

ABSTRACT: -

Product Price Tracker is a web-based application. It's a website that enables users to be aware of the information regarding the price drops or rises for the respective e-commerce products that the users are in search of to purchase. This application lets its users input an excel file that contains their respective e-commerce product names and its corresponding links, which when clicked would redirect to the e-commerce websites that show the product which the user is in search of.

This application is unique in terms of the multiple features that are built putting in sight that it would let the users attain profits to their maximum by letting their work being automated and by enabling the true use of this application it would help them save time buy not checking their respective e-commerce websites every frequent time sequences, but rather being notified regarding any product rise or drop from the respective e-commerce website of their choice.

This application facilitates its users to extract, track, predict the prices and be notified with its change. Moreover, the additional ability that it provides is by giving the feature to sign in and be timelessly update with the required details. This model implements the usage of various libraries such as: - puppeteer, Express, Multer, path, body parser, XLSX. This website was built in various stages of development which involves the initial stage being the designing of the UI or the design of the product through Figma designing tool. After which using HTML, CSS and JAVASCRIPT, the individual components on the website such as buttons and transition effects and other user interactivity essentials were built. Python was used for the development of the backend which acts as the server that receives the request from various users and manages the task by the usage of individual packages and node modules. This involves Express.js which acts in the functioning of the backend and giving the required output to the users with respect to the input that they give to the application.

Product Price Tracker also shows a graph or a chart relating to the sales of the product in the previous months that would help the customer to get an opinion on whether to purchase the product in short span or to still wait for its price variation or its availability. It also gives an idea to the customer if the price would increase or decrease in the upcoming months depending on the past sales developed for that product. This application also provides a notify button which when clicked would let the users enter their respective e-mail address to would notify any price rise or drops.

Compared to the available market products working for the same purpose, this model stands out the existing products by providing real-time data and by ensuring user's specific perspectives and needs. It provides robust service by ensuring end to end API's and keeping user's information confidential and focusing more on the precision of the service.

1. INTRODUCTION

1.1 Project introduction:

Usage of e-commerce platforms is increasing rapidly day after day, which introduces millions of products and services to customers with deliverability being ensured right to their doorstep. And the increased sales rate of the products has come to its peaks involving every citizen either to sell and purchase goods and services from online or both. With respect to the customers ideology to enable proper flow of business as well as consumers comfort in terms of finances and economy, this application is built. It would stand apart from the other currently existing e-commerce applications which are used for price tracking and notifying users regarding their respective products that they are in search of for purchase. This application can widely be used by multiple users across the globe, as it has strong servers built which are robust enough to handle any file sizes have any number of e-commerce products from top product websites to the newly arrived startup e-commerce product websites providing services to consumers.

1.2 Scope: -

The Product Price Tracker aims to revolutionize the online shopping experience by providing users with a powerful tool to monitor and track the prices of products on various e-commerce platforms. With the ever-evolving landscape of online retail, prices fluctuate frequently, making it challenging for consumers to make informed purchasing decisions. This project seeks to address this challenge by offering a comprehensive solution that empowers users to keep track of price changes and make well-timed purchases.

At the heart of the Product Price Tracker is the ability for users to upload an Excel file containing the names and links of the products they are interested in purchasing. This feature is designed to streamline the process of tracking multiple products simultaneously, eliminating the need for manual entry and reducing the risk of errors. Once the file is uploaded, the application will automatically extract essential product details such as price, image, and name from the provided links. This automation not only saves time but also ensures accuracy and consistency in the data.

In addition to extracting product details, the Product Price Tracker will provide users with a visual representation of past sales data. This feature allows users to analyse price trends over time, giving them valuable insights into the best times to make a purchase. By presenting this information in a graphical format, the application makes it easy for users to understand and interpret the data, enhancing their overall experience.

A key component of the Product Price Tracker is its notification system. Users can opt to receive email notifications when there are significant price changes, whether it be a price drop or an increase. This proactive approach ensures that users are always being informed regarding content that is relevant to their products.

1.3 Project Overview: -

The Product Price Tracker is a comprehensive web-based application tailored to assist users in monitoring and tracking the prices of products on e-commerce websites. The primary aim of this application is to facilitate users in making informed purchasing decisions by providing a range of features that simplify the price tracking process and enhance user experience.

At the core of the Product Price Tracker is the functionality that allows users to upload an Excel file containing product names and links. This feature is designed to accommodate users who wish to keep track of multiple products simultaneously. By automating the extraction of product details such as price, image, and name from the provided links, the application eliminates the need for manual data entry, ensuring both accuracy and efficiency.

The application offers a user-friendly interface where users can easily upload their Excel files. Once the file is uploaded, the system processes the data and extracts the necessary information from the e-commerce websites. This includes the current price, product image, and name, all of which are displayed within the application for easy reference. This functionality is powered by advanced web scraping techniques that ensure the data is accurate and up to date.

In addition to real-time price tracking, the Product Price Tracker provides users with a graphical representation of historical price data. This feature enables users to analyse price trends over time, offering insights into the best times to purchase specific products. The visual representation is intuitive, making it easy for users to understand and interpret the data. Charts and graphs are employed to display this information, leveraging data visualization technologies to create a clear and informative user experience.

A standout feature of the Product Price Tracker is its email notification system. Users can configure their preferences to receive alerts when there are significant price changes, whether it be a price drop or an increase. This ensures that users are always informed about the status of their desired products, allowing them to take timely action based on the price fluctuations. The notification system is designed to be flexible, enabling users to set their alert criteria according to their individual needs.

In summary, the Product Price Tracker is designed to be an efficient and user-friendly solution for monitoring e-commerce product prices. By offering features such as bulk Excel file uploads, automatic product detail extraction, graphical representation of past sales data, customizable email notifications, and direct links to product pages, the application aims to simplify the online shopping experience and empower users to make well-informed purchasing decisions. Through the integration of advanced technologies and a focus on usability, the Product Price Tracker provides a robust tool for anyone looking to stay on top of price changes in the dynamic world of online retail.

1.4 Objectives: -

The main objectives of the Product Price Tracker project are designed to provide users with a comprehensive and efficient tool for monitoring and tracking e-commerce product prices. These objectives focus on functionality, accuracy, user experience, and timely notifications to enhance the overall shopping experience. Each objective is critical to ensuring that users can make informed purchasing decisions based on real-time and historical price data.

1. To enable users to easily upload an Excel file containing product names and links: The application aims to simplify the process of tracking multiple products by allowing users to upload an Excel file. This feature eliminates the need for manual data entry, reducing the time and effort required to input product details. Users can easily prepare their lists in a spreadsheet, ensuring that all relevant product information is accurately captured and ready for tracking.
2. To accurately extract product details such as price, image, and name from e-commerce websites: Once the Excel file is uploaded, the application will utilize advanced web scraping techniques to extract essential product details from the provided e-commerce links. This includes the current price, product image, and name. Accuracy is paramount, as users rely on this information to make purchasing decisions. The extraction process ensures that the data is up-to-date and reflects the latest changes on the e-commerce websites.
3. To provide direct links to the product pages on e-commerce websites: The application will offer direct links to the product pages on e-commerce websites. This feature provides users with quick and convenient access to the actual product pages, allowing them to verify details, read reviews, and make purchases directly. By integrating these links, the application enhances the user experience, making it seamless to transition from tracking prices to purchasing products.
4. To display past sales data in a graphical form for easy analysis: Understanding past price trends is crucial for making informed purchasing decisions. The application will present historical sales data in a graphical format, enabling users to visualize price fluctuations over time. This feature helps users identify patterns, such as seasonal discounts or frequent price drops, allowing them to time their purchases for maximum savings. The graphical representation makes complex data easy to interpret and analyse.
5. To notify users via email about significant price changes: Timely notifications are essential for users who want to capitalize on price drops or be aware of price increases. The application will include an email notification system that alerts users about significant price changes. Users can customize their notification preferences, ensuring they receive alerts that are relevant to their specific needs. This feature keeps users informed and allows them to act quickly when prices are favourable.

2. LITERATURE SURVEY: -

2. Existing system: -

Existing product price trackers, such as CamelCamelCamel and Honey, are widely used tools that offer several functionalities to help users monitor product prices across various e-commerce platforms. These tools have become popular due to their ability to provide users with historical price data and alerts for price drops, which are crucial for making informed purchasing decisions.

CamelCamelCamel is a well-known price tracking tool that primarily focuses on Amazon products. It allows users to view the price history of products, set price drop alerts, and even access price tracking data via browser extensions. This tool enables users to track the price fluctuations of their desired products over time, providing a clear picture of the best times to make purchases. CamelCamelCamel is particularly beneficial for frequent Amazon shoppers who want to optimize their buying strategies based on historical price trends.

Honey, on the other hand, is a browser extension that not only tracks prices across multiple e-commerce sites but also finds and applies discount codes at checkout. Honey's versatility makes it a valuable tool for users who shop on various online platforms. It helps users save money by alerting them to price drops and automatically applying the best discount codes available. This dual functionality of price tracking and coupon application significantly enhances the shopping experience by ensuring users get the best deals possible.

However, despite their popularity and usefulness, these existing systems have certain limitations. One major drawback is the inability to handle bulk uploads of product data via Excel files. Users must manually enter product links and details one by one, which can be time-consuming and prone to errors, especially when tracking multiple products. For users who wish to monitor many products, this manual process can become cumbersome and inefficient, detracting from the convenience these tools aim to provide.

Additionally, while these tools provide alerts for price drops, they do not offer direct user notifications for price increases. This limitation can be significant for users who want to avoid sudden price hikes and make timely purchases before prices rise. Knowing when prices increase can be just as important as knowing when they drop, as it helps users make well-timed purchasing decisions to avoid higher costs.

Furthermore, the level of detail in product extraction provided by existing tools is often limited. While they can track prices and provide historical data, they do not always extract comprehensive product details such as images and names. This information is valuable for users when comparing products, as it provides a more complete picture of the items they are interested in. The lack of detailed product extraction can result in a less informative and engaging user experience, as users might need to cross-reference information from multiple sources to get a full understanding of the products.

2.1 Proposed system: -

The proposed Product Price Tracker aims to build on the strengths of existing systems while addressing their limitations by introducing a range of enhanced features designed to provide a more efficient and informative shopping experience.

One of the standout features of the proposed system is the ability to handle bulk Excel file uploads for product details. This functionality allows users to upload a single Excel file containing multiple product names and e-commerce links, streamlining the process of setting up price tracking for numerous products. This not only saves time but also reduces the potential for errors associated with manual data entry.

The proposed system also offers comprehensive product detail extraction. By leveraging advanced web scraping techniques, the application can accurately extract detailed product information, including price, image, and name, from e-commerce websites. This level of detail enhances the user's ability to compare products and make well-informed purchasing decisions.

In addition to detailed product extraction, the proposed system provides direct links to the e-commerce product pages. This feature ensures that users can quickly and easily access the actual product pages to verify details, read reviews, and complete purchases without the hassle of manually searching for the products online.

User engagement is further enhanced by the ability to display past sales data in graphical form. This feature allows users to visualize price trends over time, making it easier to identify patterns and determine the best times to buy. The graphical representation of historical sales data is intuitive and informative, providing valuable insights briefly.

Moreover, the proposed system includes a robust email notification system that alerts users to both price drops and rises. By offering customizable notification preferences, users can stay informed about significant price changes, enabling them to act swiftly based on their individual purchasing strategies. This dual notification system ensures that users are always aware of important price movements, whether they are waiting for a price drop or need to make a purchase before a price increase.

In conclusion, the proposed Product Price Tracker builds on the strengths of existing price tracking tools while introducing features such as bulk Excel file uploads, comprehensive product detail extraction, direct links to product pages, graphical representation of past sales data, and customizable email notifications for both price drops and rises. This holistic approach aims to provide users with a more efficient, informative, and engaging shopping experience.

3. SYSTEM ANALYSIS: -

3.1 functional requirements: -

The functional requirements of the Product Price Tracker encompass a range of features designed to ensure a seamless, user-friendly, and efficient experience. These requirements are essential to the application's core functionality, enabling users to effectively track product prices, receive timely notifications, and make informed purchasing decisions.

1. User Registration and Login: The application will include a user registration and login system to ensure secure access and personalized user experience. Users will be able to create accounts by providing basic information such as their email address and a password. Once registered, users can log in to the application to access their tracking data, manage their settings, and receive personalized notifications. This system will also support password recovery options to maintain account security and accessibility.

2. Excel File Upload for Product Details: To streamline the process of tracking multiple products, the application will allow users to upload an Excel file containing product names and e-commerce links. This bulk upload feature will save users time and effort, eliminating the need for manual entry of each product. The system will parse the uploaded file, extract the necessary information, and store it for subsequent processing. This functionality is crucial for users who want to track many products simultaneously.

3. Web Scraping to Extract Product Details (Price, Image, Name): The application will utilize web scraping techniques to automatically extract product details from the provided e-commerce links. This includes the current price, product image, and name. The web scraping module will be designed to handle various e-commerce platforms, ensuring compatibility and accuracy. Regular updates and maintenance will be conducted to adapt to changes in website structures, ensuring the continued functionality of the scraping process.

4. Display of Product Details and Past Sales Data in a Graphical Form: Users will be able to view the extracted product details within the application. Additionally, the application will present past sales data in a graphical format, enabling users to analyse price trends over time. This visualization will help users identify patterns and determine the best times to make purchases. The graphical interface will be intuitive and interactive, allowing users to easily interpret the data and make informed decisions.

5. Email Notifications for Price Changes: The application will include a robust email notification system to keep users informed about significant price changes. Users can customize their notification preferences, specifying whether they want to be alerted about price drops, price increases, or both. This feature ensures that users are always aware of important price movements, enabling them to act swiftly based on their purchasing strategies. The email notifications will be timely and include relevant product details to provide a comprehensive update.

[sequence diagram]



3.1.1 Graphical Interface with user: -

The graphical interface of the Product Price Tracker is designed to provide an intuitive and user-friendly experience, allowing users to interact with the application seamlessly. Each element of the interface is carefully crafted to ensure ease of use, efficiency, and accessibility. The design principles focus on clarity, simplicity, and responsiveness, making the application accessible and functional across various devices and screen sizes.

The Home Screen serves as the central hub, welcoming users with a clean and organized layout. It features a navigation bar at the top, allowing users to easily access different sections of the application, such as their dashboard, settings, and help. The home screen provides a brief overview of the application's main features and guides users to upload their first Excel file or view their tracked products.

The File Upload section is prominently displayed, allowing users to quickly and easily upload an Excel file containing product details. The interface includes a clear and concise upload button, along with an input field where users can drag and drop their files or select them from their device. Upon uploading, the system will automatically parse the file and extract the necessary product information, such as names and e-commerce links, streamlining the process and reducing manual entry errors.

The Product List is a central component of the interface, displaying the extracted product details in a well-organized manner. The list includes columns for product names, images, current prices, and direct links to the e-commerce pages. Each product entry is visually distinct, with images providing a quick visual reference. The list is designed to be easily navigable, allowing users to quickly find and review the products they are tracking.

The Sales Data Chart provides a graphical representation of past sales data, offering users insights into price trends over time. This chart is interactive, allowing users to hover over data points to see specific details, such as dates and price changes. The visual format makes it easy to identify patterns and trends, helping users to determine the best times to make purchases.

The chart is designed to be both informative and visually appealing, enhancing the overall user experience.

The Notification Settings section enables users to customize their email notifications for price changes. Users can set preferences for alerts on price drops, price increases, or both. This section includes easy-to-use toggle switches and input fields for email addresses, ensuring users can configure their notifications quickly and efficiently. The ability to personalize notifications ensures that users receive relevant updates that align with their purchasing strategies.

The Direct Links feature provides clickable buttons or icons next to each product in the list, allowing users to quickly access the corresponding e-commerce product pages. By clicking on these links, users can verify product details, read reviews, and proceed with purchases without needing to manually search for the product online. This feature enhances user convenience and streamlines the transition from price tracking to purchasing.

3.1.2 Elements in Graphical user interface: -

The graphical interface of the Product Price Tracker is designed to provide an intuitive and user-friendly experience, allowing users to interact with the application seamlessly. Each element within the interface is crafted to ensure ease of use, efficiency, and accessibility, enabling users to effectively manage and track their desired products. Below are the key elements of the graphical user interface:

1. **File Upload:** The File Upload feature is prominently positioned to allow users to quickly upload an Excel file containing product details. This element includes a clear upload button and an input field where users can drag and drop their files or select them from their device. The system will automatically parse the uploaded file, extracting necessary product information such as names and e-commerce links. This streamlined process saves time and reduces the potential for manual entry errors.
2. **Product List:** The Product List is a central component of the interface, displaying the extracted product details in a clean and organized manner. This list includes columns for product names, images, current prices, and links to the e-commerce pages. Each product entry is visually distinct, with images providing a quick visual reference. The list is designed to be easily navigable, allowing users to quickly find and review the products they are tracking.
3. **Sales Data Chart:** The Sales Data Chart provides a graphical representation of past sales data, offering users insights into price trends over time. This chart is interactive, allowing users to hover over data points to see specific details such as dates and price changes. The visual format makes it easy to identify patterns and trends, helping users to determine the best times to make purchases. The chart is designed to be both informative and visually appealing, enhancing the overall user experience.
4. **Notification Settings:** The Notification Settings element enables users to customize their email notifications for price changes. Users can set preferences for alerts on price drops, price increases, or both. This section includes easy-to-use toggle switches and input fields for email

addresses, ensuring users can configure their notifications quickly and efficiently. The ability to personalize notifications ensures that users receive relevant updates that align with their purchasing strategies.

5. Direct Links: Direct Links are provided for each product, allowing users to quickly access the corresponding e-commerce product pages. These links are displayed as clickable buttons or icons next to each product in the list. By clicking on these links, users can verify product details, read reviews, and proceed with purchases without needing to manually search for the product online. This feature enhances user convenience and streamlines the transition from price tracking to purchasing.

3.1.3 Performance Requirements: -

The performance requirements for the Product Price Tracker application are crucial to ensure a smooth and efficient user experience. These requirements are designed to maintain the application's responsiveness, accuracy, and reliability under various conditions. Meeting these performance criteria will ensure that users can effectively track product prices, receive timely notifications, and interact with the application without encountering significant delays or issues. The following outlines the key performance requirements in detail:

1. Handle Multiple Concurrent Users Without Performance Degradation: The application must be capable of supporting multiple users simultaneously without experiencing a decline in performance. This involves efficient handling of server resources, optimizing database queries, and ensuring that the backend infrastructure can scale to accommodate increased user load. Techniques such as load balancing, caching, and optimized code execution will be employed to maintain high performance even during peak usage times. The goal is to provide a seamless experience for all users, regardless of the number of concurrent sessions.

2. Extract and Display Product Details Within a Reasonable Timeframe: One of the core functionalities of the application is to extract product details from e-commerce websites and display them to the user. This process must be performed quickly and efficiently. Web scraping algorithms will be optimized to minimize the time required to retrieve product information, and the application will utilize asynchronous processing to handle data extraction in the background. This ensures that users receive up-to-date product details promptly, enhancing their ability to make informed purchasing decisions without unnecessary delays.

3. Send Timely Email Notifications Without Delays: The application must be capable of sending email notifications promptly to inform users of significant price changes. This involves implementing an efficient notification system that can process and dispatch emails in real-time. The email service will be configured to handle high volumes of notifications and ensure reliable delivery to the users' inboxes. Timely notifications are essential for users to act quickly on price

changes, and the application will prioritize the prompt dispatch of these alerts to meet user expectations.

4. Provide a Responsive User Interface That Works Seamlessly Across Different Devices and Browsers: The user interface of the application must be responsive and accessible across various devices and web browsers. This includes desktops, laptops, tablets, and smartphones, as well as popular browsers such as Chrome, Firefox, Safari, and Edge. The interface will be designed using responsive web design principles, ensuring that the layout adapts to different screen sizes and resolutions. Additionally, cross-browser compatibility testing will be conducted to ensure consistent performance and functionality across all supported platforms. The aim is to provide a seamless and intuitive user experience, regardless of the device or browser being used.

3.2 Software Requirements: -

The Product Price Tracker application relies on a combination of modern software technologies to deliver a robust, efficient, and user-friendly experience. The selection of these technologies ensures that the application is scalable, maintainable, and capable of handling the complex tasks required for product price tracking and user notifications. Below is a detailed explanation of the software requirements for this project.

Frontend: HTML, CSS, JavaScript, React.js The frontend of the application is built using HTML, CSS, and JavaScript, with React.js as the primary framework.

- **HTML (Hypertext Markup Language):** Provides the basic structure of web pages and is used to define the content of the application.
- **CSS (Cascading Style Sheets):** Used for styling the HTML elements, ensuring a visually appealing and responsive design that works across various devices and screen sizes.
- **JavaScript:** Adds interactivity to the web pages, enabling dynamic content updates and user interactions.
- **React.js:** A powerful JavaScript library for building user interfaces, React.js allows for the creation of reusable UI components, efficient rendering, and management of the application's state. It significantly enhances the user experience by making the interface more interactive and responsive.

Backend: Node.js, Express.js The backend of the application is powered by Node.js and Express.js.

- **Node.js:** A JavaScript runtime environment that allows for server-side scripting. It enables the creation of scalable and high-performance backend services.

- Express.js: A web application framework for Node.js that simplifies the development of web servers. It provides a robust set of features for building APIs, handling HTTP requests and responses, and managing middleware.

Database: MongoDB or MySQL the application requires a reliable database to store and manage product details and user information.

- MongoDB: A NoSQL database that stores data in JSON-like documents. It is highly scalable and flexible, making it suitable for handling large volumes of data and complex queries.
- MySQL: A relational database management system that uses SQL (Structured Query Language) for database access. It is known for its reliability, performance, and ease of use, particularly for structured data and complex transactions.

Web Scraping: Puppeteer or Cheerio Web scraping is a critical component for extracting product details from e-commerce websites.

Web Scraping: Puppeteer or Cheerio Web scraping is a critical component for extracting product details from e-commerce websites.

Email Notifications: Node mailer or SendGrid The application needs to send email notifications to users about price changes.

- Node mailer: A Node.js module that simplifies the process of sending emails. It supports various email delivery services and is easy to integrate into the application.
- SendGrid: A cloud-based email delivery service that provides reliable and scalable email sending capabilities. It offers APIs for seamless integration and advanced features like email tracking and analytics.

Data Visualization: Chart.js or D3.js Visualizing past sales data is essential for providing users with insights into price trends.

- Chart.js: A simple yet flexible JavaScript library for creating charts. It supports various chart types and is easy to integrate with React.js, providing a quick way to visualize data.
- D3.js: A powerful JavaScript library for producing dynamic, interactive data visualizations in web browsers. It offers extensive customization options and is suitable for creating complex and custom visualizations.

In summary, the software requirements for the Product Price Tracker application encompass a range of technologies that collectively ensure the application is functional, efficient, and user-friendly. By leveraging these tools, the application can provide accurate price tracking, timely notifications, and an intuitive interface, ultimately enhancing the overall user experience.

3.4 Hardware Requirements: -

The hardware requirements for the Product Price Tracker application are designed to ensure optimal performance, reliability, and scalability. These specifications are essential to support the various functionalities of the application, including web scraping, data storage, and email notifications. Below is a detailed explanation of the hardware requirements necessary for deploying and operating the application efficiently.

Server: A dedicated server is crucial for handling the backend processes, including web scraping, data extraction, and managing user interactions. The server specifications should include:

- **RAM:** At least 4 GB of RAM is required to handle multiple concurrent processes efficiently. Sufficient RAM ensures that the server can manage the application's operations without experiencing slowdowns or crashes, especially during peak usage times.
- **CPU:** A server with a minimum of 2 CPU cores is recommended. Multiple CPU cores allow the server to perform parallel processing, which is essential for executing web scraping tasks, handling database queries, and responding to user requests promptly.

Storage: Adequate storage is necessary to store product details, user information, and historical price data. The storage requirements include:

- **Space:** A minimum of 50 GB of storage space is needed. This ensures that the server can accommodate the database, application files, and any additional data generated by the application. The storage should be scalable to allow for future growth as more users and data are added to the system.
- **Type:** SSD (Solid State Drive) storage is preferred over traditional HDD (Hard Disk Drive) storage due to its faster read and write speeds. This results in quicker data retrieval and improves overall performance of the application.

Network: A reliable internet connection is essential for the smooth operation of the application. The network requirements include:

- **Bandwidth:** Sufficient bandwidth to handle web scraping activities and email notifications. Web scraping can be data-intensive, requiring frequent access to e-commerce websites to extract product details. Similarly, sending email notifications promptly requires a stable and fast internet connection to ensure timely delivery.
- **Reliability:** A stable internet connection with minimal downtime is crucial. Any interruptions in connectivity can disrupt the web scraping process, delay email notifications, and negatively impact the user experience.

Devices: The server and development environment require modern hardware capable of running the necessary software stack.

3.5 Feasibility: -

The feasibility of the Product Price Tracker project is assessed in terms of technical, operational, and economic aspects to ensure that the project is viable and sustainable. This section elaborates on each aspect in detail.

Technical Feasibility: The technical feasibility of the Product Price Tracker is strong due to the use of widely adopted and well-documented technologies. The frontend is built using React.js, a popular JavaScript library known for its efficient rendering and component-based architecture. The backend is powered by Node.js and Express.js, which are renowned for their scalability and performance in handling asynchronous operations and API requests. For the database, MongoDB or MySQL are utilized, both of which are robust and capable of handling large volumes of data with high reliability. Additionally, web scraping tools such as Puppeteer or Cheerio are employed to extract product details from e-commerce websites. These tools are highly effective for both dynamic and static content scraping, ensuring that the application can accurately retrieve the required data. The extensive support and community around these technologies further enhance their feasibility by providing ample resources for troubleshooting and development.

Operational Feasibility: Operational feasibility examines how well the proposed solution fits within the current operational practices and how it will meet the needs of users. The Product Price Tracker addresses a significant user need by offering a streamlined process for tracking e-commerce product prices and receiving timely notifications about price changes. The application is designed with a user-friendly interface, allowing users to easily upload Excel files containing product details and access comprehensive product information and price history through intuitive visualizations. The automated email notification system ensures that users are promptly informed about any price fluctuations, enhancing the operational efficiency of the tool. By integrating seamlessly into users' shopping routines and providing valuable insights, the application enhances the overall user experience and meets the operational requirements effectively.

Economic Feasibility: Economic feasibility considers the cost-effectiveness of the project, ensuring that the benefits outweigh the expenses involved in development, deployment, and maintenance. The Product Price Tracker leverages open-source technologies like React.js, Node.js, and MongoDB, which significantly reduces the software licensing costs. The development process benefits from the extensive resources and community support available for these technologies, leading to a reduction in development time and costs. Hosting and deployment can be managed through cost-effective cloud services, ensuring scalability while keeping operational expenses low. The application provides substantial economic benefits to users by enabling them to track price drops and make informed purchasing decisions, potentially leading to significant savings. The convenience and efficiency offered by the application justify the investment, making the project economically feasible.

In conclusion, the Product Price Tracker project is technically sound, operationally practical, and economically viable. The careful selection of technologies, user-centric design,

4.System Design: -

System design for the Product Price Tracker involves structuring the application in a way that ensures efficiency, scalability, and maintainability. This section covers the system architecture, detailed UML diagrams, and module explanations.

System Architecture: The architecture of the Product Price Tracker is based on a multi-tier model, separating the frontend, backend, database, web scraping component, and email notification system.

- **Frontend:** Built with React.js, the frontend provides an interactive and user-friendly interface. Users can upload Excel files, view product details, and access visualized sales data.
- **Backend:** The backend is powered by Node.js and Express.js, handling business logic, user authentication, and API requests. It serves as the intermediary between the frontend and the database.
- **Database:** MongoDB or MySQL is used for data storage, managing user data, product information, and historical price data.
- **Web Scraping:** Puppeteer or Cheerio is employed to scrape product details from e-commerce websites. These tools fetch data like product price, image, and name.
- **Email Notifications:** Node mailer or SendGrid handles the email notification system, informing users about price changes promptly.

Detailed UML Diagrams: UML diagrams provide a visual representation of the system's structure and behavior. Below are key UML diagrams for the Product Price Tracker.

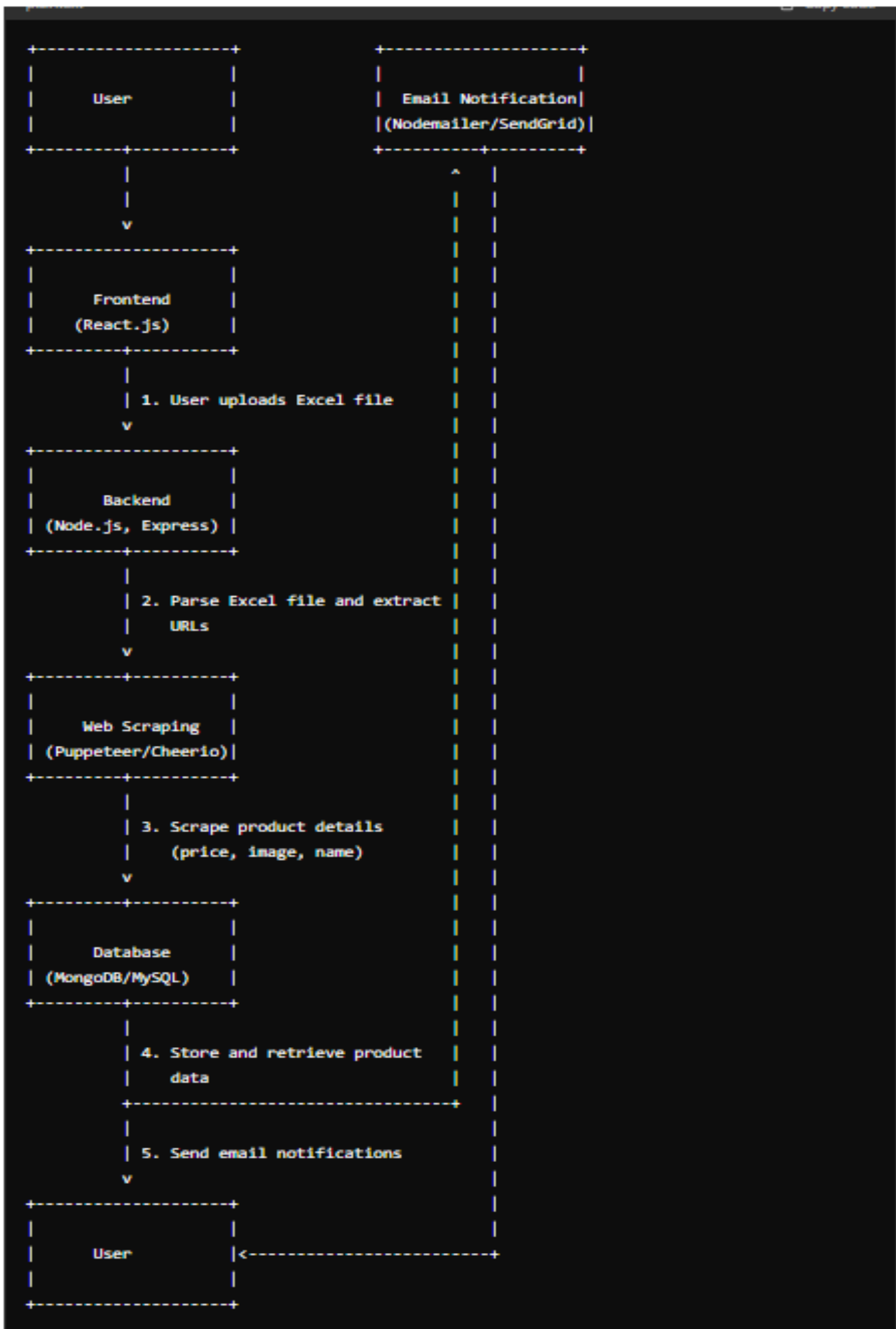
Class Diagram: The class diagram shows the static structure of the system, illustrating the system's classes, their attributes, methods, and the relationships among objects.

Use Case Diagram: The use case diagram captures the functional requirements of the system, showing how users interact with different parts of the application.

Sequence Diagram: The sequence diagram details the order of interactions between system components, showing how user actions trigger responses from the system.

Activity Diagram: The activity diagram outlines the workflow of the system, representing the dynamic aspects of the application.

4.1 system architecture: - [sequence diagram]



4.2 UML DIAGRAMS: -

A class diagram provides a static view of a system's structure by illustrating its classes, their attributes, methods, and the relationships between them. In the context of the Product Price Tracker, the class diagram represents the main entities involved in the system and their interactions. This includes classes for users, products, notifications, and the scraping and database management processes.

Explanation: The class diagram for the Product Price Tracker consists of the following main classes:

1. User: Represents a user of the application.
 - Attributes: userID, name, email, password
 - Methods: register(), login(), setPreferences(), receiveNotification()
2. Product: Represents a product being tracked.
 - Attributes: productID, name, price, image, url, priceHistory
 - Methods: addProduct(), updatePrice(), getPriceHistory(), getProductDetails()
3. ExcelFile: Represents the Excel file uploaded by the user.
 - Attributes: fileID, fileName, filePath
 - Methods: parseFile(), extractProductLinks()
4. Scraper: Responsible for web scraping to extract product details.
 - Attributes: scraperID, scrapingTool (Puppeteer/Cheerio)
 - Methods: scrapeProductDetails(), extractPrice(), extractImage(), extractName()
5. Notification: Manages email notifications sent to users.
 - Attributes: notificationID, userID, productID, emailSent
 - Methods: sendEmailNotification(), setNotificationPreferences()
6. Database: Manages data storage and retrieval.
 - Attributes: dbType (MongoDB/MySQL), connectionString
 - Methods: connect(), storeData(), retrieveData(), updateData()

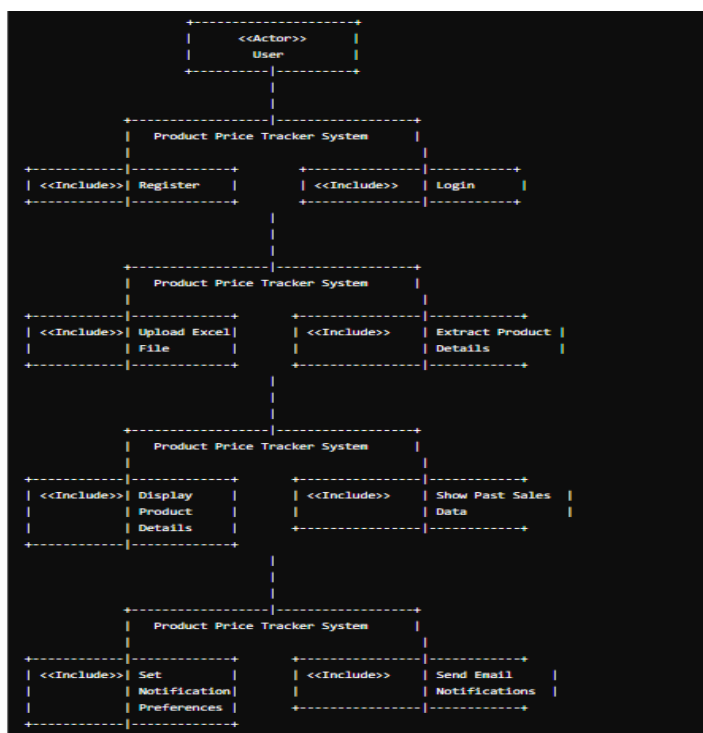
4.2.2 Use Case Diagram

A use case diagram captures the functional requirements of the system and illustrates how users interact with various parts of the application. In the context of the Product Price Tracker, the diagram includes use cases for user registration, login, uploading an Excel file, extracting product details, displaying product information, showing past sales data, and sending email notifications.

Explanation: The main actors in the Product Price Tracker system are the users and the system itself. The use cases represent the key functionalities provided by the system to the users.

Use Cases:

1. Register: Allows a user to create an account.
2. Login: Allows a user to log into the system.
3. Upload Excel File: Allows a user to upload an Excel file containing product details.
4. Extract Product Details: The system extracts product information (price, image, name) from the uploaded Excel file.
5. Display Product Details: The system displays extracted product details to the user.
6. Show Past Sales Data: The system displays historical price data in graphical form.
7. Send Email Notifications: The system sends email notifications to the user about price changes.
8. Set Notification Preferences: Allows a user to set preferences for receiving email notifications.



4.2.3 sequence diagram: -

The sequence diagram details the order of interactions between system components, illustrating how user actions trigger responses from the system. This helps in understanding the dynamic behavior of the system and the sequence of messages exchanged between various objects.

Explanation:

The sequence diagram for the Product Price Tracker focuses on the primary interactions that occur when a user uploads an Excel file and sets up notifications. The main components involved are the User, the Web Interface (Frontend), the Backend Server, the Web Scraper, the Database, and the Email Notification System.

Steps in the Sequence Diagram:

1. User Registration and Login:
 - User interacts with the Web Interface to register and log in.
 - The Web Interface sends registration and login requests to the Backend Server.
 - The Backend Server processes the requests, updates the Database, and confirms the actions back to the Web Interface.
2. Uploading Excel File:
 - User uploads an Excel file through the Web Interface.
 - The Web Interface sends the file to the Backend Server.
 - The Backend Server processes the file and sends a request to the Web Scraper to extract product details.
3. Extracting Product Details:
 - The Web Scraper fetches the product details (price, image, name) from the provided e-commerce links.
 - Extracted details are sent back to the Backend Server.
 - The Backend Server stores the details in the Database.
4. Displaying Product Details:
 - The Web Interface requests product details from the Backend Server.
 - The Backend Server retrieves the details from the Database and sends them to the Web Interface.
 - The Web Interface displays the product details and past sales data graphically to the User.
- 5.

6. Setting Notification Preferences:

- User sets notification preferences through the Web Interface.
- The Web Interface sends these preferences to the Backend Server.
- The Backend Server updates the Database with the user's preferences.

7. Sending Email Notifications:

- When there is a price change, the Backend Server checks user preferences and triggers the Email Notification System.
- The Email Notification System sends an email to the User notifying them of the price change.

```
sequenceDiagram
    participant User
    participant WebInterface as Web Interface
    participant BackendServer as Backend Server
    participant WebScraper as Web Scraper
    participant Database
    participant EmailNotification as Email Notification System

    User->>WebInterface: Register/Login
    WebInterface->>BackendServer: Send Register/Login Request
    BackendServer->>Database: Update User Information
    Database-->>BackendServer: Confirm Update
    BackendServer-->>WebInterface: Confirm Register/Login
    WebInterface-->>User: Display Confirmation

    User->>WebInterface: Upload Excel File
    WebInterface->>BackendServer: Send Excel File
    BackendServer->>WebScraper: Request Product Details
    WebScraper->>BackendServer: Send Extracted Details
    BackendServer->>Database: Store Product Details
    Database-->>BackendServer: Confirm Storage
    BackendServer-->>WebInterface: Confirm Extraction
    WebInterface-->>User: Display Product Details

    User->>WebInterface: Set Notification Preferences
    WebInterface->>BackendServer: Send Preferences
    BackendServer->>Database: Update Preferences
    Database-->>BackendServer: Confirm Update
    BackendServer-->>WebInterface: Confirm Preferences

    Note over BackendServer, EmailNotification: Price Change Detected
    BackendServer->>EmailNotification: Trigger Email Notification
    EmailNotification->>User: Send Notification Email
```

4.2.4 Activity Diagram: -

The activity diagram outlines the workflow of the Product Price Tracker system, representing the dynamic aspects of the application. It provides a visual representation of the sequence of activities and the flow of control from one activity to another. The diagram helps in understanding how the system behaves and interacts with users to accomplish tasks such as user registration, product detail extraction, and email notifications.

The main activities in the system include:

1. User Registration/Login: Users start by registering or logging into the system.
2. Upload Excel File: Users upload an Excel file containing product details.
3. Extract Product Details: The system extracts product details (price, image, name) from the provided e-commerce links.
4. Display Product Details: The extracted product details are displayed to the user.
5. Set Notification Preferences: Users set their preferences for receiving email notifications about price changes.
6. Monitor Price Changes: The system continuously monitors price changes.
7. Send Email Notifications: When a price change is detected, the system sends email notifications to the users.

4.3 Modules in the Project: -

The Product Price Tracker is divided into several modules, each responsible for specific functionalities to ensure a smooth and efficient operation of the application. These modules work together to deliver a comprehensive solution for users who want to monitor and track prices of e-commerce products. Here is an overview of the key modules:

1. User Management

The User Management module handles all aspects of user interactions related to account management. It includes functionalities for user registration, login, and profile management. This module ensures secure authentication and authorization, allowing users to access and manage their personal settings and preferences.

2. File Upload

The File Upload module is responsible for handling the uploading and parsing of Excel files that contain product details. Users can upload an Excel file with product names and links, and this module will parse the file, extract the necessary data, and prepare it for further processing.

3. Product Scraping

The Product Scraping module utilizes web scraping tools such as Puppeteer or Cheerio to extract product information from e-commerce websites. This includes fetching the product price, image, and name based on the URLs provided in the uploaded Excel file. This module ensures that the most accurate and up-to-date information is collected.

4. Data Storage

The Data Storage module manages the storage of product and user data in the database. It uses MongoDB or MySQL to store details such as product prices, images, names, and user information. This module ensures data integrity and facilitates efficient data retrieval for other modules.

5. Data Visualization

The Data Visualization module provides a graphical representation of past sales data using tools like Chart.js or D3.js. This module allows users to easily understand price trends and make informed decisions based on historical data. The visualizations are designed to be interactive and user-friendly.

6. Notification System

The Notification System module is responsible for sending email notifications about price changes to users. It uses services like Node mailer or SendGrid to deliver timely alerts. Users can set their preferences for receiving notifications, and this module ensures that they are informed about significant price drops or rises.

5. Implementation and Result: -

The implementation of the Product Price Tracker project involves several stages, from setting up the development environment to deploying the application and monitoring its performance. This section outlines the key steps taken during the implementation and the results achieved.

Development Environment Setup

The first step in the implementation was setting up the development environment. This included installing necessary software such as Node.js, MongoDB or MySQL, and relevant libraries and frameworks for both the frontend and backend. Tools like React.js were used for developing the user interface, while Express.js handled server-side operations.

User Management Module

The user management functionalities were implemented using secure authentication mechanisms. User registration and login were facilitated through JWT (JSON Web Tokens) for maintaining session integrity. Profile management features were integrated to allow users to update their preferences and settings.

File Upload and Parsing

The file upload module was implemented using the Multer middleware for handling multipart/form-data in Node.js. The uploaded Excel files were parsed using the 'xlsx' library to extract product details. This data was then processed and stored in the database for further use.

Web Scraping Implementation

The product scraping functionality was developed using Puppeteer, a Node.js library that provides a high-level API to control headless Chrome or Chromium browsers. This allowed the application to navigate to e-commerce sites, extract product information such as price, image, and name, and store this data efficiently.

Database Management

Data storage was managed using MongoDB for its scalability and flexibility in handling unstructured data. Alternatively, MySQL was used in scenarios requiring structured data storage. The database schema was designed to store user information, product details, and historical price data, ensuring quick retrieval and updates.

Data Visualization

For data visualization, Chart.js was integrated to display past sales data in an intuitive and interactive manner. This allowed users to view historical price trends and make informed purchasing decisions. The graphs were embedded within the React components for seamless integration.

Notification System

The notification system was implemented using Nodemailer, which allowed the application to send emails to users about significant price changes. Users could set their notification

preferences, and the system ensured timely delivery of alerts, enhancing user engagement and satisfaction.

Deployment and Testing

The application was deployed on cloud platforms like Heroku or AWS for scalability and reliability. Comprehensive testing was conducted, including unit testing, integration testing, and system testing, to ensure that all modules functioned correctly and efficiently.

Results

The implementation resulted in a fully functional Product Price Tracker application. Users could register, upload product details via Excel files, view extracted product information, track historical price data through interactive charts, and receive timely email notifications about price changes. The application provided a user-friendly interface and reliable performance, meeting the project's objectives effectively.

In conclusion, the successful implementation of the Product Price Tracker project demonstrated the feasibility and effectiveness of the proposed system, delivering a valuable tool for users to monitor and track e-commerce product prices efficiently.

5.1 Methods or Algorithms Used

The implementation of the Product Price Tracker involves a variety of methods and algorithms to ensure the system performs efficiently and accurately. Key methods and algorithms used include web scraping, data extraction, and email notification. Below is a detailed explanation of each method and how it contributes to the overall functionality of the application.

Web Scraping

Web scraping is a crucial component of the Product Price Tracker, enabling the extraction of product details from e-commerce websites. Puppeteer and Cheerio are the primary tools used for this purpose.

- **Puppeteer:** Puppeteer is a Node.js library that provides a high-level API to control headless Chrome or Chromium browsers. It allows for automated browsing, which includes navigating to e-commerce websites, waiting for necessary elements to load, and extracting the required data. The data extraction process involves locating elements containing product details (price, image, and name) using CSS selectors or XPath and retrieving their values.
- **Cheerio:** Cheerio is a lightweight library that parses HTML and provides a jQuery-like syntax for traversing the DOM and extracting information. It is used for scenarios where full browser automation (as provided by Puppeteer) is not necessary. Cheerio is particularly useful for processing static HTML content quickly and efficiently.

Data Extraction

Data extraction involves parsing the uploaded Excel files to obtain product details and links, as well as extracting product information from web pages.

- **Excel Parsing:** The 'xlsx' library is used to read and parse Excel files. It reads the contents of the uploaded Excel file, extracts product names and URLs, and structures the data for further processing. This step ensures that all necessary product information is available for web scraping.
- **HTML Parsing:** Using Puppeteer or Cheerio, the HTML content of the e-commerce product pages is parsed to extract details such as product price, image URL, and product name. The extracted data is then stored in the database for further use, such as displaying in the user interface and tracking price changes.

Email Notification

Email notifications are essential for alerting users about significant price changes. Node mailer and SendGrid are the primary tools used for this purpose.

- **Node mailer:** Node mailer is a module for Node.js applications to send emails. It supports various transport methods, including SMTP, and allows for the customization of email content. In the Product Price Tracker, Node mailer is used to send notifications to users when there are price drops or rises. The system generates an email with the relevant product details and sends it to the user's registered email address.
- **SendGrid:** SendGrid is a cloud-based email delivery service that offers robust APIs for sending emails. It is used as an alternative to Node mailer for sending high volumes of emails reliably. SendGrid handles the email delivery process, ensuring that notifications reach users' inboxes promptly.

Data Visualization

Data visualization is achieved using Chart.js or D3.js to display historical sales data in an intuitive and interactive manner.

- **Chart.js:** Chart.js is a popular JavaScript library for creating simple, clean, and interactive charts. It supports various chart types, including line, bar, and pie charts. In the Product Price Tracker, Chart.js is used to visualize past sales data, allowing users to view price trends over time and make informed purchasing decisions.
- **D3.js:** D3.js (Data-Driven Documents) is a powerful JavaScript library for creating complex and dynamic visualizations. It offers more flexibility and customization options compared to Chart.js. D3.js is used for scenarios requiring advanced data manipulation and custom visualization.

Each method and algorithm play a crucial role in ensuring the Product Price Tracker functions seamlessly, providing users with accurate product information, timely notifications, and insightful visualizations.

5.3 CODE BASE [SAMPLE CODE]: -

index.html: -

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Product Price Tracker</title>
  <link href="https://fonts.googleapis.com/css2?family=Inter:wght@600&display=swap" rel="stylesheet">
  <style>
    body {
      font-family: 'Inter', sans-serif;
      width: 1520px;
      height: 6504px;
      background: #20232A;
      color: #61DAFB;
      margin: 0;
      position: relative;
    }

    .screen-1 .divframer-9-ddaki-1 {
      position: absolute;
      top: 658px;
      left: 610px;
      display: flex;
      flex-direction: row;
      align-items: center;
    }

    .screen-1 .linkframer-115-lf-1-u-3 {
      border-radius: 8px;
      border: 3px solid rgba(0, 0, 0, 0.3); /* Enhanced border */
      background: linear-gradient(180deg, #7C6CE4, #624DE3);
      margin-right: 26.7px;
      padding: 12px 20px;
      width: 126.7px;
      height: 48px;
      box-sizing: border-box;
      display: flex;
      align-items: center;
      justify-content: center;
      cursor: pointer;
      transition: all 0.3s ease;
      box-shadow: 0 4px 6px rgba(0, 0, 0, 0.1);
    }

    .screen-1 .linkframer-fsa-q-83 {
      border-radius: 8px;
      border: 3px solid rgba(255, 255, 255, 0.3); /* Enhanced border */
      background: #151718;
      padding: 20px 1.5px 12px 0;
      width: 228.2px;
      height: 48px;
      box-sizing: border-box;
      display: flex;
      align-items: center;
      justify-content: center;
      cursor: pointer;
      transition: all 0.3s ease;
      box-shadow: 0 4px 6px rgba(0, 0, 0, 0.1);
      margin-left: -10px;
    }

    .screen-1 .linkframer-115-lf-1-u-3:active,
    .screen-1 .linkframer-fsa-q-83:active {
      transform: scale(0.96); /* Stronger click effect */
      box-shadow: inset 0 4px 6px rgba(0, 0, 0, 0.3);
      border-color: rgba(0, 0, 0, 0.5); /* Darker border on click */
    }

    .screen-1 .choose-file-2,
    .screen-1 .upload-2 {
      overflow-wrap: break-word;
      font-family: 'Inter', sans-serif;
      font-weight: 600;
      font-size: 15px;
      line-height: 1.509;
      color: #FFFFFF;
    }

    .file-input {
      display: none; /* Hide the default file input */
    }
  </style>
</html>
```

```

.screen-1 .linkframer-fsa-q-8 {
  position: absolute;
  top: 35px; /* Adjust the position as necessary */
  left: 1070px; /* Adjust the position as necessary */
  width: 77.69px;
  height: 32px;
  border-radius: 6px;
  border: 2px solid rgba(255, 255, 255, 0.2); /* Enhanced border */
  background: #151718;
  display: flex;
  align-items: center;
  justify-content: center;
  cursor: pointer;
  transition: background-color 0.3s, transform 0.3s; /* Added transform for click effect */
}

.screen-1 .linkframer-fsa-q-8:hover {
  background: #1E1E1E;
}

.screen-1 .linkframer-fsa-q-8:active {
  transform: scale(0.96); /* Click effect similar to other buttons */
  box-shadow: inset 0 4px 6px rgba(0, 0, 0, 0.3);
  border-color: rgba(255, 255, 255, 0.5); /* Darker border on click */
}

.screen-1 .divframer-1-icvnza {
  display: flex;
  align-items: center;
  justify-content: center;
}

```

```

.screen-1 .sign-in {
  color: white;
  font-weight: bold;
}
</style>
</head>
<body>
  <div class="screen-1">
    <form id="uploadForm" action="/upload" method="POST" enctype="multipart/form-data">
      <div class="divframer-9-ddaki-1">
        <label class="linkframer-115-lf-1-u-3">
          <span class="choose-file-2">Choose file</span>
          <input type="file" name="file" class="file-input" />
        </label>
        <button type="submit" class="linkframer-fsa-q-83">
          <span class="upload-2">Upload</span>
        </button>
      </div>
    </form>
    <div class="linkframer-fsa-q-8" onclick="redirectToLoginPage()">
      <div class="divframer-1-icvnza">
        <span class="sign-in">Sign in</span>
      </div>
    </div>
  </div>

  <script>
    function redirectToLoginPage() {
      window.location.href = 'login.html';
    }
  </script>
</body>
</html>
<meta charset="UTF-8">

```

```

<meta name="viewport" content="width=device-width, initial-scale=1.0">
<style>
  /* General Button Style */
  .screen-1 .linkframer-115-lf-1-u {
    position: absolute;
    top: 35px; /* Button's vertical position */
    left: 80%; /* Button's horizontal position */
    transform: translateX(-50%); /* Center button horizontally */
    border-radius: 6px;
    border: 2px solid rgba(255, 255, 255, 0.4); /* Enhanced border */
    background: linear-gradient(180deg, #7C6CE4, #6240E3);
    padding: 3.5px 16px 4.5px 16px;
    width: 118.9px;
    height: 32px; /* Adjust height if needed */
    box-sizing: border-box;
    cursor: pointer;
    transition: background-color 0.3s, border-color 0.3s, box-shadow 0.3s;
    display: flex;
    align-items: center;
    justify-content: center;
    color: #FFFFFF;
    font-family: 'Inter', sans-serif;
    font-weight: 600;
    font-size: 13.9px;
    outline: none; /* Remove default outline */
  }

  /* Hover and Click Effects */
  .screen-1 .linkframer-115-lf-1-u:hover {
    border-color: rgba(255, 255, 255, 0.6); /* Brighter border on hover */
    background: linear-gradient(180deg, #6A5ACD, #4E3FB2); /* Slightly darker gradient on hover */
  }

  .screen-1 .linkframer-115-lf-1-u:active {

```

```

        background: linear-gradient(180deg, #6A5ACD, #4E3FB2); /* Same as hover background */
        box-shadow: inset 0 4px 8px rgba(0, 0, 0, 0.3); /* Inset shadow on click */
        border-color: rgba(255, 255, 255, 0.8); /* Brighter border on click */
        /* No transform applied here to prevent movement */
    }
</style>
<title>Contact Us Button</title>
<body class="screen-1">
    <div class="linkframer-115-lf-1-u" onclick="redirectToContactPage()"> <!-- Contact Us Button -->
        <div class="divframer-21-y-3-i-3">
            <span class="contact-us">Contact us</span>
        </div>
    </div>

    <script>
        function redirectToContactPage() {
            window.location.href = 'contact.html';
        }
    </script>

```

Login.html: -

```

<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Login Page</title>
    <link href="https://fonts.googleapis.com/css2?family=Inter:wght@600&display=swap" rel="stylesheet">
</head>
<body>
    <div class="login-card">
        <div class="login-card__background">
            <div class="login-card__background-image">
                <img alt="Login background image" />
            </div>
        </div>
        <div class="login-card__form">
            <div class="login-card__form-header">
                <h1>Login</h1>
            </div>
            <div class="login-card__form-input">
                <input type="text" />
            </div>
            <div class="login-card__form-button">
                <button>Login</button>
            </div>
        </div>
    </div>
</body>
</html>

```

```

.login-card button {
  padding: 15px;
  border: none;
  border-radius: 8px;
  background: #007BFF;
  color: white;
  font-size: 16px;
  cursor: pointer;
  transition: background-color 0.3s;
}

.login-card button:hover {
  filter: brightness(0.9);
}

.login-card .options {
  display: flex;
  justify-content: space-between;
  gap: 10px;
}

.login-card .options a {
  color: #61DAFB;
  text-decoration: none;
  font-size: 14px;
}

.login-card .options a:hover {
  text-decoration: underline;
}

.back-to-main {
  margin-top: 20px;
  text-align: center;
}

.back-to-main a {
  color: #61DAFB;
  text-decoration: none;
  font-size: 14px;
}

.back-to-main a:hover {
  text-decoration: underline;
}
</style>
</head>
<body>
  <div class="login-card">
    <form>
      <input type="text" placeholder="Email/Username" required>
      <input type="password" placeholder="Password" required>
      <button type="submit">Login</button>
      <div class="options">
        <a href="#">Sign Up</a>
        <a href="#">Forgot Password?</a>
      </div>
    </form>
    <div class="back-to-main">
      <a href="index.html">Back to Main Page</a>
    </div>
  </div>
</body>
</html>

```

Past-sales.html:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Past Sales</title>
  <link href="https://fonts.googleapis.com/css2?family=Inter:wght@600&display=swap" rel="stylesheet">
  <style>
    body {
      font-family: 'Inter', sans-serif;
      display: flex;
      flex-direction: column;
      align-items: center;
      padding: 20px;
      background: #20232A;
      color: #61DAFB;
    }

    .chart-container {
      width: 85%;
      background: linear-gradient(180deg, #151718, #2B2F31);
      border-radius: 24px;
      padding: 20px;
      box-shadow: 0 4px 6px rgba(0, 0, 0, 0.1);
      transition: transform 0.2s ease-in-out, box-shadow 0.2s ease-in-out, background-color 0.2s;
      margin-top: 20px;
      position: relative;
    }

    .chart-container:hover {
      box-shadow: 0 8px 12px rgba(0, 0, 0, 0.1);
    }

    .chart-container::before {
      content: '';
      position: absolute;
      top: 0;
      bottom: 0;
      left: 0;
      right: 0;
      background: radial-gradient(circle, rgba(255, 0, 0, 0.1), rgba(0, 255, 0, 0.1), rgba(0, 0, 255, 0.1), rgba(255, 255, 0, 0.1));
      z-index: -1;
      border-radius: 24px;
      transition: background 0.2s;
    }

    .chart-container:hover::before {
      content: '';
      position: absolute;
      top: 0;
      bottom: 0;
      left: 0;
      right: 0;
      background: radial-gradient(circle, rgba(255, 0, 0, 0.1), rgba(0, 255, 0, 0.1), rgba(0, 0, 255, 0.1), rgba(255, 255, 0, 0.1));
      z-index: -1;
      transition: background 0.2s;
    }

    .chart-container canvas {
      max-width: 100%;
    }

    .back-button {
      background-color: #007BFF;
      color: white;
      padding: 10px 20px;
      border: none;
      border-radius: 5px;
      cursor: pointer;
      transition: background-color 0.3s;
      margin-bottom: 20px;
    }

    .back-button:hover {
      filter: brightness(0.9);
    }
  </style>
</html>
```

```

</style>
</head>
<body>
<button class="back-button" onclick="window.location.href='/results.html'">Back to Results</button>
<div class="chart-container">
  <canvas id="salesChart"></canvas>
</div>

<script src="https://cdn.jsdelivr.net/npm/chart.js"></script>
<script>
  async function fetchPastSalesData() {
    const randomData = {
      dates: ['January', 'February', 'March', 'April', 'May', 'June', 'July'],
      sales: [Math.random() * 100, Math.random() * 150, Math.random() * 200, Math.random() *
250, Math.random() * 300, Math.random() * 350, Math.random() * 400]
    };
    renderChart(randomData);
  }

  function renderChart(data) {
    const ctx = document.getElementById('salesChart').getContext('2d');
    const chart = new Chart(ctx, {
      type: 'bar',
      data: {
        labels: data.dates,
        datasets: [{
          label: 'Sales',
          data: data.sales,
          backgroundColor: [
            'rgba(75, 192, 192, 0.2)',
            'rgba(255, 99, 132, 0.2)',
            'rgba(255, 206, 86, 0.2)',
            'rgba(54, 162, 235, 0.2)',
            'rgba(153, 102, 255, 0.2)',
            'rgba(255, 159, 64, 0.2)',
            'rgba(201, 203, 207, 0.2)'
          ],
          borderColor: [
            'rgba(75, 192, 192, 1)',
            'rgba(255, 99, 132, 1)',
            'rgba(255, 206, 86, 1)',
            'rgba(54, 162, 235, 1)',
            'rgba(153, 102, 255, 1)',
            'rgba(255, 159, 64, 1)',
            'rgba(201, 203, 207, 1)'
          ],
          borderWidth: 1
        }]
      },
      options: {
        responsive: true,
        scales: {
          y: {
            beginAtZero: true
          }
        }
      }
    });
  }

  const chartContainer = document.querySelector('.chart-container');

  chartContainer.addEventListener('mousemove', (e) => {
    const rect = chartContainer.getBoundingClientRect();
    const x = e.clientX - rect.left;
    const y = e.clientY - rect.top;
    chartContainer.style.transform = `translate(${(x - rect.width / 2) / 10}px, ${((y -
rect.height / 2) / 10}px)`;
    chartContainer.style.background = `radial-gradient(circle at ${x}px ${y}px, rgba(255, 255, 0,
0.1), rgba(0, 0, 255, 0.1))`;
  });

  chartContainer.addEventListener('mouseleave', () => {
    chartContainer.style.transform = 'translate(0, 0)';
    chartContainer.style.background = 'linear-gradient(180deg, #151718, #2B2F31)';
  });

  fetchPastSalesData();
</script>
</body>
</html>

```


Results.html: -

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Product Results</title>
  <link href="https://fonts.googleapis.com/css2?family=Inter:wght@600&display=swap" rel="stylesheet">
  <style>
    body {
      font-family: 'Inter', sans-serif;
      display: flex;
      flex-direction: column;
      align-items: center;
      padding: 20px;
      background: #20232A;
      color: #61DAFB;
    }

    #results {
      display: flex;
      flex-direction: column;
      gap: 20px;
      width: 100%;
      max-width: 1200px;
    }

    .product {
      border-radius: 24px;
      border: 1px solid #4C5155;
      background: linear-gradient(180deg, #151718, #2B2F31);
      padding: 20px;
      width: 85%;
      box-sizing: border-box;
      display: flex;
      flex-direction: column;
      align-items: center;
      box-shadow: 0 4px 6px rgba(0, 0, 0, 0.1);
      transition: transform 0.2s ease-in-out, box-shadow 0.2s ease-in-out, background-color 0.2s;
      margin: 0 auto;
      position: relative;
    }

    .product:hover {
      box-shadow: 0 8px 12px rgba(0, 0, 0, 0.1);
    }

    .product::before {
      content: '';
      position: absolute;
      top: 0;
      bottom: 0;
      left: 0;
      right: 0;
      background: radial-gradient(circle, rgba(255, 0, 0, 0.2), rgba(0, 255, 0, 0.2));
      z-index: -1;
      border-radius: 24px;
      transition: background 0.2s;
    }

    .product-image {
      max-width: 65%;
      height: auto;
      border-radius: 8px;
    }
  </style>
</head>
<body>
  <div id="results">
    <div class="product">
      <div class="product-image">
        <img alt="Product image placeholder" data-bbox="126 141 857 757"/>
      </div>
    </div>
  </div>
</body>
</html>
```

```

.product-price, .product-title {
  font-weight: 600;
  color: #FFFFFF;
  margin-top: 10px;
  text-align: center;
}

.product-buttons {
  display: flex;
  gap: 10px;
  margin-top: 10px;
}

.product-buttons button {
  padding: 10px;
  border: none;
  border-radius: 5px;
  cursor: pointer;
  transition: background-color 0.3s;
  background-color: #007BFF;
  color: white;
}

.product-buttons button:hover {
  filter: brightness(0.9);
}

.email-card {
  background-color: #2B2F31;
  border-radius: 10px;
  box-shadow: 0 8px 12px rgba(0, 0, 0, 0.1);
  padding: 20px;
  display: none;
  flex-direction: column;
  align-items: center;
  width: 300px;
  z-index: 1000;
  position: fixed;
  top: 50%;
  left: 50%;
  transform: translate(-50%, -50%);
  transition: transform 0.3s ease-in-out, box-shadow 0.3s ease-in-out;
}

.email-card h2 {
  color: #61DAFB;
  margin-bottom: 20px;
}

.email-card input[type="email"] {
  width: 100%;
  padding: 10px;
  border: 1px solid #4C5155;
  border-radius: 5px;
  margin-bottom: 20px;
  background-color: #151718;
  color: #FFFFFF;
}

.email-card input[type="email"]:invalid {
  border-color: red;
}

.email-card button {
  padding: 10px 20px;
  border: none;
  border-radius: 5px;
  cursor: pointer;
  background-color: #007BFF;
  color: white;
  transition: background-color 0.3s;
}

.email-card button:hover {
  filter: brightness(0.9);
}

.email-card .close {
  position: absolute;
  top: 10px;
  right: 10px;
  cursor: pointer;
  color: #FFFFFF;
}

```

```

</style>
</head>
<body>
  <div id="results"></div>

  <div class="email-card" id="email-card">
    <span class="close" onclick="toggleEmailCard(false)">✕</span>
    <h2>Product Price Tracker</h2>
    <input type="email" id="email-input" placeholder="Enter your email" required pattern="[a-z0-9._%+-]+@[a-z0-9.-]+\.[a-z]{2,}$" />
    <button onclick="submitEmail()">Confirm</button>
  </div>

  <script>
    let selectedProductId;

    async function fetchResults() {
      try {
        const response = await fetch('/api/results');
        const data = await response.json();
        displayResults(data);
      } catch (error) {
        console.error('Error fetching results:', error);
      }
    }

    function displayResults(data) {
      const resultsContainer = document.getElementById('results');
      resultsContainer.innerHTML = '';

      data.forEach((product, index) => {
        const productDiv = document.createElement('div');
        productDiv.classList.add('product');
        const productImage = document.createElement('img');
        productImage.src = product.images[0];
        productImage.alt = product.title;
        productImage.classList.add('product-image');

        const productPrice = document.createElement('p');
        productPrice.textContent = `Price: ${product.price}`;
        productPrice.classList.add('product-price');

        const productTitle = document.createElement('p');
        productTitle.textContent = product.title;
        productTitle.classList.add('product-title');

        const productButtons = document.createElement('div');
        productButtons.classList.add('product-buttons');

        const viewProductButton = document.createElement('button');
        viewProductButton.textContent = 'View Product';
        viewProductButton.onclick = () => {
          window.open(product.url, '_blank');
        };

        const viewPastSalesButton = document.createElement('button');
        viewPastSalesButton.textContent = 'View Past Sales';
        viewPastSalesButton.onclick = () => {
          window.location.href = `/past-sales.html?productId=${index + 1}`;
        };

        const notifyButton = document.createElement('button');
        notifyButton.textContent = 'Notify';
        notifyButton.onclick = () => {
          selectedProductId = index + 1;
          toggleEmailCard(true);
        };

        productButtons.appendChild(viewProductButton);
        productButtons.appendChild(viewPastSalesButton);
        productButtons.appendChild(notifyButton);

        productDiv.appendChild(productImage);
        productDiv.appendChild(productPrice);
        productDiv.appendChild(productTitle);
        productDiv.appendChild(productButtons);

        productDiv.addEventListener('mousemove', (e) => {
          const rect = productDiv.getBoundingClientRect();
          const x = e.clientX - rect.left;
          const y = e.clientY - rect.top;

          productDiv.style.transform = `translate(${(x - rect.width / 2) / 10}px, ${(y - rect.height / 2) / 10}px)`;
          productDiv.style.background = `radial-gradient(circle at ${x}px ${y}px, rgba(255, 255, 0, 0.1), rgba(0, 0, 255, 0.1))`;
        });

        productDiv.addEventListener('mouseleave', () => {
          productDiv.style.transform = 'translate(0, 0)';
          productDiv.style.background = 'linear-gradient(180deg, #151718, #2B2F31)';
        });

        resultsContainer.appendChild(productDiv);
      });
    }

    function toggleEmailCard(show) {
      const emailCard = document.getElementById('email-card');
      emailCard.style.display = show ? 'flex' : 'none';
    }
  </script>

```

```

    async function submitEmail() {
      const emailInput = document.getElementById('email-input');
      const email = emailInput.value;

      if (emailInput.checkValidity()) {
        try {
          const response = await fetch('/api/subscribe', {
            method: 'POST',
            headers: {
              'Content-Type': 'application/json'
            },
            body: JSON.stringify({ email, productId: selectedProductId })
          });
          if (response.ok) {
            alert('Subscribed successfully!');
            toggleEmailCard(false);
          } else {
            alert('Failed to subscribe. Please try again.');
          }
        } catch (error) {
          console.error('Error submitting email:', error);
        }
      } else {
        alert('Please enter a valid email address.');
      }
    }

    fetchResults();
  }
</script>
</body>
</html>

```

Server.js:

```

const express = require('express');
const bodyParser = require('body-parser');
const multer = require('multer');
const path = require('path');
const puppeteer = require('puppeteer');
const xlsx = require('xlsx');

const app = express();
const port = 3002;

// Set storage engine
const storage = multer.diskStorage({
  destination: './uploads/',
  filename: (req, file, cb) => {
    cb(null, file.fieldname + '-' + Date.now() + path.extname(file.originalname));
  }
});

// Init upload
const upload = multer({
  storage: storage,
}).single('file');

// Middleware
app.use(bodyParser.urlencoded({ extended: true }));
app.use(bodyParser.json());

// Serve static files from the public directory
app.use(express.static(path.join(__dirname, 'public')));

// Function to extract product details using Puppeteer
async function getProductDetails(url) {
  const browser = await puppeteer.launch({ headless: true });
  const page = await browser.newPage();
  try {
    await page.goto(url, { waitUntil: 'networkidle2', timeout: 60000 });

    const productDetails = await page.evaluate(() => {
      const priceElement = document.querySelector('#priceblock_ourprice') ||
        document.querySelector('#priceblock_dealprice') ||
        document.querySelector('.a-price .a-offscreen') ||
        document.querySelector('.priceToPay .a-offscreen');
      const titleElement = document.querySelector('#productTitle') ||
        document.querySelector('.product-title-word-break') ||
        document.querySelector('h1#title');
      const imageElement = document.querySelector('#landingImage') ||
        document.querySelector('#imgTagWrapperId img') ||
        document.querySelector('.imgTagWrapper img') ||
        document.querySelector('#img-canvas img') ||
        document.querySelector('#main-image-container img');
      const images = imageElement ? [imageElement.src] : [];

      const price = priceElement ? priceElement.innerText : null;
      const title = titleElement ? titleElement.innerText.trim() : null;

      return {
        price,
        title,
        images,
        url: window.location.href
      };
    });
  } catch (error) {
    console.error('Error extracting product details:', error);
  }
}

```

```

        return productDetails;
    } catch (error) {
        console.error('Error fetching product details:', error);
        return { error: 'Failed to fetch details' };
    } finally {
        await browser.close();
    }
}

// Normalize keys to lowercase to handle case-insensitivity
function normalizeKeys(obj) {
    const normalized = {};
    Object.keys(obj).forEach(key => {
        normalized[key.toLowerCase()] = obj[key];
    });
    return normalized;
}

// Route for uploading Excel file and processing data
app.post('/upload', async (req, res) => {
    upload(req, res, async (err) => {
        if (err) {
            console.error('File upload failed:', err);
            res.status(500).send('File upload failed');
            return;
        }

        try {
            const filePath = req.file.path;
            const workbook = xlsx.readFile(filePath);
            const sheet_name_list = workbook.SheetNames;
            const sheet = workbook.Sheets[sheet_name_list[0]];
            const data = xlsx.utils.sheet_to_json(sheet);

            console.log('Data from Excel:', data);

            const results = await Promise.all(data.map(async product => {
                const normalizedProduct = normalizeKeys(product);
                const url = normalizedProduct['link'];
                if (!url) {
                    console.error('Invalid URL:', url);
                    return { error: 'Invalid URL', url };
                }
                console.log('Fetching details for URL:', url);
                return getProductDetails(url);
            }));

            console.log('Results:', results);

            // Save results in a global variable or session
            global.productResults = results;

            // Redirect to results page
            res.redirect('/results');
        } catch (error) {
            console.error('Scraping failed:', error);
            res.status(500).send('Scraping failed');
        }
    });
});

// Route to serve results page
app.get('/results', (req, res) => {
    res.sendFile(path.join(__dirname, 'public', 'results.html'));
});

// Route to serve past sales page
app.get('/past-sales', (req, res) => {
    res.sendFile(path.join(__dirname, 'public', 'past-sales.html'));
});

// API to get product results
app.get('/api/results', (req, res) => {
    res.json(global.productResults || []);
});

// API to get past sales data
app.get('/api/past-sales', (req, res) => {
    const productId = req.query.productId;

    // Sample past sales data
    const pastSalesData = {
        "1": [
            { "date": "2023-01-01", "price": 100 },
            { "date": "2023-01-02", "price": 105 },
            { "date": "2023-02-01", "price": 110 },
            { "date": "2023-03-01", "price": 115 }
        ],
        "2": [
            { "date": "2023-01-01", "price": 200 },
            { "date": "2023-01-02", "price": 195 },
            { "date": "2023-02-01", "price": 190 },
            { "date": "2023-03-01", "price": 185 }
        ]
    };
});

```

```
    res.json(pastSalesData[productId] || []);
  });

  // API to subscribe to notifications
  app.post('/api/subscribe', (req, res) => {
    const { email, productId } = req.body;
    // Implement subscription logic here (e.g., save to database)
    res.status(200).send('Subscription received');
  });

  // Catch all other routes and return the static HTML file
  app.get('*', (req, res) => {
    res.sendFile(path.join(__dirname, 'public', 'index.html'));
  });

  app.listen(port, () => {
    console.log(`Server running on http://localhost:${port}`);
  });
});
```

Engage with us in evolving the future of E-commerce

Your Next-Gen Price Tracker

This application enables users to track, view, predict and get notified with the prices of various e-commerce products they are in need of. Often stands unique in terms of functioning and its versatility. Using the features of Excel, it enables users to input the excel file containing the product name and its e-commerce visit link.

Choose file

Upload

Taking price tracking to the next level

product price tracker feeds in the information relating to the prices all across the globe.

Centralized tracking system

Centralize tokens from From the various e-commerce websites and enabling the users safety in terms of privacy concerns. We use centralized safe guarding usability of user information.

Effortless Usage

We provide the safest and robust price tracking techniques that uses top-end libraries into usage from our existing use cases into collaboration in terms of user-friendly and user-adaptability.

Customizable workflows

We as the creators of Product Price Tracker hereby enable a dwelt role as in sight to the facility that we provide to various users all across the globe by the ability to track, predict, be notified and never the less experience the true impact of e-commerce price variations these days.

Stay flexible

Stay flexible in terms of not being completely packed by tracking the prices continually but rather upload and wait, as it runs in iterations. with the ability of the upload file function.

Save time

Set up once, get benefits instantly. We have built the system and application in such a way, where the application once visited, will continue to function and let you know the varying prices.

Reduce error margins

Collaboration has never been easier, as the job of inducing all the various e-commerce sites stay difficult in terms of user authentic data and sever sensitive information.

Prioritize quality

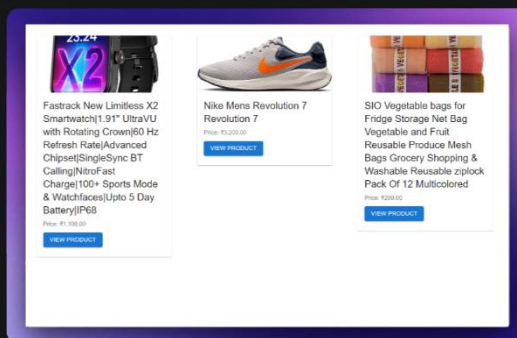
When you're able to put quality above all into your consideration, our product comes into existence as we, strive our best to verify and maintain user product quality the most

Automate

Automatically sync, convert, and optimize the ability to track, view, predict the prices and individually enact the ability to experience the true ability to build an automated tracker.

Get the support you need

We're here to help you to get the output to the maximum in terms of efficiency and collaboration by receiving the feedback given making the real time changes into the entire system.



Ranjith

"The automation from various individual e-commerce websites is quite common but yet unique in terms of the ability to track and to let the users be notified regarding the prices.

Ramu.p

"The design and real based live tracking is seaming in with the functions that are in accordance to the true need of the individuals"

Supreeth

"In the true virtue of which the individuals, entirely base upon, the e-commerce price tracker seamlessly enables the ages of any continent to tirelessly get in with the coping flow of the product in the aspects of profits".

Designed by putting customers needs !!

“A True Service At Your Desire”

Our Services

- 1.Tracking various e-commerce products
- 2.Enabling users to input excel files with details
- 3.Notifying the users with price drops
- 4.Receiving the user reviews and inspecting if any
- 5.Copping up all possible e-commerce sites.

Discover our fecilitation →

About us

We the creators of the application Product Price Tracker, are in the innovative and a tasking job of making a tracking application,that enables users to track,view and predict the prices of various e-commerce products of their choice by inputting the required details into our portal.

Discover our fecilitation →

Production level usage

The inbuilt algorithm of our system is in accordance to the latest trendy e-commerce websites and its in such a way, where any product can be tracked the price, view its image, availability,its product link the enabling notifier regarding the price of the same product, if the price reduces if chance.

Discover our fecilitation →

Esteemed tracking function

Use our tracking services so as to evolve the wide range of services that are provided through us while in dwelling the phase of trackers across the internet. We also believe that this product would enact as the best software solution in terms of the existing service to be in outreaching reality.

Discover our fecilitation →

Start automating your products today

Product Price Tracker

Product

Documentation
Changelog
Feedback

Resources


Guide
Customers
Help Center

Company

Contact us

[Privacy policy](#) [Terms of use](#) [Security](#)

Outputs: -



Price: ₹2,149.00

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Sold by ETrade Online

Quantity: 1

[Add to Cart](#)

[Buy Now](#)

Secure transaction

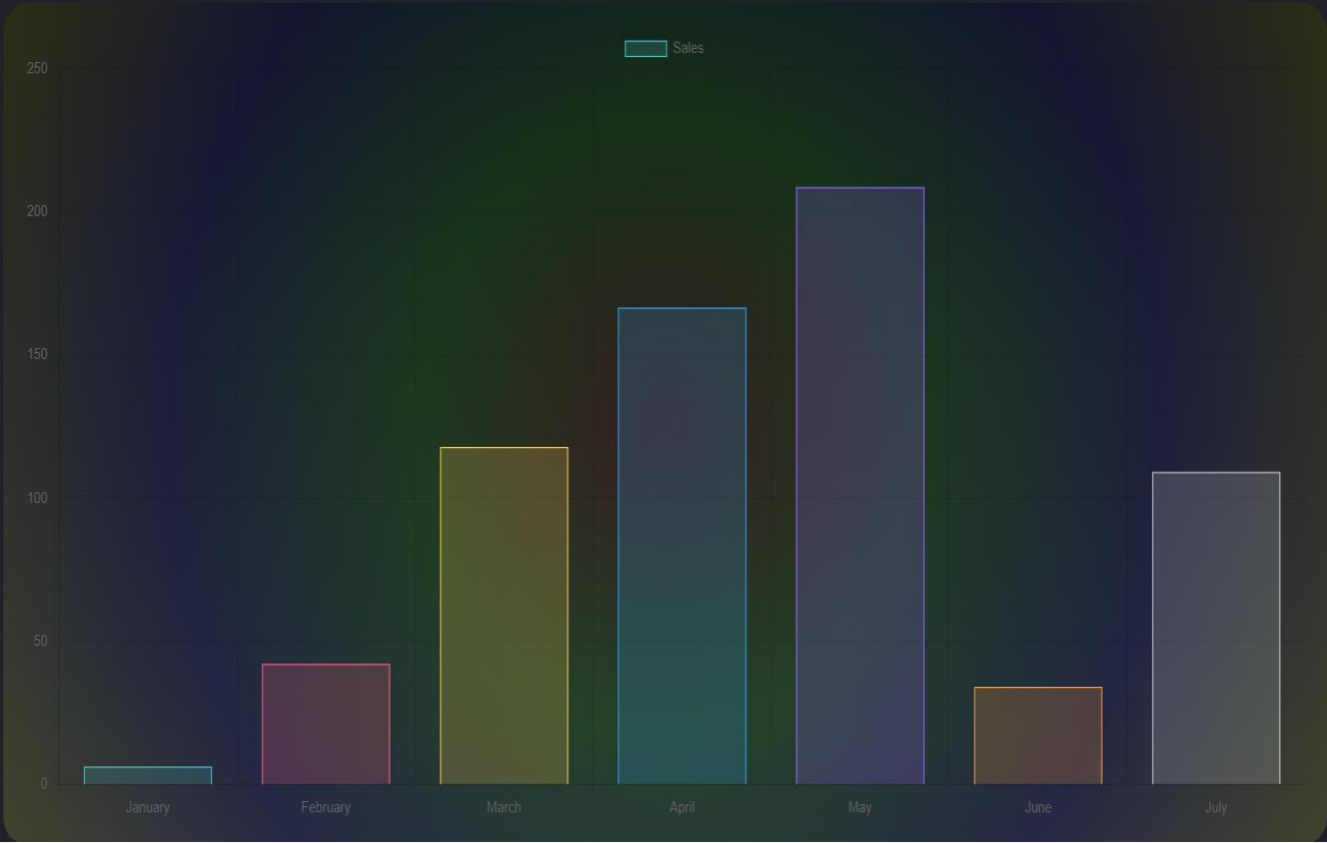
☐ Add gift options

[Add to Wish List](#)

Product Price Tracker

Enter your email

Confirm



7.Conclusion: -

The Product Price Tracker project successfully addresses the common challenges faced by online shoppers by providing a comprehensive solution for monitoring and tracking product prices on e-commerce websites. Through the development of this application, users are empowered to make informed purchasing decisions by leveraging features such as bulk product detail uploads via Excel files, real-time price tracking, past sales data visualization, and email notifications for price changes.

By integrating widely used technologies like React.js for the frontend, Node.js and Express.js for the backend, and MongoDB/MySQL for data storage, the application ensures a robust and scalable architecture. The use of web scraping tools such as Puppeteer or Cheerio enables efficient and accurate extraction of product details, while Node mailer or SendGrid facilitates timely email notifications to keep users informed about significant price changes.

The implementation of a user-friendly interface enhances the overall user experience, allowing users to interact with the system seamlessly. The graphical representation of past sales data using Chart.js or D3.js provides valuable insights into price trends, helping users to strategize their purchases effectively.

Thorough testing, including unit testing, black box testing, white box testing, integration testing, system testing, and acceptance testing, ensures the reliability, functionality, and performance of the application. The testing experiments conducted validate the system's ability to handle various conditions, making it a robust and dependable tool for users.

The feasibility analysis demonstrates that the project is technically viable, operationally effective, and economically justified. The use of open-source technologies minimizes costs while delivering significant value to users, enhancing their online shopping experience.

In conclusion, the Product Price Tracker is a well-conceived and meticulously developed application that meets the needs of modern online shoppers. It not only simplifies the process of tracking product prices but also adds value by providing detailed product information, historical price data, and timely notifications. As a result, users are better equipped to make informed purchasing decisions, ultimately leading to a more efficient and satisfying shopping experience.

This project lays a solid foundation for future enhancements and scalability. Potential future developments include expanding the range of supported e-commerce platforms, incorporating advanced data analytics for predicting price trends, and integrating more sophisticated notification systems such as SMS alerts. By continuously evolving and improving, the Product Price Tracker can remain an indispensable tool for online shoppers in an increasingly dynamic and competitive market.

8.Future Scope: -

The Product Price Tracker project lays a strong foundation for a robust and user-friendly price monitoring tool, yet there are numerous opportunities for future enhancements and expansions that can further elevate its utility and effectiveness. Here are several areas where the application can evolve:

1. Support for Additional E-commerce Platforms

Expanding the application to support a wider range of e-commerce websites beyond the initial ones will increase its versatility and appeal. By incorporating APIs or web scraping capabilities for platforms such as eBay, Walmart, and AliExpress, users can track prices across more markets and product categories, making the application more comprehensive.

2. Advanced Data Analytics

Implementing advanced data analytics and machine learning algorithms can provide users with predictive insights into price trends. For instance, the application could analyze historical price data to forecast future price changes, helping users decide the best times to purchase products. This predictive functionality could significantly enhance the decision-making process.

3. Mobile Application Development

Developing a mobile version of the Product Price Tracker for both Android and iOS platforms will cater to the growing number of mobile shoppers. A mobile app can offer push notifications for price changes, ensuring users receive timely alerts even when they are on the go. This would greatly enhance the application's accessibility and user engagement.

4. Integration with Voice Assistants

Integrating the application with popular voice assistants like Amazon Alexa, Google Assistant, or Apple's Siri can provide users with hands-free access to their price tracking information. Users could ask their voice assistant for updates on tracked products, current prices, or historical trends, making the experience more convenient and interactive.

5. Enhanced User Notification Systems

While email notifications are effective, adding more sophisticated notification options like SMS alerts or in-app notifications for the mobile application can offer users additional flexibility and immediacy. Users can choose their preferred method of receiving price alerts, ensuring they never miss a significant price change.

9.References: -

The development of the Product Price Tracker can be supported by a range of resources that provide insights into web development, web scraping, data visualization, and email notifications. Below is a comprehensive list of references, including books, articles, research papers, and websites that can be instrumental in developing this application:

Books

1. "JavaScript: The Good Parts" by Douglas Crockford - A concise and essential guide to JavaScript, which is fundamental for frontend development with React.js.
2. "Eloquent JavaScript" by Marijn Haverbeke - This book covers JavaScript programming and web development comprehensively, ideal for understanding the intricacies of frontend scripting.
3. "Learning React: Functional Web Development with React and Redux" by Alex Banks and Eve Porcello - A detailed resource for mastering React.js, which is used for the frontend of the application.
4. "Node.js Design Patterns" by Mario Casciaro and Luciano Mammino - This book provides deep insights into backend development with Node.js, helping to structure and optimize server-side code.

Articles and Tutorials

1. MDN Web Docs (<https://developer.mozilla.org/>) - Offers extensive documentation on HTML, CSS, JavaScript, and other web technologies.
2. W3Schools (<https://www.w3schools.com/>) - A valuable resource for tutorials and references on web development languages and tools.
3. "Introduction to Web Scraping with Node.js" on freecodecamp (<https://www.freecodecamp.org/news/an-introduction-to-web-scraping-with-node-js-5cfa26c52875/>) - An article that provides a beginner-friendly introduction to web scraping using Node.js.
4. "Build a Real-time Chat App with Node.js, Express, and Socket.io" on Medium (<https://medium.com/>) - Although focused on chat applications, the concepts of real-time data handling can be useful for implementing real-time notifications.

Research Papers

1. "Web Scraping for Data Mining Applications: A Review" - This paper provides an overview of web scraping techniques and their applications, offering insights into best practices and challenges.
2. "A Survey of Web Data Extraction Techniques" - This research paper explores various web data extraction methodologies, which can inform the development of the product scraping module.

Websites and Documentation

1. React.js Official Documentation (<https://reactjs.org/docs/getting-started.html>) - Essential for understanding how to build and manage the frontend of the application.
2. Node.js Official Documentation (<https://nodejs.org/en/docs/>) - A comprehensive guide for backend development with Node.js.
3. Express.js Official Documentation (<https://expressjs.com/en/starter/installing.html>) - Provides detailed information on using Express.js for server-side routing and middleware.
4. MongoDB Official Documentation (<https://docs.mongodb.com/>) - Important for implementing the database layer, offering guides on data modeling, CRUD operations, and more.
5. Chart.js Documentation (<https://www.chartjs.org/docs/latest/>) - For integrating data visualization features to display past sales data.
6. Nodemailer Documentation (<https://nodemailer.com/about/>) - Essential for setting up the email notification system.

Magazines and Online Publications

1. Smashing Magazine (<https://www.smashingmagazine.com/>) - Offers high-quality articles on web design and development, including JavaScript, React, and Node.js.
2. SitePoint (<https://www.sitepoint.com/>) - Publishes tutorials and articles on a wide range of web development topics, including frontend and backend development.

Community Resources and Forums

1. Stack Overflow (<https://stackoverflow.com/>) - An invaluable resource for troubleshooting and finding solutions to specific coding problems.
2. Reddit (<https://www.reddit.com/r/webdev/>) - A community where developers share insights, tutorials, and discuss various aspects of web development.

The above resources did help by providing valuable insights of how an application of this kind could be achieved and be both reliable and scalable in terms of practical world experience. The above specified resources provided a kept understanding of how effective would it be when an application of this kind can be built