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Product-Pricelytics: Compare, Save, Conquer!!

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ABSTRACT

The price comparison application is designed to compare the prices of products from different e-commerce websites (e.g., Flipkart.com, Amazon.in, etc.), which helps consumers in making decisions to purchase products that will help save money. It acts as a medium between the consumers and the sellers. This application has become more important in recent times where there's a huge sea of e-commerce that is available in today's world. Nowadays many consumers have hectic lifestyles, especially those who live in cities, most customers prefer to acquire their necessities online because it saves them time. Many different e-commerce websites display different values and offers, sometimes the difference will be too different. Having a price comparison application could be very helpful for people; it can help customers pick out the best deals possible from multiple different websites, saving their time, efforts, and money. The application is built using Python and Python libraries like "requests" and "beautiful soup".

KEYWORDS:E-commerce, Price Comparison, Price Comparison Application, Web Scrapper

INTRODUCTION

The online shopping application, through the current digital world, has experienced huge growth, which has turned e-commerce into a vast path for people to shop over the internet [1]. In fact, e-commerce has emerged as a dominant player in global retail markets. Co-mart is being discussed in detail and takes help from different types of technologies that can reduce human efforts and time in searching for the best price availability of the product across various e-commerce websites. Co-mart is a very great platform where one can easily compare the prices of various products, which will help them save their time and money [2].

The website provides users with useful data that will help them make educated decisions. This price comparison site deals with the issue of people who work checking prices before making purchases. This website will allow users to com pare prices on numerous e-commerce shopping websites in order to locate the best deal on a product. This will undoubtedly save buyers time and effort [4].

As e-commerce continues to flourish, the number of platforms offering similar or identical products has expanded dramatically. Websites such as Amazon, eBay, chroma, olx, Flipkart, and many others cater to

millions of customers around the world, each offering a unique pricing strategy based on factors like demand, supply chain efficiency, and market competition. While consumers have more choices than ever, this abundance can lead to confusion and inefficiency [5].

A Price Comparison Application acts as a platform or medium between the shoppers and also the sellers[6]. Comparison of Product Prices from different ecommerce websites and result is displayed on single web interface. This Websites aims at providing the best possible deal to the users for the required product by comparing the Product price and displaying the minimum price from various E-commerce Websites such as Amazon, Flipkart and Croma, which are leading and some of the best websites to shop.

This project takes advantage of computer vision, machine learning, and real-time databases to develop an application that allows users to effectively compare the prices of products on different e-commerce websites [8]. This application aims to help eliminate the stress and inconvenience of different prices by updating prices through web scraping. In this way, users can make better purchasing decisions and respond to changing market trends, which is important for responsible shopping. The goal of developing a price comparison website is to make purchasing easier for customers. Users may rapidly evaluate choices and select the most reasonable one by combining costs from numerous retailers. This not only saves time and effort, but also allows users to save money on their purchases.

Furthermore, price comparison tools can integrate advanced technologies such as machine learning algorithms and artificial intelligence (AI) to enhance their functionality. These technologies can analyse historical pricing data, predict future price trends, and offer personalized recommendations based on user behaviour and preferences. For instance, some price comparison applications utilize AI-powered chatbots to assist users in finding the best deals by understanding their specific needs and preferences. This level of customization makes the shopping experience more intuitive and efficient[10].

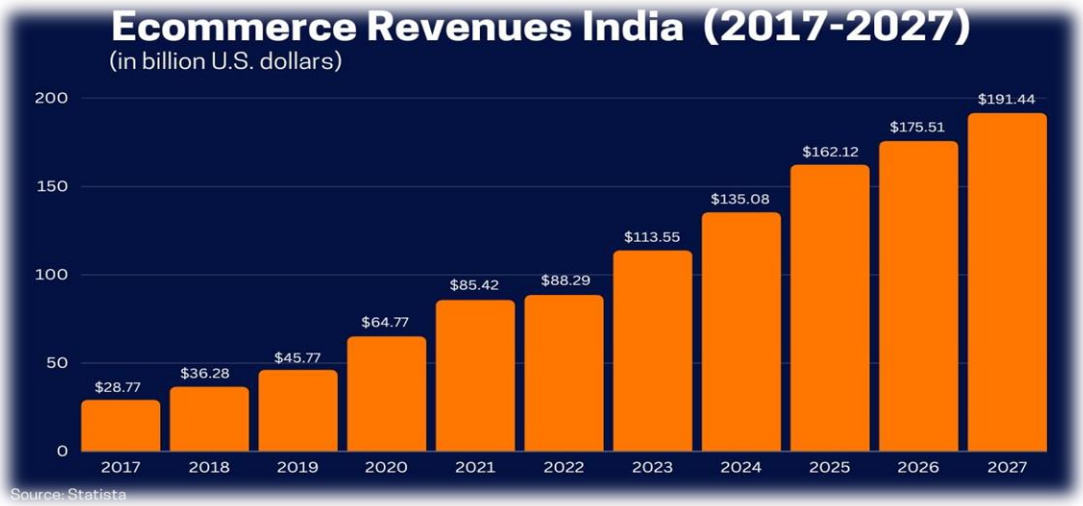

Fig. 1. Growth of E-Commerce(2017-2027)

Above Figure(Fig. 1.) illustrates the projected growth in e-commerce revenues in India from 2017 to 2027. Based on the data from Statistic graph, there has been a steady upward trend, reflecting the rapid expansion of the e-commerce sector in the country. The product grew from $28.77 billion in 2017 to $88.29 billion in 2022. The growth will be at a steady pace with revenue going up to $113.55 billion in the year 2023. It will then increase even higher to $135.08 billion in the year 2024 and then surge up to $191.44 billion in the year 2027. These increases will come from this steady acceleration of digital adoption in India, fueled through internet penetration, smartphone penetration, and growing consumer behavior for online shopping.

LITERATURE SURVEY

Varun proposed resolution aims to streamline this process for online users, enabling them to discover the best deals for their desired products through a unified web interface that consolidates multiple e-commerce platforms. This not only saves customers This not only saves them time, but also enables them to save money through easy comparison of product costs across numerous e-commerce websites [1]. price comparison site deals with the issue of people who work checking prices before making purchases. This website will allow users to compare prices on numerous e-commerce shopping websites in order to locate the best deal on a product.

Harishchandra Maurya proposed price comparison website, The growth of e-commerce has contributed to an increase in use of price comparison websites, which provide customers with information and metrics to compare prices across various online retail outlets. Price comparison websites have grown in significance in the current industry, boosting provider efficiency and competition while assisting consumers [2].

Creating a price comparison website that helps users find the least expensive products across e-commerce platforms such as Flipkart, Amazon, and Croma. Users can upload product images, which the system processes to identify the item and fetch price comparisons from various sites via APIs. This project is created in Python, so that unnecessary advertisements are not interrupted with, thereby ensuring a quick experience for users. This approach combines the use of image recognition in identifying products and retrieving data from e-commerce APIs[3]. A proper literature review will therefore remind one of previous research, which highlighted this need for the algorithms to be tailored in order to correctly collate and present this price data. The website is a comparison platform that is uniquely focused on helping users make better purchasing decisions by providing more accurate and actionable price comparisons specific to India's e-commerce context. Further research and development focused on means of retrieving data and how the system can improve, making it a more reliable user-friendly scheme.

Arman Shaik *et al* have demonstrated a Price comparison Application to compare the price of goods and services from a range of providers, which will help consumers in making decision to choose products that will save their money through online [4]. due to huge increase in online users, it will be great help to those who have busy office work and don’t have much time to check the current prices of products which they want to purchase. According to social, digital and mobile in India research by we are Social, internet

penetration in India is 59% and the average number of hours Indian internet users spend using the internet each week is 19.8 hours.

Rajendra proposed Price Comparison Websites for online Shopping, Price comparison sites are designed to compare the price of goods and services from a range of providers, which will help consumers in making decision to choose products that will save their money through online. In the current era of online business, ecommerce has become a huge market for the people to buy products online. price comparison Application solves the problems of working people to check on the price before buying products [5].

The aim of this Application is to check the product costs of various sellers like Flipkart.com, Amazon.in, Croma.com etc. And come back the worth of product in every web site that helps the client to make a decision and get the minimum priced product. A price comparison web site acts as a platform or medium between the shoppers and also the sellers [6].

The present e-commerce scenario has the same price across all platforms does not favour to a consumer's decision-making process when it comes to obtaining the lowest price. There are multiple comparison websites available but they suffer from irrelevant searches, old prices, and a lack of accuracy in their results. The current paper works over such challenges and outlines a friendly user system designed with two components: data collection using JSoup and offering analysis concerning TF-IDF, SVD, and Cosine Similarity. The system gathers data from reputable retailers, analyses it, and presents accurate product information to users. Measured against real data from different marketplaces, the system had a success rate of 84%, which is par with other industrial solutions operating in the market such as Akakçe and Cimri. Even though the system is promising in terms of the actual, real-time delivery of product information, further research will aim to enhance its performance by increasing the products and alternative algorithms such as Random Forest to make it more competitive and useful for the user[7].

This project capitalizes on computer vision, machine learning, and real time databases to create an application which enables users to effectively compare the sizes and prices of products in several supermarkets. This application seeks to help eliminate the stress and hassle of different prices and false ads by updating prices through web scraping and identifying and measuring product sizes with image recognition. As a result, it allows users to make better purchasing decisions, cut down on food wastage, and respond to changing market trends, all of which are important for more responsible shopping [8].

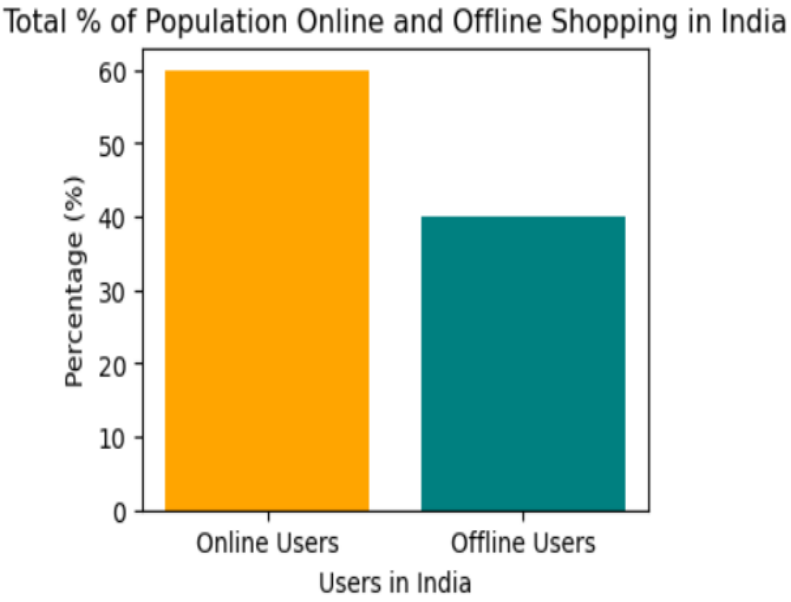

Fig. 2. Total % of Population online and offline Shopping

Above Figure (Fig. 2.) illustrates Total % of Population online and offline Shopping, 60% of the population prefers online shopping, while 40% still stick to traditional offline shopping. This indicates a significant shift towards online shopping, likely due to its convenience and wide range of products.

Table 1: Literature Survey of similar works.

Reference	Year	Title	Summary	Advantages	Algorithm
[8], Yvonne et al.,	2024	DealWithIt – Real time price checker with Object recognition	The App updates the prices through web scrapping and using image recognition for accurate size and measurements, the app promotes informed purchasing reduces the time.	It helps consumers save time by enabling quick price and size comparisons across supermarkets. It also promotes sustainability by reducing food waste and supporting responsible consumption.	Deep learning model of product recognition, Volume estimation, size grading and price retrieval from real-time database.
[9], Mobina et al.,	2022	Food products pricing theory with application of machine learning and game	The paper presents an optimized pricing model for fresh foods.	machine learning and game theory to optimize pricing for perishable food products, improving profitability and sustainability.	Genetic algorithm, Artificial Intelligence algorithms and CNN-LSTM algorithm.

		theory approach			
[10], John Michael et al.,	2024	Optimizing Grocery shopping through AI-Driven Price comparison	This project develops an AI-Driven grocery price.	AI-driven price comparison tool to reduce grocery shopping costs and time.	Embeddings, hybrid search cobining vector and text search, approximate nearest Neighbours.
[11], Siti Nurhaliza et al.,	2022	The Application of a Cost Plus Pricing Method in Determining the Selling Price of Dried Lomek Products	This study Evaluates the pricing method of dried Lomek products at Bumdes Kuala Alam, results in more competitive prices.	Quantitative approach, analyzing production costs.	Cost plus pricing calaulations and Full-Costing principles
[12], Ajay Kumar Gupta et al.,	2024	St-Hot: A Prospect of Pirce Equilibrium in a Multi-Player Game for Electric Vehicle Charging Application	This study proposes the St-Hot game model to establish price equilibrium among non-cooperative electric vehicle charging stations	Employs a modified St-Hot game framework, where EVCS strategically establish equilibrium pricing.	Nash equilibrium-based pricing strategy
[13], Ludwig von Auer et al.,	2024	Retrospective Computations of Price Index Numbers: Theory and Application	This paper presents methods to reduce substitution bias in Consumer Price index, aiming for long term price level tracking	Correction and imputation methods for revising CPI retrospectively.	Laspeyres, Tornqvist, Fisher, and Walsh index calculations, and correction factors of weight
[14], Reid L et al.,	2024	Application of Computational fluid dynamics to Investigate Pathophysiological mechanism in exercise-	This study explores airflow and pressure distribution in the larynx of (EILO) patients, identifying force	The study combines CFD simulations with MRI-based 3D modeling and Laryngoscopy data.	K-W turbulence model and Reynolds-averaged Navier-Stokes (RANS) equations

		induced laryngeal obstruction	disparities that contribute to healthy controls.		

Click & Find.com and PriceWar .Com are online sites that help the consumers find products and services with less time and resources. In India, it gives information about pricing and helps find a good deal in home products. As people go online for shopping more, these websites will help the customers make the right choice. E-catalogues will save retailers from costs and help in green initiatives while price awareness is improved. Online price comparison websites are making it easier for consumers to save. They are helping consumers find the most tolerable terms of offers. As online shopping catches up, these websites are going to be more beneficial in India [15].

Online price comparison application, using data on the prices offered by multiple retailers, both online and offline, helps the consumers make a better purchase decision. Numerous studies have been conducted on various methodologies and technologies used in such applications. These range from web scraping and API integration to machine learning in price prediction and recommendation. -According to existing research, web scraping is by far the most common approach to acquiring data from eCommerce sites in prices-extraction format; however, this suffers from many problems, including changes in dynamic website structures and anti-scraping mechanisms. API integration is preferable since, typically, the communication channels ensure that more reliable and organized data is obtained.

Beyond this, machine learning seeks to generate price trends predictions and improve recommendations, making choices based on user preferences. Besides this, blockchain technologies are studied for secured and transparent record-keeping with regard to price data. Besides, the literature contains practical analysis of consumer behavior, focusing on how price comparator applications modify consumer purchasing behavior in the market context. In a nutshell, research in this area seeks to improve data integrity, system efficiency, and user experience while, on the contrary, addressing challenges such as data privacy, site restrictions, and prices that change in real time.

This project capitalizes on computer vision, machine learning, and real time databases to create an application which enables users to effectively compare the sizes and prices of products in several supermarkets. This application seeks to help eliminate the stress and hassle of different prices and false ads by updating prices through web scraping and identifying and measuring product sizes with image.

METHODOLOGY

This section covers the components that have been used in building the application, these separate components work together seamlessly to provide a smooth and desired result.

The framework is designed using HTML, CSS, JavaScript as a front-end and Python as a back-end. Python library like requests and Beautiful Soup are used for web Scraping.

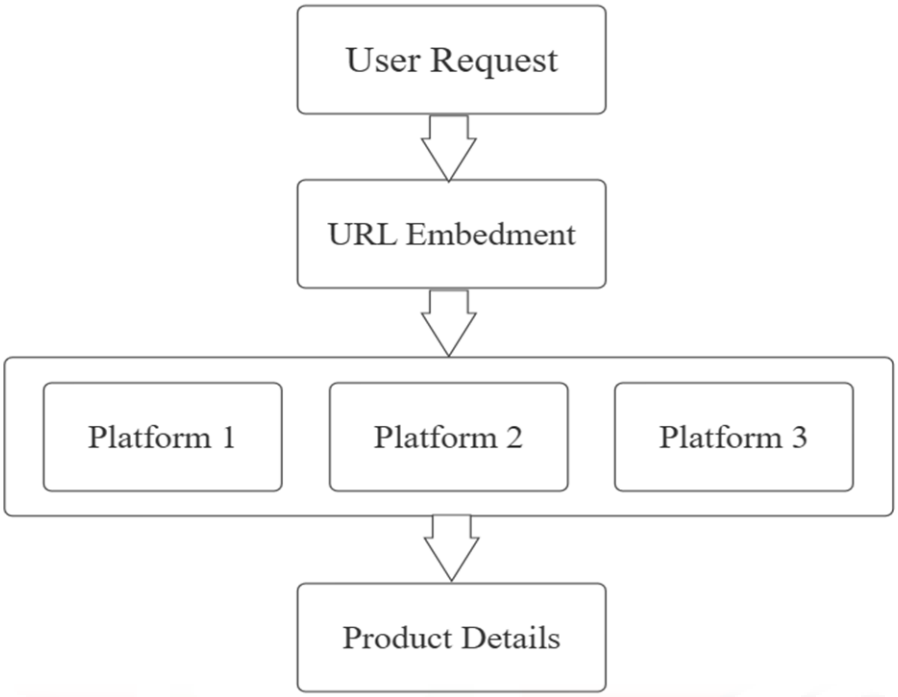

Fig. 3. Block Design of Price Comparison Application

Above Block Design of Price Comparison Application (Fig. 3) illustrate how product details are retrieved from multiple platforms based on a user request. It begins with a user request, followed by a URL in step 2, which directs the system to relevant data sources. The system then queries multiple platforms (Platform 1, Platform 2, and Platform 3) to gather diverse product information, this collected information is then consolidated into Product Details, providing a detailed response to the user. The multi-platform approach ensures that users receive complete and up-to-date information, making it particularly useful for e-commerce and product comparison applications.

Price Comparison Application involves transforming raw pricing data into a structured and standardized format to ensure accuracy and consistency. One of the key challenges in price comparison is handling large and unstructured datasets collected from various e-commerce platforms.

POSSIBLE ROLES OF PRODUCT - PRICELYTICS APPLICTION IN REAL LIFE SCENARIOS:

Price comparison applications are crucial in the current shopping environment because they improve the user experience. They aggregate information on the prices of similar products at different retailers, enabling users to make informed purchasing decisions, and they can be sure that they can easily spot minimum price. This Application saves them a lot of time and money by comparing a price from different E-commerce Platforms.

A Price comparison application can be incredibly useful for users looking to optimize their budgets and make informed shopping decisions. By comparing prices across multiple online and offline shopping stores, such an app saves users time and money, allowing them to find the best deals on products user want. A price comparison Application can support sustainability and ethical shopping choices. For example, small business can use the application to monitor competitor prices and understand where they stand in the market, helping them adjust their prices to remain competitive.

Pricelytics makes online shopping easier by instantly comparing prices across multiple websites, helping users find the best deals in real time. It also simplifies decision-making by allowing shoppers to compare products based on price, quality, and reviews, ensuring they make informed choices. Additionally, Pricelytics offers personalized recommendations based on shopping history and preferences, suggesting relevant and affordable products. By saving time and effort, it creates a smarter and more convenient shopping experience.

Pricelytics empowers businesses with dynamic pricing, allowing e-commerce platforms to adjust prices in real time based on competitor pricing, demand fluctuations, and even time of day. This ensures competitive pricing strategies that maximize sales and profitability. Additionally, the platform enhances customer retention by partnering with retailers to offer cashback, loyalty rewards, and exclusive discounts. These incentives encourage repeat purchases and foster long-term customer relationships, benefiting both consumers and businesses.

The Use of Price Comparison Sites in the India's General Insurance Market' a strategist for Consumer Intelligence has reported the current performance, media coverage, usage and marketing activity of price comparison sites in the India's General Insurance sector. The results shows that there is increased on the advertising spend and competition and it gives adverse effect on the financial performance towards the price comparison sites. Meanwhile the number of consumers using price comparison sites for quotes has remains high and its average number of sites used are increasing over time[4].

Early days users should visit every E-commerce Platforms to check the minimum price of a required product. Instead of visiting multiple websites or Platforms, user can quickly compare prices and availability in one place, saving time and effort.

APPLICATIONS IN DIFFERENT SECTORS

1. **Electronics**

   In the electronics sector, where products frequently undergo upgrades, price comparison applications help consumers find the best deals on smartphones, laptops, and other gadgets. User can compare technical specifications side by side, helping them choose based on features and functionalities.

2. **Clothes**

   The fashion industry benefits from price comparison tools, enabling consumers to navigate seasonal sales effectively. These applications gather price information from various online clothing retailers, allowing users to see who is offering the lowest price for desired items. By comparing prices across multiple retailers, consumers can secure the best deals on clothing, reducing overall spending.

3. **Groceries**

   grocery shopping is enhanced through price comparison applications, helping users identify the best prices for everyday items. Price comparison features, shoppers and easily compare prices of various items across different supermarkets and online grocery delivery services, ultimately helping them save money on their monthly bills by identifying the best deals available.

4. **Home Appliance**

   Home Appliances like refrigerators and washing machines, price comparison applications assist consumers in evaluating features and prices comprehensively.

5. **Automotive**

   Price comparison applications play a crucial role in the automotive market empowering potential car buyers and owners to make informed decisions. For those in the market for a vehicle, these platforms allow users to compare prices for both new and used cars across various dealers.

6. **Event Ticketing**

   Price comparison application is highly useful for both entertainers and travellers, as they use them to get the most value for their money while booking experiences. Concert, theatre performance, or sports event fans can look forward to comparing tickets prices by various sellers, thus allowing a customer to get the lowest-priced tickets for any specific events or movies.

Price comparison applications empower consumers through various sectors by equipping them with the tools that are needed to make good and economically sound decisions in the market. From electronics, clothing, groceries, to home appliances and automotive products, these applications enhance shoppers experiences by encouraging more price transparency and better consumer satisfaction. Yet, with the improvement in technology, they will probably be even more advanced, possessing personalized recommendation features, augmented reality-based comparisons.

CHALLENGES

1. **Data Collection and Integration:** Price comparison applications face challenges with data sources and integration. Since the data will be pulled from many shops with unique formats and APIs, integration is difficult. Due to frequent changes in availability, pricing, and promotions, it may not be able to guarantee the accuracy and freshness of data. In these situations, robust real-time tracking is necessary for error-free processing. Web scrapping is a technological as well as a legal concern because many websites have policies that prohibit scrapers owing to resource overload and security risks, and they frequently employ anti-scraping tools.

2. **Product Matching and Standardization:** Comparison Application of products face the problem that cannot compare quite accurately similar products in different sites. Because their names, descriptions, and specifications would be different. However, the best approach to determine identical products is through the SKU or specific attributes such as color, size, or model and required complex algorithms to normalize and align them properly across different catalogs. Categories need to be consistent across the retailers.

3. **Dynamic Pricing and Personalization:** Price comparison application struggle with frequent price changes on e-commerce platforms, especially during sales or high-demand periods, making real-time accuracy challenging. Additionally, retailers may offer personalized pricing based on factors like location, browsing history, or membership, creating inconsistencies that are difficult for comparison apps to capture accurately.

RESULTS

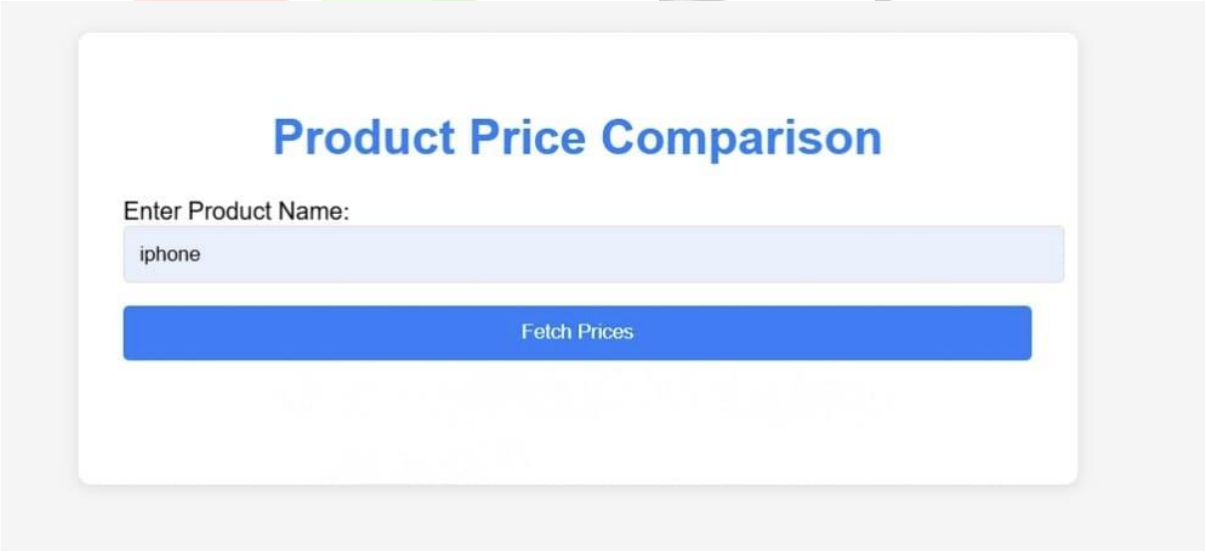

Fig. 4. User Interface of Product-Pricelytics:Compare, Save, Conquer!! Application

The Above Fig.4. represents a simple and Natural user interface for a Product Price Comparison application. This interface allows users to enter a product name, such as "iPhone," into a text input field. Upon entering the product name, users can click the "Fetch Prices" button to retrieve and compare prices for the specified product across various e-commerce platforms. The clean design ensures ease of use, providing a seamless experience for users to access real-time pricing information.

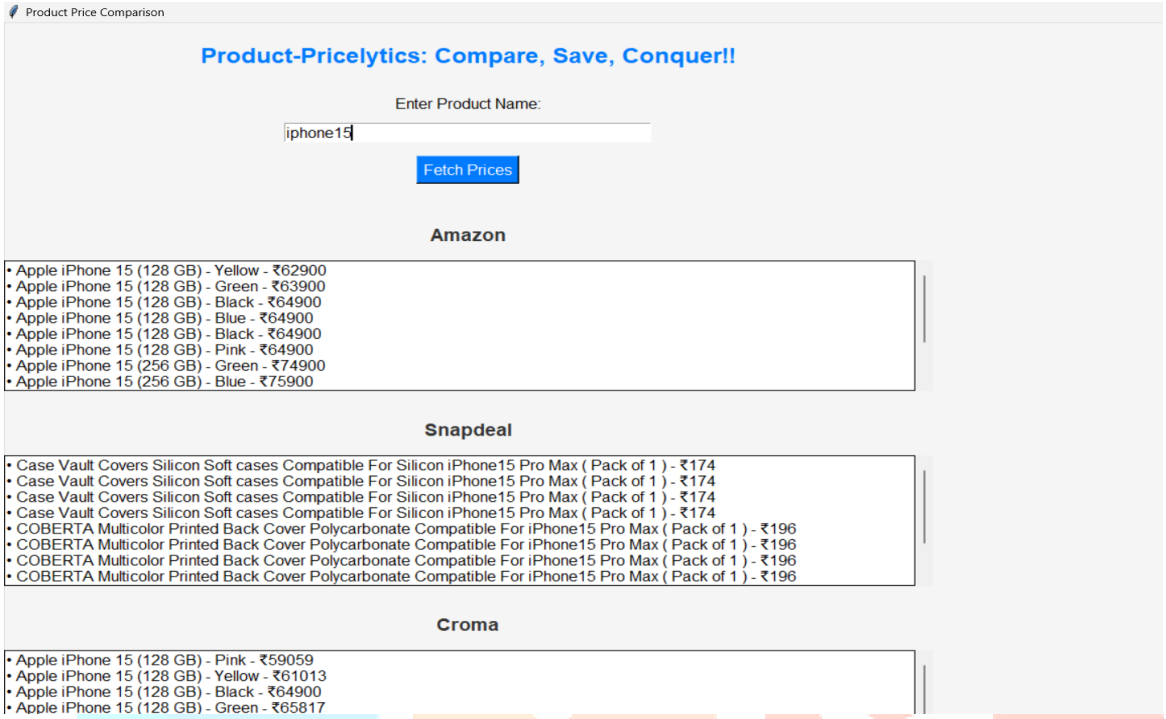

Fig. 5. Compared Results of iphone15 from different E-commerce Platforms

The Fig. 5. showcases a web-based price comparison tool, "Product-Pricelytics: Compare, Save, Conquer!!", designed to help users find the best deals across multiple e-commerce platforms. Users can enter a product name in the search bar and click the "Fetch Prices" button to retrieve listings from Amazon, Flipkart, Snapdeal, and Croma. While Amazon and Flipkart display iPhone 15 models, Snapdeal mainly lists phone accessories, and Croma provides additional product listings. This tool allows users to efficiently compare prices and availability, aiding in informed purchasing decisions.

Conclusion and future work

The price comparison project successfully supports users to make the right purchasing decisions by providing accurate, real-time comparative prices on multiple platforms. Its intuitive design and efficient processing of data enhance convenience, save time, and invite cost-effectiveness. The tool has thus proved to be very useful in making consumers find the best deals while raising their trust and satisfaction.

Future developments could be in the direction of including AI/ML for personalized recommendations and price trend analysis, increasing data sources to include more markets, and advanced filtering options to cater to user preferences. Developing a mobile app, integrating secure payment systems, and dynamic alerts

for price drops can further enhance usability. Other features such as multilingual support, customer reviews, and blockchain-based data integrity can make the platform robust and user-friendly.

- Integration with More Platforms: Expanding the application to include additional e-commerce platforms ensures a more comprehensive and competitive price comparison.
- Real-Time Notifications: Implementing alerts for price drops and discounts will enhance user engagement and provide timely purchasing opportunities.
- Price History and Trends: Offering visual representations of price trends over time helps users make informed decisions about when to buy products.
- Mobile Application Development: Creating mobile versions for Android and iOS will increase accessibility and user convenience, making the application more versatile.

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