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E-Commerce Website Product Compare



Abstract: - In today's digital age, purchasing products online has become incredibly convenient and time-efficient for customers. Recognizing this trend, we are developing a website dedicated to comparing e-commerce products, enabling users to identify the best options available while accessing a comprehensive list of relevant products. Our platform prioritizes the security and privacy of our customers' data, ensuring a safe browsing experience. The website employs cutting-edge web scraping techniques to gather data from numerous e-commerce websites, streamlining the process of finding the best deals available. By comparing products based on factors such as price, quality, and user reviews, our platform helps users make informed purchasing decisions. The decision-making process is powered by a decision tree algorithm that considers various variables like cost, quality, and user feedback, ultimately identifying the top product across multiple e-commerce platforms. Our website provides detailed product information, including pricing, ratings, and direct purchase links, making it easy for customers to complete their purchases with confidence. The platform is designed to inspire trust, thanks to its strong commitment to privacy and security. Additionally, our data analysis techniques offer users comprehensive product evaluations and ratings, ensuring an unbiased and informative decision-making process. This application is designed to help customers effortlessly analyze data and purchase high-quality products with minimal effort.

Keywords: Web scraping, Decision tree algorithm, Customer data privacy, security, AES algorithm.

I. INTRODUCTION

E-commerce websites are setting new benchmarks in digital marketing by offering products with numerous discounts and deals. Customers often face the challenge of identifying the best offers and products, which typically requires extensive research across various e-commerce platforms. This search for the ideal product can be time-consuming, as it involves visiting multiple websites. In today's digital age, customers increasingly rely on online shopping for convenience, avoiding the need to physically visit stores. However, the process of finding the best deals online can still be time-intensive, and often, customers may miss out on the best offers. Our primary goal is to simplify the online purchasing process, ensuring customers can easily find the best products available. In this paper, we present an application designed to locate the top products from various e-commerce websites. This solution optimizes customers' time by providing an efficient tool for finding the best products among millions, spanning categories such as electronics, clothing, appliances, home décor, and more.

Our platform guarantees access to the latest products, complete with up-to-date prices, ongoing promotions, discounts, and special offers. By utilizing advanced web scraping techniques, our database continually updates with the most current product details. Whether you're searching for a smartphone, home goods, or other items, our website streamlines the process, delivering fast results in minimal time. [2] This comprehensive approach ensures that you remain within your budget while confidently selecting products that meet your expectations. Recognizing that online shopping has become a significant trend, we have taken proactive steps to make the process of finding and purchasing the best products even easier.

Problem Statement

The motivation behind developing this website stems from the growing need for consumers to efficiently navigate the overwhelming number of e-commerce options and find the best products quickly and securely. The problem lies in the time-consuming and often confusing process of comparing products across various platforms, which can lead to missed opportunities for better deals or higher-quality items. Our platform addresses this issue by leveraging advanced web scraping techniques and a decision tree algorithm to compile and compare products based on cost, quality, and user reviews, thereby simplifying the decision-making process and ensuring that consumers can make informed, confident purchases with ease and security.

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II. LITERATURE REVIEW

[1] It provides a summary of the key ideas and contributions of the research. Online shopping has become essential for many daily needs, but the vast array of products and prices can make it challenging for buyers to find the most cost-effective options. The "Co-Mart" application is highlighted as a valuable solution to this problem by offering a user-friendly platform for price comparison. This tool simplifies the process of finding the best prices on everyday items, enhancing the shopping experience. One of the study's major contributions is the development of the "Co-Mart" application, which facilitates price comparisons for daily necessities. Users can input their requirements into the app, which then generates comparisons from various sources, enabling more informed purchasing decisions. This is particularly important for everyday necessities, where cost savings can significantly impact a household budget. The application is designed to be accessible and practical for a wide range of users, showcasing how technology can improve convenience and help customers maximize their shopping budgets.

[2] It presents a comprehensive summary of the main ideas and contributions related to e-commerce and product comparison. E-commerce has revolutionized shopping by providing convenient access to a wide range of products, yet customers face the challenge of navigating this extensive selection to make informed choices. The study emphasizes the need for innovative solutions to simplify the purchasing process and aid customers in making well-informed decisions. It introduces a machine learning-based product comparison engine designed to enhance online shopping. This system employs algorithms to analyze ratings, reviews, and product features to offer users personalized comparisons and recommendations. This approach streamlines the decision-making process, helping customers find products that best meet their needs and preferences. The study also addresses the challenges of data collection, integration, and interpretation necessary for a reliable product comparison engine. It explores the use of natural language processing (NLP) for analyzing product reviews, adding a qualitative dimension to the recommendation system. Additionally, the study highlights the broader impacts of such systems, including increased user engagement, higher e-commerce sales, and a competitive advantage for online retailers, emphasizing the importance of leveraging advanced technologies to enhance the e-commerce experience.

[3] It explores the challenge of making informed purchasing decisions in the rapidly evolving e-commerce landscape, where consumers face an overwhelming number of options. The study proposes a novel approach using a web scraping-based product comparison model. This model gathers product information from multiple e-commerce sites via web scraping techniques, allowing customers to make better decisions. The development and implementation of this comparison model is a significant contribution of the research, aiming to simplify the process of comparing products and prices across various e-commerce platforms. By collecting and presenting data on product specifications, prices, and availability, the model enables comprehensive comparisons without requiring users to manually visit different websites. The study also emphasizes the technical capabilities and potential of web scraping to enhance e-commerce experiences, demonstrating its effectiveness in obtaining accurate and up-to-date data. Additionally, it highlights the advantages of automation in handling large volumes of data. [8]The model's practical value lies in its ability to help users make well-informed choices that align with their preferences and budgets, thus creating a more consumer-centric e-commerce environment and reducing the time and effort required for product comparison.

[4] It provides a literature review that summarizes key ideas and findings regarding brand competition in both offline and international e-commerce settings. The report highlights the increasing importance of understanding competitive interactions in these contexts and explores brand spillover effects as a concept. It contrasts offline retail settings with the dynamics of international e-commerce, noting that the influence of brand spillover can differ significantly. The study is aligned with existing research on consumer behaviour, brand competition, and the impact of digital technology on the retail sector. It emphasizes the need to consider various factors, such as customer attitudes and marketing strategies, to fully understand how competing brands affect consumers in both online and offline markets.

[5] It provides a concise overview of key concepts and conclusions regarding recommendation systems in e-commerce. These systems are crucial for enhancing user experience and driving business revenue in a market saturated with choices. Mishra and Kumar's research introduces a product-based recommendation system tailored for e-commerce platforms, highlighting the importance of personalization. This approach offers product recommendations based on individual user behaviour and preferences, which not only boosts sales but also improves user engagement. The study underscores the need for advanced recommendation algorithms, discussing methods such as content-based filtering, collaborative filtering, and hybrid approaches. These techniques enhance the accuracy and relevance of recommendations by considering both product features and user behaviour. The paper also covers the technologies involved in building these systems, focusing on data mining and machine learning

methods. Challenges such as data sparsity, scalability, and real-time recommendations are addressed, which are essential for developing effective recommendation systems for e-commerce.

[6] It uses PHP, XAMPP, MongoDB, Django, and web scraping to examine a new method for creating an online pricing comparison platform. The study addresses the challenges associated with online data scraping, emphasizing the necessity of accurate and high-quality data for effective product comparisons. Additionally, it highlights the critical role of interface design and user experience in creating a clear and user-friendly platform for customers seeking the best products and prices.

[7] It explains how price comparison services are important for helping internet shoppers make wise purchases. These services compare product prices from several e-commerce sites, therefore filling the information vacuum. The study focuses on web scraping as a key method for acquiring up-to-date pricing and product information. It also underscores the challenges related to web scraping, such as ensuring data integrity, adapting to changes in website structures, and addressing ethical concerns. The paper stresses the importance of robust and adaptable scraping techniques to maintain accurate and current data

[8] Its significant contributions to the field of e-commerce, particularly in the context of product searching and price comparison. As e-commerce becomes an integral part of modern consumer behaviour, the sheer number of available products and the dynamic nature of online pricing make it challenging for consumers to identify the best deals. To address this issue, the authors propose the development of a price comparison website that aggregates data from various e-commerce platforms, allowing users to compare product prices, features, and availability. This tool simplifies the decision-making process for consumers by helping them find the most cost-effective options that align with their needs and budget. Additionally, the study underscores how technology is revolutionizing e-commerce by enhancing the shopping experience. Through data aggregation and web scraping, these comparison sites efficiently collect and present information, enabling consumers to make informed choices. The study emphasizes the practical significance of such platforms, noting that they not only make shopping more convenient but also drive competition among online retailers, ultimately benefiting consumers with better deals and prices. The prevalence of these websites highlights the evolving nature of e-commerce and the critical role that data and technology play in its advancement.

[9] The authors discuss the increasing expectations of consumers in the e-commerce sector as online shopping becomes more popular. With a vast array of products and brands available, consumers often struggle to quickly evaluate and select the best options. To address this challenge, the study integrates object recognition technology, enhancing the accuracy and efficiency of product identification. A key aspect of this research is the combination of advanced object recognition with traditional web scraping techniques. This hybrid approach allows the system to effectively recognize and classify products while collecting information from various e-commerce platforms. The system's capability to identify items based on images or descriptions significantly simplifies the comparison of prices and specifications. The integration of object recognition technology provides a major advantage to consumers, enabling them to perform visual searches that make online shopping more intuitive and user-friendly. Accurate product identification streamlines the process by eliminating the need for extensive searching and manual data entry, allowing consumers to quickly find desired products across multiple e-commerce platforms. Additionally, the study highlights the transformative potential of emerging technologies in e-commerce. Object recognition serves as an example of how artificial intelligence and machine learning can be leveraged to solve common consumer challenges. The research underscores the importance of employing these technologies to enhance e-commerce and make it more accessible to a broader audience.

[10] The overview of the literature acknowledges the critical role of e-commerce in modern retail and its rapid growth. Given the vast array of products available online, consumers often face challenges in making informed purchasing decisions. To address this, the authors propose the application of web mining, a data-driven approach, to e-commerce platforms. Web mining allows for the extraction and analysis of large amounts of data from e-commerce websites, including product specifications, customer reviews, and pricing information. A key contribution of this research is the identification of web mining as a transformative tool in e-commerce, providing comprehensive and up-to-date insights into product prices and features, which helps consumers make well-informed choices. Moreover, the study emphasizes that web mining goes beyond simple price comparisons by incorporating user reviews and ratings to assess the overall value of a product. The authors also highlight the importance of web mining in trend analysis and market research, enabling e-commerce companies to adapt to customer preferences, refine pricing strategies, and deliver personalized recommendations. Adopting a data-driven approach is crucial for staying competitive in the ever-changing e-commerce landscape.

III. PROPOSED SYSTEM

Our system provides a website designed to streamline the process of comparing products across various e-commerce platforms to help users find the best options available. The primary goal is to ensure that customers can easily access the top products offered by different online retailers. We utilize web scraping techniques to gather real-time data from various e-commerce websites, ensuring that the information is both accurate and current.

In our proposed system, users simply enter the name of a product, and the platform returns a list of the best options available, including detailed information from the selected websites. To determine the best product, we employ a Decision Tree algorithm that evaluates product reviews and pricing. For data security, we utilize the AES (Advanced Encryption Standard) algorithm for both encrypting and decrypting data, safeguarding user information against potential breaches and ensuring privacy.

On the results page, users can view the product name, price, and a URL link to purchase the item online. The system is designed to be user-friendly, straightforward, and easy to navigate, addressing the complexities often associated with online shopping. By simplifying the decision-making process, our platform helps users efficiently find and purchase products without the need to visit multiple sites.

With a focus on security, the AES encryption protects user data and privacy, reinforcing the system's commitment to data safety. The platform not only assists users in finding the best deals but also reduces the time and effort required to compare products across different websites. [9] This enhancement boosts user confidence in making informed purchasing decisions while discovering new products with minimal effort.

In today's fast-paced world, where time is a valuable resource, our system aims to make the process of comparing and purchasing products as efficient as possible. We respect our users' time and money, which is why we developed this website to facilitate easy tracking and analysis of product data.

IV. METHODOLOGY

The proposed system's architecture will feature a sophisticated framework integrating several key components. It is designed to compare products across e-commerce platforms, apply a decision algorithm, ensure data security with AES encryption, and incorporate product ratings and reviews.

Data Collection and Web Scraping. The architecture will include a data collection module responsible for web scraping from various e-commerce sites. This module will extract real-time data, including product prices, descriptions, links, and availability, to keep the system's database current. A scheduling and prioritization system will effectively manage this crawling process.

Data Storage and Database Management. A robust database system will be utilized for storing the collected data. This database needs to be scalable to handle large volumes of product information and support both structured and unstructured data storage, including user reviews and ratings.

User Interface. The framework will feature an intuitive user interface accessible via mobile and web applications. This interface will allow users to input their preferences and view product recommendations and comparisons. The design will prioritize ease of use, ensuring a seamless shopping experience.

Security and Privacy Layer. The architecture will incorporate a robust security layer to protect user data. [10] AES encryption will be employed to secure sensitive information, ensuring its confidentiality and protection against potential breaches.

Searching The Best product. The Decision Tree algorithm classifies products by splitting data into branches based on feature values, creating a tree-like structure. Each node in the tree represents a decision based on a product attribute, leading to a final classification at the leaf nodes. By evaluating multiple features like price, quality, and customer reviews, the algorithm predicts the best product among multiple options. It is effective because it visualizes decisions and outcomes, making it easier to identify the most suitable product. The model can be fine-tuned by adjusting parameters like tree depth to improve prediction accuracy.

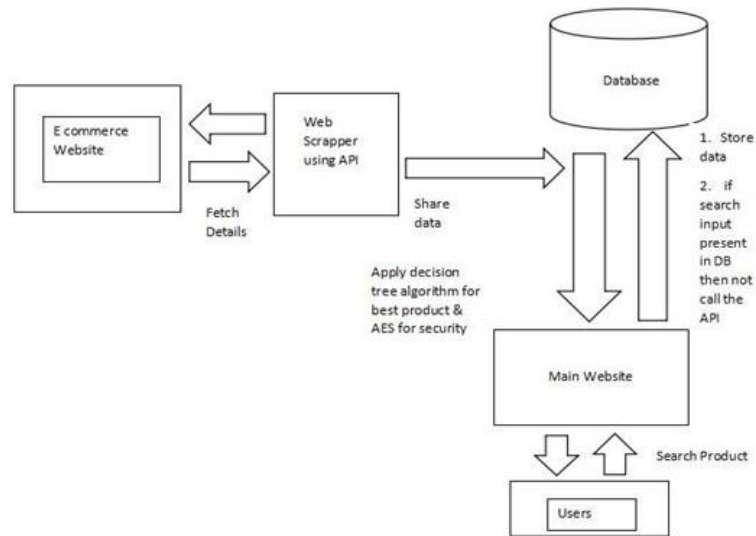


Fig. 1. Architecture Diagram of System.

Decision Tree Algorithm

Central to the system’s framework is the decision algorithm, which processes the gathered data through data analytics and machine learning techniques. This algorithm will consider user preferences and other factors to provide tailored product recommendations. It will also include sentiment analysis to assess user reviews and ratings.

An individual dataset's class is predicted via a decision tree algorithm, which begins at the root node. Based on comparisons between the root's attribute values and those in the dataset, the algorithm branches out and advances to subsequent nodes. In order to get to a leaf node at the top of the tree, this algorithm keeps going around and around, comparing attribute values at every hub. To better understand the procedure, consider the following steps:

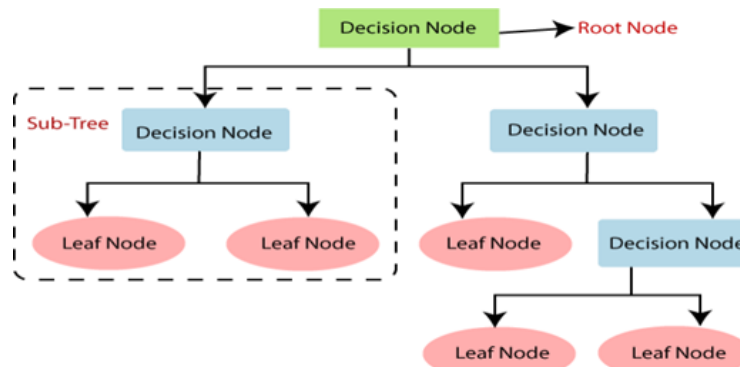


Fig. 2. Decision Tree Diagram.

Algorithm Steps. The steps involved in the decision tree algorithm are:

- **Initiate the Tree:** Start with the root node, which is represented by the letter S and includes the complete dataset.
- **Determine the Best Attribute:** Use an Attribute Selection Measure (ASM) to identify the most effective attribute for splitting the dataset.
- **Split the Dataset:** Divide the dataset S into subsets, each corresponding to different values of the best attribute.
- **Create the Decision Tree Node:** Construct a node in the decision tree that represents the selected attribute.
- **Recursive Tree Generation:** Apply the same process recursively to the subsets obtained in step 3. Continue to create new decision tree nodes until you reach a point where further classification is not possible, and these final nodes are referred to as leaf nodes.

Advanced Encryption Standard Algorithm

In order to safeguard data using a symmetric key technique, the Advanced Encryption Standard (AES) is a popular encryption algorithm. It uses keys of lengths of 128, 192, or 256 bits, which dictates the amount of encryption rounds that are applied. It works on fixed-size data blocks, which are generally 128 bits. Plaintext is converted into ciphertext by means of the AES algorithm, which has many crucial phases.

After the original encryption key has been enlarged into a set of round keys, the encryption process starts. Following that, the encryption method uses these round keys in subsequent rounds.

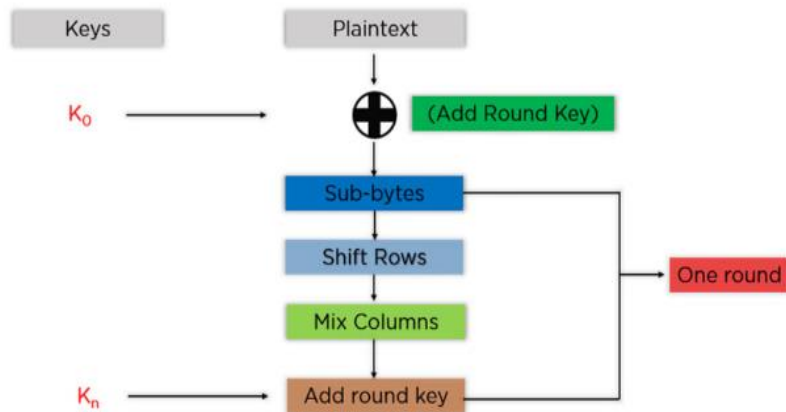


Fig. 3. Advanced Encryption Standard.

AES encryption involves a sequence of four main operations applied to the data block, known as the state array: Sub Bytes. In this stage, the state array is substituted byte-by-byte using the S-Box, a predetermined replacement table. To assist hide the data, a byte from the S-Box is substituted for each byte in the state array.

$$Formula : State[i][j] = S - box (State[i][j]) \tag{1}$$

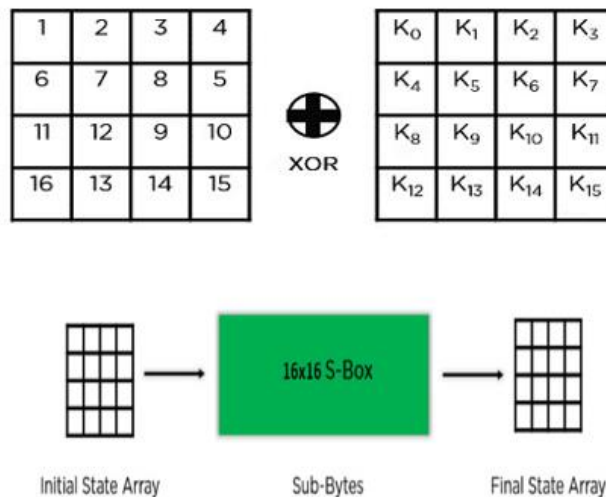


Fig. 4. Sub Bytes Diagram.

Shift Rows. The rows in the state array are moved to the left by different amounts of places throughout this process. One slot is moved in the second row, two in the third, and three in the fourth, while the first row stays the same. Inside the data block, this shifting improves diffusion.

$$Formula : State[i][j] \rightarrow State[i][(j + i) \bmod 4] \tag{2}$$

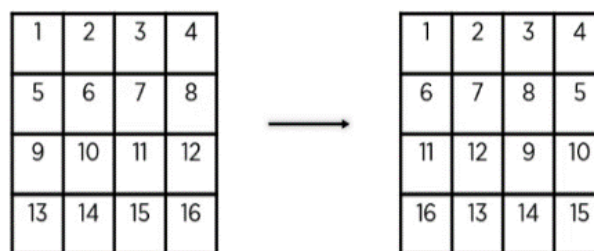


Fig. 5. Shift Rows Diagram.

Mix Columns. During this stage, each column of the state array is multiplied by a fixed matrix. This transformation mixes the data within each column, further enhancing the diffusion of the plaintext across the entire block. However, this step is omitted in the final round of encryption.

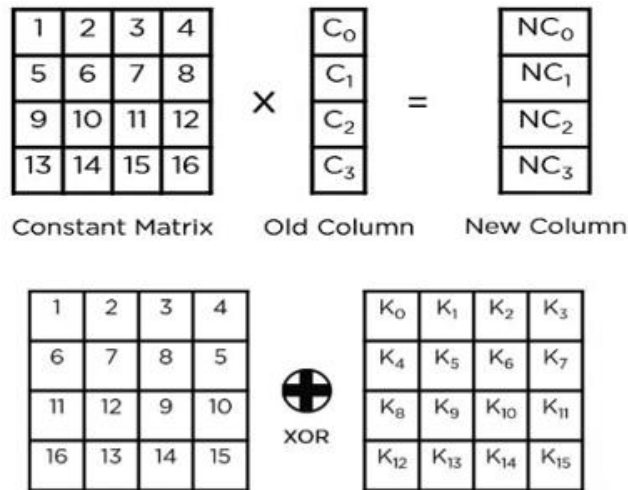


Fig. 6. Mix Column Diagram.

$$Formula : c' = M \cdot c \tag{3}$$

Add Round Key. In this final operation of each round, the current state array is XORed with a round key derived from the key expansion process. This step combines the state with the round key, introducing additional complexity to the encryption process.

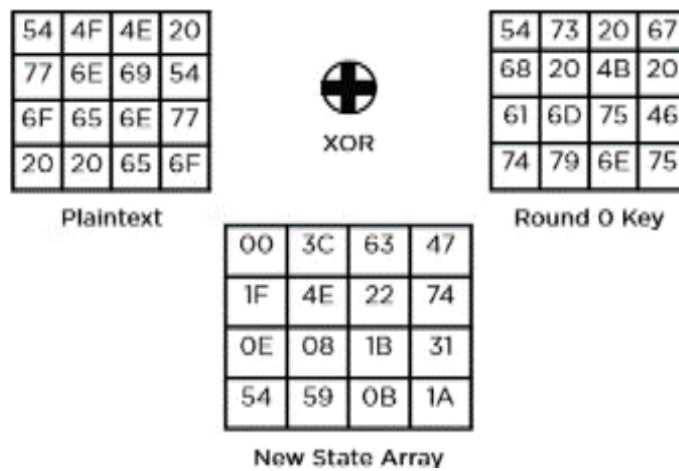


Fig. 7. Add Round Key.

$$Formula : State_{new} = State_{old} \oplus RoundKey \tag{4}$$

The AES algorithm consists of multiple rounds of these operations, depending on the key length used. For a 128-bit key, there are 10 rounds; for a 192-bit key, 12 rounds; and for a 256-bit key, 14 rounds. Each round except the final one includes the MixColumns step.

The SubBytes, ShiftRows, and AddRoundKey operations are carried out in the last round of AES encryption, but the MixColumns process is skipped. The ciphertext, or encrypted version of the original plaintext, is the result of the last round.

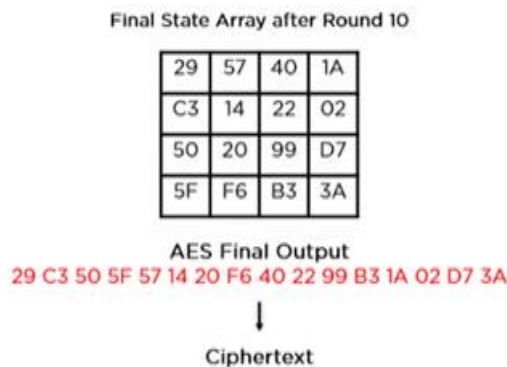


Fig. 8. Final Output.

AES is a common option for securing sensitive data in a variety of applications, from secure communications to data encryption at rest, due to its reputation for effectiveness and security.

V. RESULT & DISCUSSION

The development and implementation of our e-commerce product comparison website has yielded significant results in enhancing the online shopping experience. The software effectively gathers and contrasts product data from several e-commerce sites by integrating sophisticated web scraping algorithms, empowering consumers to make educated purchase decisions. The use of a decision tree algorithm to analyze multiple factors such as price, quality, and user reviews has proven effective in guiding users towards the best product options. Moreover, the platform's strong focus on data security and privacy has fostered user trust, ensuring a safe and reliable browsing experience. The comprehensive data analysis tools embedded within the website provide detailed product evaluations and unbiased ratings, which significantly streamline the decision-making process for consumers. Overall, the website successfully meets the demands of modern online shoppers by offering a secure, user-friendly, and informative platform that simplifies the process of finding and purchasing high-quality products.

Search Products

Searching for a product involves querying the database to match the product name or attributes against user input to retrieve relevant results.

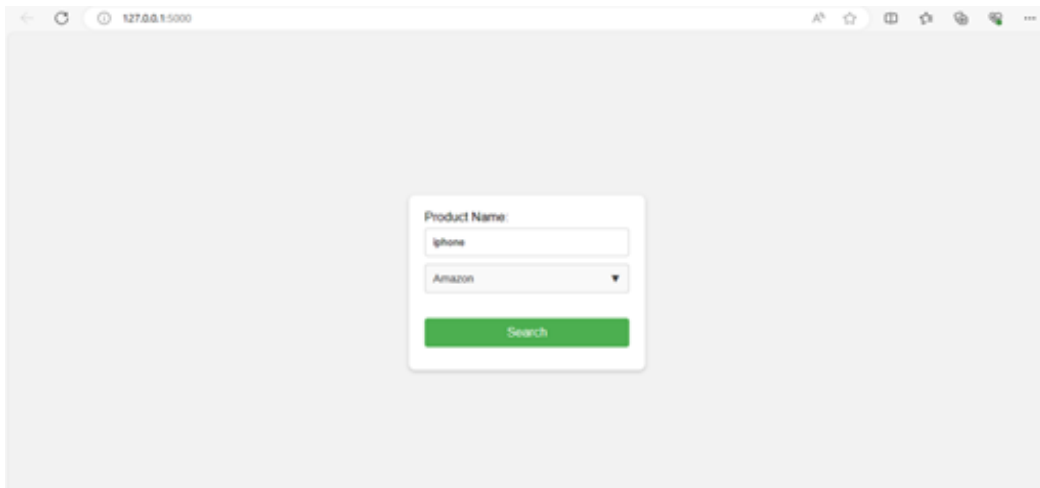


Fig. 9. Searching Products.

Selecting Website

Selecting an online website for comparison involves identifying and choosing relevant e-commerce platforms.

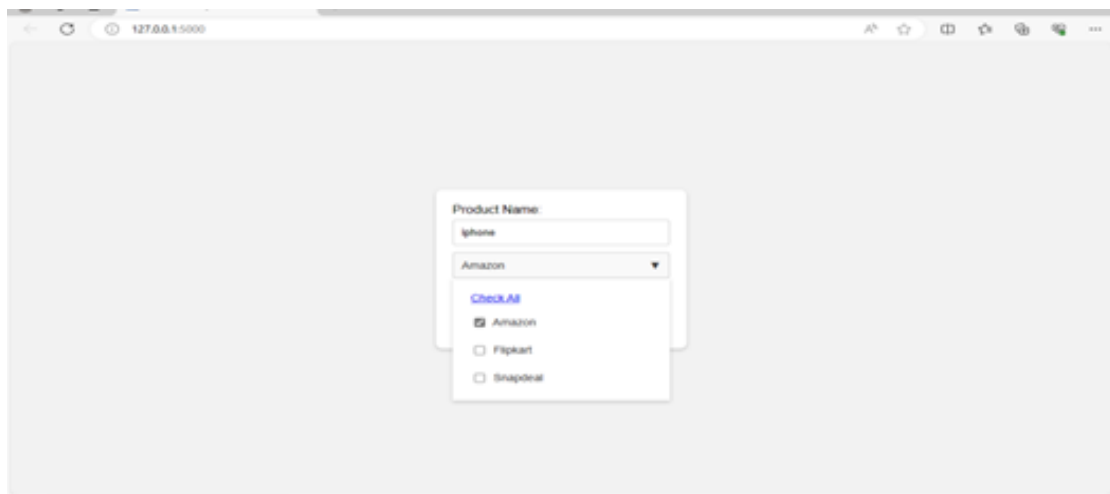


Fig. 10. Selecting Websites.

Search Results

Showcase every product that meets the criteria (price, user rating, features, etc.) among the relevant goods found in the search results.

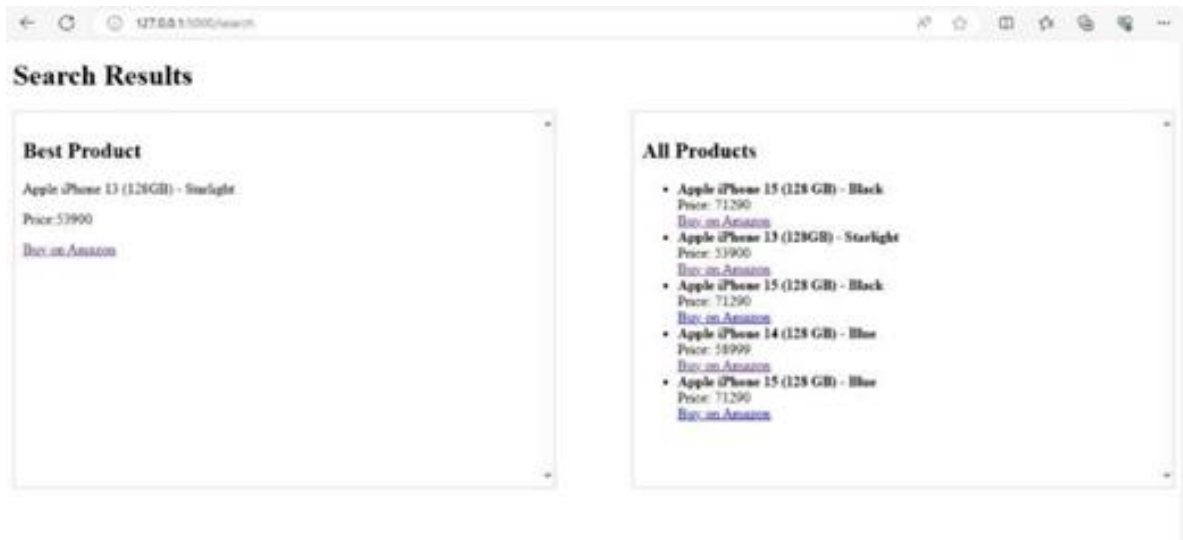


Fig. 11. Search Results.

VI. CONCLUSION

A revolutionary approach to online shopping could emerge through the development of a comprehensive e-commerce product comparison website, enhanced with advanced data scraping and analytical technologies. This platform, characterized by its robust technical infrastructure and user-focused design, offers several key benefits.

To begin with, web scraping serves as the primary method for gathering a wide array of product information from various e-commerce sites. This approach ensures an exhaustive and impartial comparison of products, including details on prices and customer reviews. At the heart of the system is a decision-making algorithm that assists users in selecting the best product options available. By analyzing multiple factors such as product features, pricing, and user ratings, the system delivers data-driven recommendations, empowering customers to make informed choices and find the best deals. Data security is a top priority in this system. To protect user information and ensure privacy, the platform incorporates the Advanced Encryption Standard (AES) algorithm. This commitment to safeguarding data enhances the website's reliability and trustworthiness.

Furthermore, the integration of data analysis tools provides users with in-depth information, such as product ratings and reviews. These insights are valuable not only to consumers but also to retailers, offering feedback that supports more informed decision-making. With its user-friendly interface and secure data handling, this website meets the needs and expectations of online shoppers, enhancing the overall shopping experience by making the process more efficient and cost-effective.

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