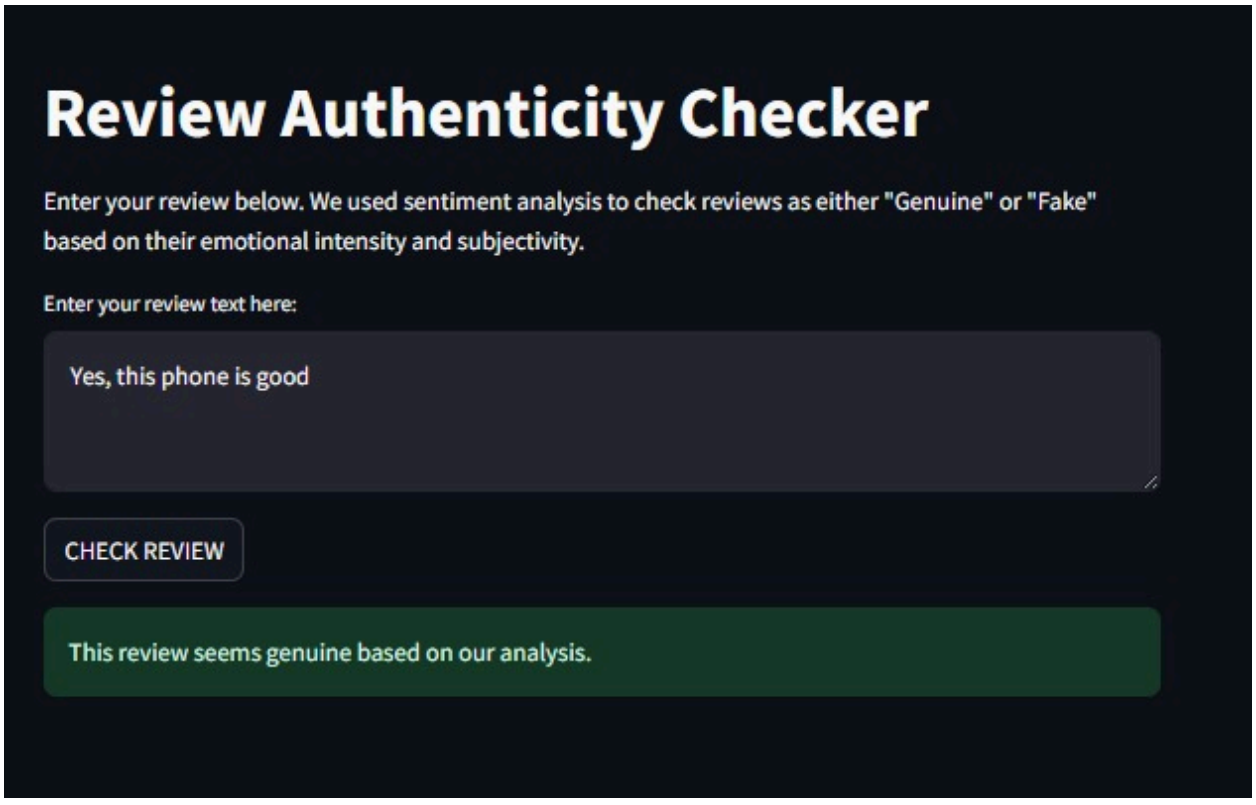

Review Authenticity Checker
Enter your review below. We used sentiment analysis to check reviews as either "Genuine" or "Fake" based on their emotional intensity and subjectivity.
Enter your review text here:
CHECK REVIEW


Review Authenticity Checker
Enter your review below. We used sentiment analysis to check reviews as either "Genuine" or "Fake" based on their emotional intensity and subjectivity.
Enter your review text here:
Yes, this phone is good
CHECK REVIEW
This review seems genuine based on our analysis.