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Price Probe: E-Commerce Platforms Using Machine Learning

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Abstract
This research is an innovative chatbot revolutionizing the e-commerce landscape. By harnessing advanced algorithms and real-time data analysis, it simplifies online shopping by providing users with comprehensive comparisons and exclusive discounts from various platforms. Its adaptive nature enables personalized recommendations, learning from user interactions to enhance relevance and responsiveness. This project empowers users to make informed decisions, maximizing convenience and savings in the dynamic world of online retail.

Keywords: E-Commerce Website, Machine Learning, Beautiful Soup, Personalised Recommendation, NLP

1. INTRODUCTION

In the fast-paced and competitive realm of e-commerce, the quest for the best deals often feels like navigating a labyrinth of options. Amidst this complexity emerges the PriceProbe Chatbot, a revolutionary solution poised to simplify the shopping experience. This innovative tool harnesses the power of advanced algorithms and real-time data analysis to offer users a streamlined approach to online shopping. By seamlessly integrating with various platforms, PriceProbe Chatbot swiftly analyzes vast amounts of data to deliver timely and accurate comparisons, as well as access to exclusive discounts.

At the heart of PriceProbe Chatbot lies its adaptive nature, which sets it apart as a dynamic ally for shoppers. Through continuous learning from user interactions, the chatbot evolves its recommendations, ensuring they are not only relevant but also responsive to individual preferences. Many strategies have been developed by analyzing customer's behavior so as to attract more business and participation of people. As there are many e-commerce websites available it becomes difficult for users to choose best deal for desired product amongst these websites[1].Whether seeking the latest electronics or everyday essentials, PriceProbe Chatbot empowers users with tailored insights, guiding them towards informed decisions.

In a landscape where convenience and savings are paramount, PriceProbe Chatbot emerges as a beacon of efficiency and value. By consolidating information from disparate sources and distilling it into actionable insights, the chatbot eliminates the need for exhaustive manual searches. This not only saves users valuable time but also enables them to capitalize on cost-effective opportunities that might

otherwise go unnoticed. In essence, PriceProbe Chatbot becomes a trusted companion in the quest for value, facilitating a seamless shopping experience characterized by convenience and savings.

Fig. 1. Various E-Commerance websites

The paper's structure encompasses several key sections: Section II delves into the contributions made, while Section III provides an extensive literature survey. Following this, Section IV outlines the methodology employed, including data preprocessing techniques. In section V , we present the detailed implementation process, To conclude Section VI presents the obtained results and key takeaways from our analysis and potential areas for further exploration and improvement.

2. CONTRIBUTION

In this paper contribution includes as follows:

1. **Simplified Shopping Experience:** In a crowded and often confusing e-commerce market, PriceProbe Chatbot streamlines the shopping process. By aggregating and analyzing data from multiple platforms, it provides users with real-time comparisons and exclusive discounts. This simplification of the shopping experience saves users time and effort, making it easier for them to find the best deals without having to search through multiple websites.
2. **Personalized Recommendations:** The adaptive feature of PriceProbe Chatbot, which uses user interactions to generate personalised recommendations, is one of its main features. The chatbot may personalise its recommendations to each user by learning about their tastes and behaviour, which helps to make sure the offers and goods it displays are interesting and relevant. In addition to improving the overall purchasing experience, personalisation raises the possibility that users will be satisfied.
3. **Informed Decision-Making:** PriceProbe Chatbot gives people the information they need to make the best judgements, enabling them to make decisions with knowledge. Users may easily evaluate their alternatives and find the best products or bargains for their needs thanks to its real-time comparisons and exclusive discounts. This feature lowers the possibility of buyer regret and increases users' trust in their purchase selections.
4. **Convenience and Savings:** Ultimately, PriceProbe Chatbot contributes to both convenience and savings for users. By simplifying the shopping process, providing personalized recommendations,

and facilitating informed decision-making, the chatbot helps users save time and money. This combination of convenience and savings enhances the overall value proposition of the chatbot and encourages continued use by users seeking to optimize their online shopping experiences.

3. LITERARURE SURVEY

The Online transactions play an increasingly important role in our daily lives. Recently, onlineshopping has dramatically expanded not only in small and medium enterprises, but also among individual internet users who use social media as online trading platforms. While there are several online-shopping platforms in Saudi Arabia, they are still facing critical obstacles that challenge customers, businessmen, and organizations. This paper presents a smart control unit that could help address current challengesfacing e-commerce and suggest recent government legislation dedicated to governing and simplifying online transactions to make them more reliable, faster, secure, and competitive. [2].

The research paper details the creation of a product comparison website utilizing web scraping techniques to gather and analyze data from multiple product websites. By employing a customized algorithm, the website offers users comprehensive comparisons based on factors like price, features, and user ratings, aiding informed purchasing decisions. Furthermore, the developed platform serves as a prototype for similar websites across various categories.[3].

The paper investigates e-commerce dynamics through bipartite graph modeling, focusing on customer-e-shop relationships and the role of price comparison sites like Heureka. It addresses market entry strategies, discontinuation timing for online pricing comparison services, and related issues using network analysis and simulation methods. Keywords include network-based inference, simulation, price comparison site, and e-commerce. [4]

This paper focuses on a Price Comparison website utilizing web scraping techniques, catering to consumers seeking cost-effective purchases amid busy lifestyles. By aggregating price data from various providers, the platform aims to streamline the shopping process, allowing users to make informed decisions and save time and money. Keywords include Web Scraper, E-commerce, and Price Comparison. [5].

This abstract highlights top-rated price comparison apps, including Honey for discounts and PriceGrabber for comprehensive comparisons. CamelCamelCamel and Google Shopping cater to Amazon shoppers and offer broader searches across various retailers. Price Runner covers multiple categories with user reviews, enhancing convenience and cost savings for consumers seeking the best rates. [6].

The paper explores "Scraping and Visualization of Product Data from E-commerce Websites," focusing on web scraping's cost-effectiveness, ease of implementation, and speed in extracting unstructured data for analysis. It comprises three phases: web scraping to store data in CSV format, data analysis using statistical methods, and visualization of extracted data through various charts, enhancing understanding and insights. Keywords include web scraping, data analysis, visualization, and data mining. [7].

This Mobile apps have evolved to be more useful for regular use in recent years. The goal of this project is to give users an easy way to compare product availability and costs on various e-commerce websites. Users can easily compare prices from numerous sources by simplyentering the product information into the programme. To compare the product information found on several websites side by side, the application's databases are then searched. In order to ensure that they never miss out on a great offer, customers can also receive push notifications when things become available or go on sale. [8].

The abstract emphasizes the importance of price comparison websites in facilitating informed purchases across numerous e-commerce platforms. Employing web crawling and scraping techniques, users can efficiently compare prices and product features, enabling informed decision-making. The proposed system prioritizes user expectations and security, offering a simple and effective solution for accessing competitive prices and discount offers from various e-commerce websites.[9].

The literature surveyed in this study provides insights into the development and application of price comparison websites utilizing web scraping techniques in the e-commerce domain. These papers highlight the significance of such platforms in aiding consumers in making informed purchasing decisions across a multitude of online shopping platforms. By employing custom algorithms and web scraping methodologies, these websites aggregate price data and product information from various sources, enabling users to efficiently compare prices, features, and user ratings. Moreover, the research emphasizes the importance of addressing challenges faced by e-commerce platforms, such as reliability, security, and competitiveness, through innovative solutions like smart control units and government legislation. The findings underscore the potential of these technologies in enhancing the online shopping experience, saving time and money for consumers while promoting transparency and efficiency in the e-commerce ecosystem.

4. METHODOLOGY

The following Fig2, represents the steps which Data preparation, User Interaction, Streamlit, Price Retrieval, Personalized Recommendation, NLP Integration, Price Comparison and URL Display.

Fig 2. Flow chart

A. Data preparation

Initializing the necessary libraries, including requests and BeautifulSoup, is the first step in the project. The headers variable, which includes a user agent, is also defined. When submitting queries to the websites, this user agent helps to simulate a web browser.

B. User Interaction

Users are prompted via the chatbot interface to enter the name of the desired product, which starts the search process for customized recommendations and support.

C. Streamlit

This Python library is intended for web application development specifically for data science and mach-

ine learning tasks. It makes it easier to create interactive and adaptable user interfaces, making tasks like data analysis, prediction, and visualization easier to accomplish without requiring a lot of coding.Streamlit is an intuitive API for quick development that integrates seamlessly with popular data science tools like Pandas and TensorFlow.

D. Price Retrieval

Implementing three functions, flipkart(), amazon(), and croma(), to search for the product on each website and retrieve the price. Each function uses the requests library to send a GET request to the website's search API and then parses the HTML response using BeautifulSoup.

E. Personalized Recommendation

To improve the user experience, the system applies personalized recommendation algorithms after retrieving the price. This feature optimizes shopping results by customizing product recommendations based on user preferences and previous interactions.

F. NLP Integration

Natural Language Processing (NLP) techniques are used to enhance user interactions in addition to individualized recommendations. NLP makes it easier to interpret user inputs, which helps the system comprehend user questions and provide more accurate and pertinent responses.

G. Price Comparison

The system starts comparing the data it has collected in order to determine the lowest pricing. Accuracy is ensured by first removing non-positive values and then figuring out the lowest price necessary for a precise cost estimate. By taking this step, users' purchasing experience is optimized and they are given access to the most competitive pricing options.

H. URL Display

Printing the minimum price and the corresponding URL for the product on the website offering the lowest price. Also printing the URLs for the product on all three websites for reference.

5. IMPLEMENTATION

The Fig.3 illustrates a process flow for an e-commerce site or a shopping-related chatbot that aims to provide users with accurate and up-to-date product price information.

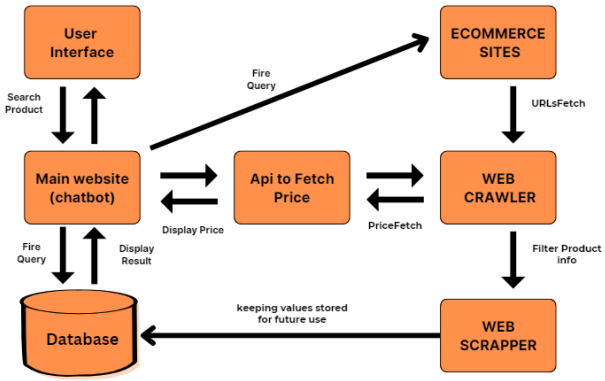


Fig 3. Design

This process can be broken down into several steps:

1. **Initiating a search or fire query:** The procedure starts when a customer looks for a product using a conversational chatbot or by engaging with a user interface on a primary website.

2. **Displaying the search result:** The system presents the user with the search result after retrieving a list of pertinent products based on their query.
3. **Connecting to a database:** The search result is connected to a database that contains comprehensive product information, including product descriptions, specifications, and corresponding prices.
4. **Fetching the price:** The system makes use of an API (Application Programming Interface) to speak with outside services that offer current pricing data in order to obtain the price of a product.
5. **Displaying the price:** The user can view the retrieved price as part of the product details after it has been shown.
6. **Storing values for future use:** By cutting down on the time required to retrieve and display information, the system may momentarily store data in a cache for quick access. This enhances the user experience overall.
7. **Collecting product information:** The system gathers URLs and extracts pertinent product data from several e-commerce sites using a web crawler and web scraper. Ensuring that the system has current and accurate product information is a crucial part of the data collecting and pre-processing phase.
8. **Filtering product information:** The system first retrieves the raw data, then filters and processes it to get rid of unnecessary information, fix mistakes, and format it in a way that is easy to read.

6. RESULT

The project was undertaken with the objective of creating a comprehensive comparison website that could gather data from multiple sources and effectively compare prices across various platforms. The primary focus was to provide users with a streamlined interface where they could easily view and compare prices, ultimately enabling them to make informed purchasing decisions based on the lowest available price.

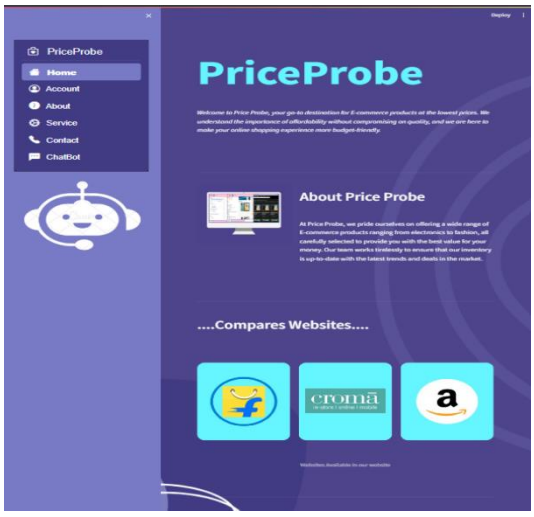


Fig 4.Home page

Fig 5. About page

The Price Probe project offers a comprehensive solution for online shoppers, seamlessly integrating various features to enhance the shopping experience. The login page(Fig 6) serves as the secure entry point for registered users, ensuring privacy and control over user-specific data and functionalities. Once logged in, users are greeted by the central hub of the platform—the home page(Fig.4), which provides a user-friendly interface for easy navigation and access to essential features such as product searches, price comparisons, and personalized recommendations.

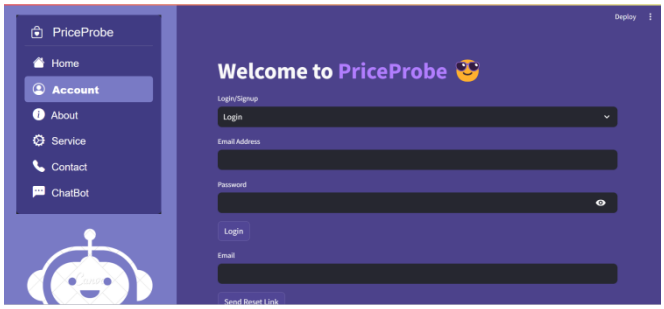


Fig 6. Login Page

Additionally, the about page(Fig.5) offers users detailed insights into the Price Probe project, including its objectives, mission statement, and the dedicated team behind its development. This transparency fosters trust and confidence among users, enhancing their overall experience on the platform. The chatbot(Fig 7) feature further elevates user engagement by serving as a virtual assistant, offering personalized recommendations, answering queries, and providing assistance throughout the shopping journey.

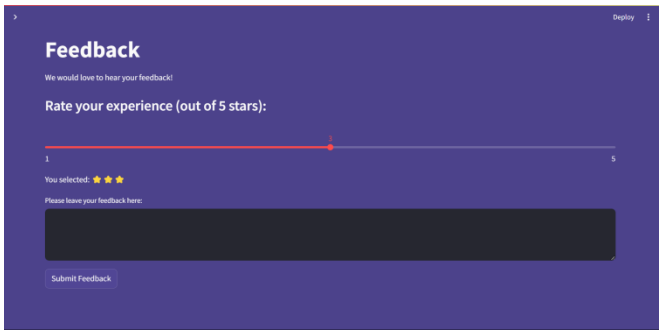
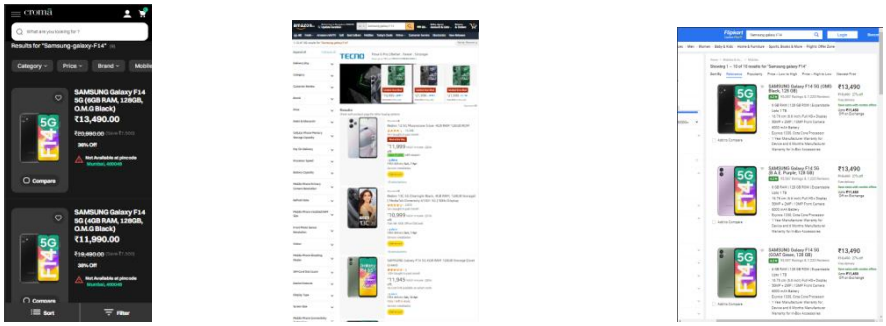


Fig 7. Feedback

Fig 8. Lowest price products with URL

Furthermore, the comparison tool empowers users to make informed decisions by enabling them to compare prices, specifications, and other relevant details of products across multiple e-commerce platforms such as Flipkart, Amazon and Croma (Fig 9). Presented in a clear and structured manner, this feature facilitates easy comparison and aids users in selecting the best option for their needs. Finally, the lowest price (Fig.8) feature ensures that users can swiftly identify the most cost-effective deals available, saving time and maximizing savings during their online shopping endeavors. Together, these features culminate in a platform that prioritizes user convenience, transparency, and savings, ultimately enhancing the overall online shopping experience.



(a) (b) (c)

Fig 9. Multichannel Shopping with Price Comparison

7. CONCLUSION

The innovative chatbot simplifies online shopping through comprehensive comparisons and exclusive discounts from various platforms, revolutionizing the e-commerce landscape. By leveraging advanced algorithms and real-time data analysis, it offers personalized recommendations, learning from user interactions to enhance relevance and responsiveness. Integrated with Streamlit and Natural Language Processing, the chatbot provides a user-friendly interface and interprets user inputs accurately. With functionalities like price retrieval, personalized recommendations, and comparison, users make informed decisions, maximizing convenience and savings. Future work includes implementing image recognition for users to search products by sharing images, enhancing the chatbot's capabilities and appeal.

TABLE I. SYSTEM CONFIGURATION DETAILS

Hardware Requirements	● A computer with a multi-core CPU ● High-end graphics card (GPU) ● Sufficient RAM would be required to train deep learning models on large datasets

Software Requirements	● Windows 32/64- bit operating System
Platform	● Windows 32/64-bit operating System
Programming Language/Tools	• Python • Jupyter notebook • Beautifulsoup • NLTK • Pickel • Streamlit

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