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Pricewise AI: An E-Commerce Price Comparison System

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Abstract: ***Growing competition among online retail platforms has made it considerably challenging for buyers to locate the most affordable option for a given product within a practical time frame. Prices, discounts, ratings, and inventory availability for identical products often differ substantially across e-commerce websites, compelling shoppers to visit numerous platforms individually before making a purchase decision. This manual process is tedious, repetitive, and susceptible to missed opportunities.***

PriceWise AI is a browser-based price aggregation tool built to streamline this experience through automated product discovery and intelligent multi-source comparison. Users can initiate a search either by typing a product name or by submitting a direct product link. The platform then gathers matching product data from several major online stores Amazon, Flipkart, and Croma and consolidates the results within a single, cohesive display. Key features include automatic identification of the cheapest available listing, flexible sorting by price or user rating, and one-click navigation to the respective retailer's product page.

Beyond its comparison core, PriceWise AI integrates user account management, profile customization, and a conversational AI chatbot to improve overall accessibility. The system is developed with React, TypeScript, Tailwind CSS, Supabase, and serverless edge functions. Through the convergence of automated data retrieval, unified result presentation, and user-centric design, PriceWise AI delivers a robust and extensible solution for enhancing transparency and efficiency in digital purchasing.

I. INTRODUCTION

The rise of e-commerce has profoundly reshaped how individuals discover and acquire products. Today, shoppers can access an expansive ecosystem of digital retailers offering varied prices, broad product selections, and home delivery services. Nevertheless, this expansion has produced a fragmented marketplace in which the same product frequently appears on multiple platforms with inconsistent pricing, ratings, and availability data. Consumers are consequently left to manually compare listings across numerous websites before reaching a purchasing decision.

This manual approach carries meaningful practical costs. It requires extra time and mental effort and leaves users vulnerable to missing superior deals. For high-consideration purchases — including smartphones, laptops, and major appliances — even small price discrepancies can weigh heavily on buying choices. Most existing retail platforms are designed to promote products within their own ecosystems and offer no impartial, cross-platform comparison

capabilities. This gap highlights the need for a neutral aggregation tool that synthesizes product data from multiple sources into a single, actionable view.

PriceWise AI was conceived to fill this need. The platform accepts either a keyword query or a direct product link, retrieves comparable listings from supported retailers, and presents the findings in a structured, easy-to-read layout. Rather than simply displaying prices, the system automatically surfaces the best-value option, facilitates direct navigation to the chosen retailer, and supports users through features like account management and AI-assisted guidance.

The overarching goal of PriceWise AI is to lower the barrier to effective product comparison while sharpening price transparency and purchase confidence. The project also serves as a practical demonstration of how contemporary frontend frameworks, serverless architecture, structured web extraction, and managed cloud services can be coordinated to deliver a scalable, user-friendly e-commerce support application.

II. LITERATURE REVIEW

Research into online price comparison systems has grown substantially alongside the expansion of digital retail. Early aggregation platforms depended primarily on manually assembled product feeds, affiliate partnerships, or proprietary store databases. While these systems broadened product visibility for shoppers, their reach was typically limited to partner vendors, and data freshness was inconsistent.

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The emergence of automated web extraction techniques significantly extended what comparison platforms could achieve. By programmatically collecting product attributes — including titles, prices, ratings, review volumes, and stock availability — directly from public-facing product pages, developers could build aggregators independent of formal API relationships. This approach is especially valuable where vendor APIs are restricted or nonexistent. The primary ongoing challenge remains maintaining reliable extraction across websites that frequently alter their layouts and structures.

Contemporary comparison applications have further refined the user experience by prioritizing responsive design, query-driven workflows, and personalized engagement. Capabilities such as dynamic sorting, attribute filtering, visual rankings, and direct retailer links have transitioned from optional enhancements to expected functionality, as users require actionable outputs rather than raw price lists. Similarly, account-based personalization and intelligent conversational assistants have become standard components of user-facing applications in this domain.

A synthesis of academic literature and industry trends identifies three pillars for a competitive price comparison solution: dependable cross-retailer product matching, an intuitive and uncluttered interface, and interactive support mechanisms that guide users toward decisions. PriceWise AI was architecturally grounded in these principles, uniting multi-source automated retrieval, a responsive frontend, user authentication, and a chatbot assistant within a single cohesive platform.

III. PROBLEM STATEMENT

Online shoppers regularly struggle to pinpoint the best available deal for a desired product, given that pertinent information is dispersed across many different retail websites. A typical user may need to navigate to several platforms, repeat the same search on each, manually compare prices, and cross-check ratings and stock availability before committing to a purchase. This workflow is cumbersome and particularly frustrating when different platforms represent the same product under varying names or formats.

Existing tools often address only part of this problem — limiting their scope to a single retailer, delivering superficial comparisons, or failing to equip users with the information needed to act decisively. A comprehensive solution is therefore needed: one that consolidates product data from multiple stores, surfaces the most competitive offer, and maintains user engagement through intelligent navigation support and guided assistance.

IV. METHODOLOGY

PriceWise AI is built as a complete full-stack web application, incorporating a React and TypeScript frontend, a Supabase-managed backend, and serverless edge functions responsible for product retrieval and chatbot interactions. The development methodology is organized across the following stages.

A. User Input Processing

The application supports two distinct input modes: a free-text product search query and a direct product URL. Upon submission, the frontend dispatches the input to a Supabase edge function for processing. When a product URL is detected, the system standardizes the link and infers a canonical product name from its structure or the metadata of the associated page. This normalization step ensures a consistent basis for cross-retailer comparison.

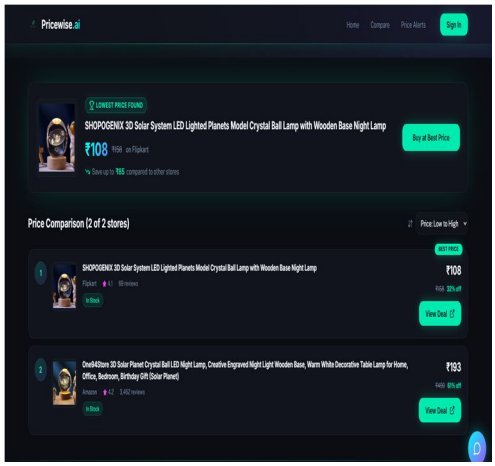


Fig: 1

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B. Multi-Store Product Retrieval

A dedicated edge function coordinates product discovery across Amazon, Flipkart, and Croma simultaneously. Structured extraction is used to capture key product attributes — including product title, sale price, original price, star rating, review count, thumbnail image, and availability status — from each platform. Candidate results are evaluated through normalized title comparison and token-based similarity algorithms, enabling the system to match listings that represent the same physical product across differently formatted store pages.

C. Data Cleaning and Normalization

Due to differences in how each e-commerce platform labels and presents product information, all retrieved data undergoes a cleaning phase prior to display. Product names are standardized, platform-specific suffixes and noise are stripped, and price values are converted into a consistent numeric representation to allow accurate comparison. The cleaned data is mapped to a shared product schema that enables uniform rendering across the interface.

D. Ranking and Comparison

Once retrieval and normalization are complete, all products are arranged in ascending price order. The most affordable in-stock option is automatically designated as the recommended deal. Users may also switch to alternative orderings — descending price or rating-based — according to their preference. This ranking system gives users immediate access to the optimal choice while preserving the flexibility to evaluate other listings.

E. User Interface Design

The frontend emphasizes clarity and ease of interaction. A search-centric home screen channels users directly into the comparison workflow. Results are presented as individual product cards displaying thumbnails, retailer identity, pricing, discount percentages, ratings, review totals, and stock information. A prominently displayed summary card highlights the cheapest available option together with an estimated savings figure relative to higher-priced alternatives, reducing the cognitive load on users. The interface is fully responsive, delivering a seamless experience across desktop computers, tablets, and smartphones. Page transitions are smooth, and loading states are communicated clearly throughout the data retrieval process.

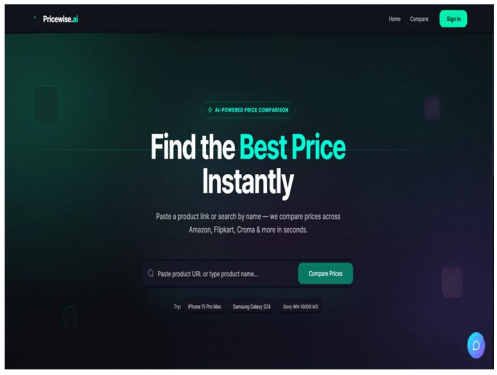


Fig: 2

F. Redirect Mechanism

Each product card stores the direct URL of its associated retailer listing. When a user clicks the action button on a card, they are taken straight to that product page on the corresponding store. This direct handoff removes the need for additional searching and positions PriceWise AI as both a comparison tool and an active navigation aid — not merely a passive information display.

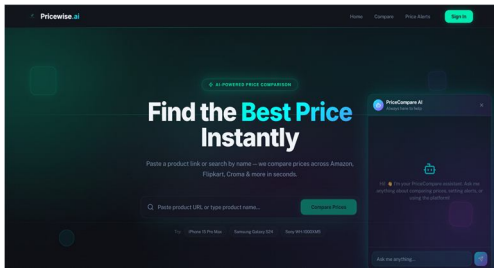
G. User Authentication and Personalization

PriceWise AI incorporates registration and sign-in flows backed by Supabase's authentication service. When a user registers, a personal profile is created and persisted in the database. Signed-in users can access their account information and unlock personalization features unavailable to guest visitors. This layer of account management makes the platform more valuable for users who return frequently rather than using it only once.

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H. AI-Powered Support Chatbot

To lower the learning curve and guide users through the platform, PriceWise AI includes a built-in conversational assistant. The chatbot is capable of responding to common questions about product searches, deal comparisons, account management, and general navigation. Its presence meaningfully reduces friction for new users and enhances the overall intuitiveness of the application.

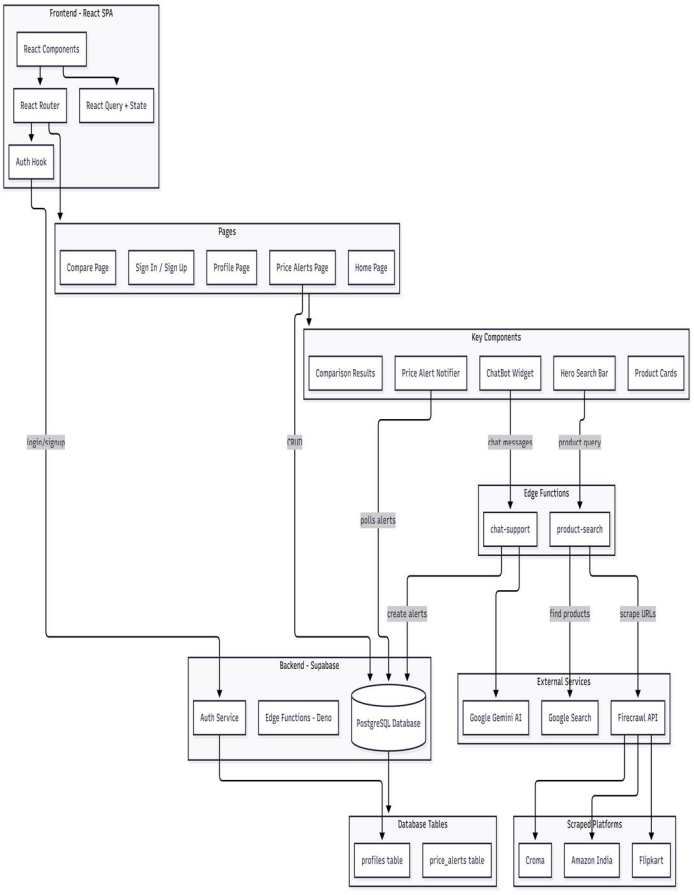


I. Performance Considerations

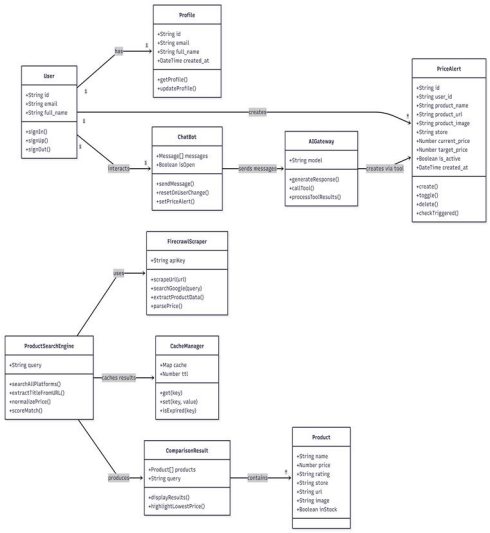
To prevent redundant computation on repeated searches, the product retrieval service caches results for recently processed queries over a short time window. This mechanism reduces latency and server load for recurring requests. The retrieval logic is structured modularly, which means that adding support for new e-commerce platforms requires minimal changes to the existing codebase.

V. SYSTEM ARCHITECTURE

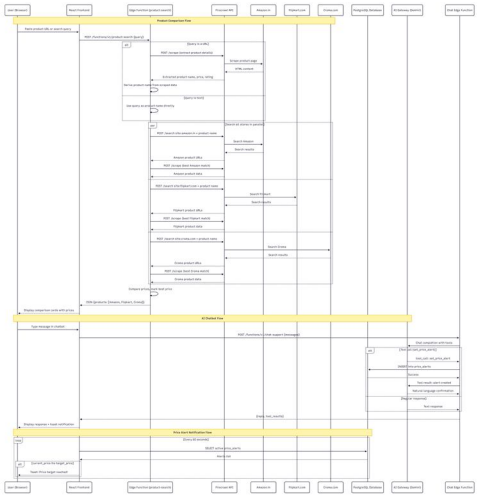
PriceWise AI's architecture is organized into three interconnected layers: the presentation layer, the service and data layer, and the external data integration layer.



The presentation layer is constructed with React, TypeScript, Vite, and Tailwind CSS, following a component-based architecture. This layer handles client-side routing, application state, user interactions, and the rendering of comparison results. The main pages of the application are the Home page, Comparison results page, Sign-In page, Sign-Up page, and Profile page.



The service and data layer runs on Supabase, which manages user authentication, profile data storage, and the execution of serverless edge functions. One edge function handles product discovery and ranking logic; another manages the chatbot's query responses. Row-level security policies are enforced at the database level to protect individual user data and maintain appropriate access boundaries.



The external integration layer encompasses the supported retailer websites from which product data is collected, along with the extraction logic that retrieves structured information from their pages and search results. Together, these three layers form a pipeline that transforms a user's product query into a ranked, actionable comparison presented through the application's interface.

VI. RESULT AND DISCUSSION

The deployed system demonstrates that a multi-source price comparison platform can be effectively built and operated using modern web technologies. When a product name or URL is entered, the application successfully retrieves relevant listings from Amazon, Flipkart, and Croma, compiles them into a single display, and highlights the lowest available price. The results are presented in a format that is easy to interpret and that substantially reduces the effort traditionally involved in manual online price research.

The best-deal summary card delivers immediate decision support by isolating the cheapest option and displaying it prominently above the full listing grid. Additional data points — star ratings, review volumes, original prices, and estimated savings — further enrich the comparison and give users a broader basis for evaluating each option. The integrated redirect functionality allows users to proceed directly to a retailer's product page without any additional navigation steps, streamlining the path from search to purchase.

The platform's scope extends beyond basic comparison through the inclusion of authentication, profile management, and a conversational chatbot.

These features increase the application's relevance for repeat users and demonstrate a broader vision of what a comparison platform can offer. From a technical perspective, the project confirms that a lightweight, serverless stack combining a React frontend with Supabase-managed backend services can support a fully functional, production-oriented consumer application.

Normalized product matching and a unified data schema allow the platform to meaningfully compare listings that originate from different retailers with different formatting conventions. While the current system covers only three platforms, the modular architecture makes it straightforward to expand coverage to additional stores in future iterations.

VII. ADVANTAGES OF THE PROPOSED SYSTEM

PriceWise AI delivers several concrete benefits compared to traditional manual shopping and single-retailer platforms. It collects and displays product data from multiple e-commerce sources within one unified interface. It saves user time by automating the search-and-compare process that would otherwise require opening multiple websites. The system autonomously identifies and flags the lowest-priced available product, enabling fast decision-making. Multiple sorting options and visual product cards support faster evaluation across results. Direct retailer links embedded in each card eliminate the need for secondary navigation steps. Secure user authentication enables profile-based personalization and persistent account features. The integrated AI chatbot provides on-demand guidance for both new and returning users navigating the platform.

VIII. LIMITATIONS

The current release of PriceWise AI operates within several constraints. Product retrieval is presently limited to three e-commerce platforms, which restricts the breadth of price comparisons. Matching accuracy can degrade when the same product is listed under significantly different names or formats on different websites. Furthermore, structural changes to retailer web pages can disrupt data extraction and may require ongoing maintenance to preserve system reliability.

IX. FUTURE ENHANCEMENTS

A range of planned improvements will expand the platform's capability and user value. Coverage will be extended by onboarding additional e-commerce retailers, broadening the comparison pool. A proactive notification system will be introduced to alert users via email, SMS, or mobile push notifications when prices fall to their specified target thresholds. Product matching will be upgraded using semantic similarity models and AI-based classification to improve accuracy across inconsistently named listings. Historical price tracking with interactive trend charts will allow users to evaluate price trajectories and time their purchases more effectively. A personalized recommendation engine will surface relevant products based on each user's past activity and browsing behavior. Advanced filtering by category and detailed side-by-side specification comparisons will be added for deeper product evaluation. Finally, an administrative dashboard will provide insights into search trends and user engagement to support platform optimization.

X. CONCLUSION

PriceWise AI presents a focused and practical answer to the widespread challenge of fragmented online shopping. In the current digital retail landscape, buyers are routinely expected to visit multiple e-commerce platforms, evaluate prices independently, and weigh product quality across inconsistent listing formats before arriving at a purchase decision. PriceWise AI removes this burden by acting as a centralized, intelligent shopping interface — one that gathers, organizes, and ranks product information from several major retailers and presents it through a single, coherent view. The combination of automated multi-source retrieval, structured data normalization, price-based ranking, best-deal identification, and direct retailer navigation collectively transforms what has historically been a fragmented and time-consuming process into a streamlined, efficient one.

The platform also reflects a broader understanding of what users genuinely need from a shopping tool. Through secure authentication, personalized profile management, and AI-powered conversational support, PriceWise AI transcends the role of a simple price checker and positions itself as a sustained companion for online shoppers. These capabilities ensure that the system provides lasting value across multiple sessions and builds the kind of user trust that encourages continued engagement over time.

From an engineering perspective, the project validates a lean, modern development approach. The pairing of a React and TypeScript frontend with Supabase's managed backend and serverless edge functions demonstrates that fully capable, scalable consumer applications can be delivered without the overhead of traditional server infrastructure. The use of token-based product matching, normalized schemas, and a modular retrieval pipeline reflects the kind of architectural foresight that positions the system for reliable real-world use.

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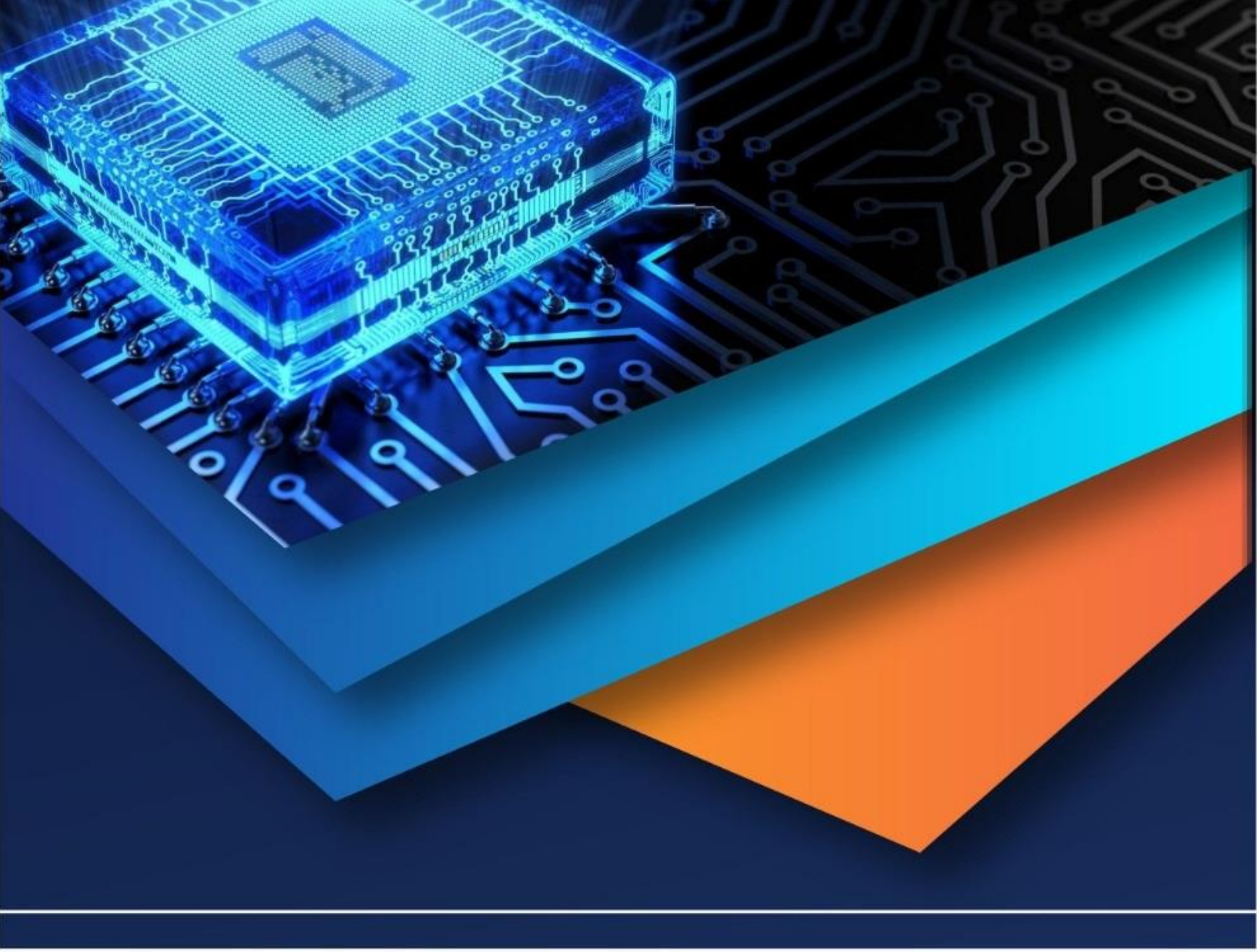
Looking to the future, PriceWise AI is well positioned for meaningful expansion. Adding more retail platforms will increase comparison depth and relevance for a larger user base. Proactive price alert notifications will shift the platform from reactive to anticipatory, ensuring users are informed of deals even when they are not actively searching. Enhanced semantic matching and AI-assisted classification will raise the quality of cross-platform comparisons, especially for products that are inconsistently named across retailers.

As it stands today, PriceWise AI represents a substantive and purposeful contribution to the landscape of e-commerce assistance tools. With the enhancements planned for future development cycles, it has the trajectory to become a comprehensive shopping intelligence platform — one that not only supports purchasing decisions but actively empowers consumers to consistently obtain the greatest value for every rupee they spend.

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