

AI-DRIVEN ADAPTIVE WEB CONTENT DELIVERY SYSTEM FOR PERSONALIZED E-COMMERCE EXPERIENCE

Dr. Bikramjit Sarkar, HOD, Dept. of CSE, JIS College of Engineering Kalyani, WB, India.

Mr. Kaushik Roy Choudhury, Asst. Professor, Dept. of CSE, JIS College of Engineering Kalyani, WB, India.

Abhinav Kumar, UG Student, Dept. of CSE, JIS College of Engineering, Kalyani, Nadia, WB, India.

Aahan Shrivastava, UG Student, Dept. of CSE, JIS College of Engineering Kalyani, Nadia, WB, India.

Sanjay Kumar Yadav, UG Student, Dept. of CSE, JIS College of Engineering Kalyani, Nadia, WB, India.

ABSTRACT:

Our AI-driven adaptive e-commerce platform revolutionizes online shopping by delivering personalized and optimized content in real time. Traditional e-commerce websites often struggle with performance issues due to varying user contexts, such as device type, network speed, and location. Additionally, static content delivery fails to adapt to user preferences, leading to inefficiencies in engagement and conversions. Our solution integrates an intelligent web content delivery system using PHP, MySQL, HTML, CSS, JavaScript, and machine learning. By analysing user behaviour, network conditions, and device capabilities, our system dynamically adjusts content layout, media compression, and priority-based loading, ensuring a seamless user experience. The AI-powered recommendation engine predicts user preferences, displaying relevant products and promotions. Server load is optimized through content tailoring, reducing bandwidth consumption without compromising quality. Security and efficiency are prioritized, ensuring safe transactions and data protection. With features like real-time user context analysis, AI-driven adaptive content delivery, and dynamic resource management, our platform enhances user engagement, minimizes latency, and maximizes e-commerce performance.

Keywords- AI-Driven; Web; Content Delivery

I. INTRODUCTION

Our team has developed an AI-driven adaptive e-commerce platform utilizing PHP and MySQL to revolutionize the online shopping experience. Traditional e-commerce platforms often face challenges related to static content delivery, high server loads, and unoptimized user experiences due to varying device types, network speeds, and user preferences. Our system addresses these inefficiencies by dynamically adapting content in real time, ensuring seamless performance, personalized recommendations, and optimized resource management.

The primary objective of this system is to enhance user engagement and streamline content delivery using AI and machine learning. By analysing user behaviour, device specifications, and network conditions, our platform intelligently adjusts product displays, media compression, and page layouts to provide an optimal browsing experience. This ensures faster load times, reduced bandwidth consumption, and higher conversion rates.

A key feature of our platform is the product recommendation system, which suggests products to users based on their previous searches and interests.

To further improve accessibility, we have implemented a network-aware adaptation feature that dynamically adjusts content delivery based on the user's internet speed. Whether the user is on a high-speed broadband connection or a limited mobile network, the system optimizes images, videos, and other media accordingly to ensure fast loading times without compromising quality. This allows users to shop seamlessly, regardless of

network conditions, minimizing buffering and delays.

The performance of our AI-driven system was evaluated based on user engagement, page load speeds, conversion rates, and server efficiency. Results indicate a significant improvement in content accessibility, reduced bounce rates, and enhanced user satisfaction. The platform operates with two main modules: one for users and one for administrators. Users can seamlessly browse and purchase products, while administrators manage product listings, user interactions, and AI-driven recommendations. Each user's session is tailored to their browsing habits, ensuring a unique and efficient shopping experience.

Our website operates 24/7, offering uninterrupted service while leveraging AI to optimize content dynamically. Through intelligent automation and real-time adaptation, we ensure a personalized and high-performance shopping journey for every user.

II. RESEARCH METHODOLOGY:

The development of our AI-driven adaptive e-commerce platform using PHP and MySQL follows a structured methodology to ensure efficient implementation and a seamless user experience. This methodology encompasses multiple phases, each focusing on key aspects of the system, including real-time user context analysis, AI-driven content adaptation, and optimized performance management.

Our system is designed to cater to two primary user categories—desktop and mobile users—each with an interface tailored to their respective devices. Users interact with the front-end, which is built using HTML, CSS, and JavaScript. Pre-coded requests are triggered when users browse products, try on items virtually, or make purchases. These interactions initiate AJAX-based dynamic updates, reducing page reloads and enhancing responsiveness.

At the middle layer, PHP scripts process user requests, handling input validation, session management, and AI-driven content adaptation. The system continuously analyses device type, screen resolution, and network conditions to

optimize media compression, product display formats, and interface layouts accordingly. The AI engine predicts user preferences based on browsing history and behaviour analysis, ensuring personalized recommendations and a tailored shopping experience.

The back-end manages data storage, retrieval, and security, ensuring that all transactions, including product searches and order placements, are securely processed and stored in the MySQL database. The database also maintains records of user behaviour and session data, allowing the AI model to refine its predictions over time. The combination of front-end interactivity, middle-end AI processing, and back-end data management results in a smart, efficient, and adaptive e-commerce system designed for modern shopping experiences.

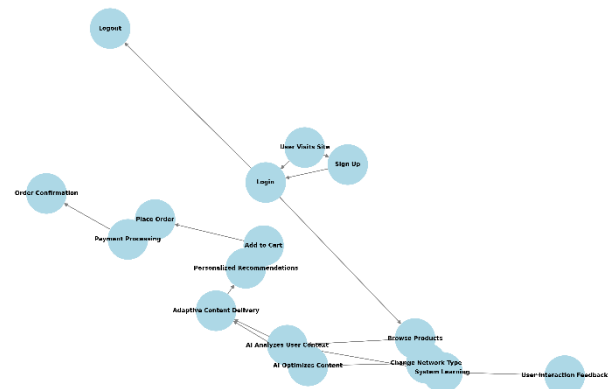


Fig: Workflow Diagram

III. OUTPUT:

Figure 1 depicts the home page of the e-commerce website, featuring options for Home, Men, Women, Kids, Electronics, Health and Household, About Us, FAQ, and Contact Us. Users can log in, register, or view their shopping cart from the top navigation bar. A search bar allows users to find products quickly. The homepage prominently welcomes users to the e-commerce platform and encourages them to shop for the latest women's accessories. Additionally, a live chat option

labelled "We are here!" is available for customer support.

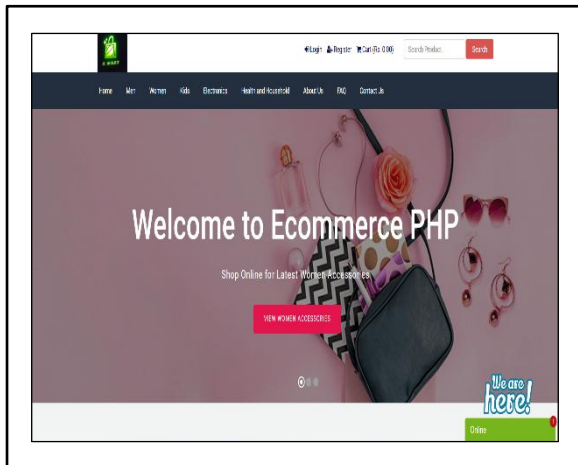


Fig 1. Dashboard Of Website

Figure 2 showcases the **user registration page**, allowing new users to sign up by providing their **name, email, phone number, and password**. After successful registration, users can log in to explore and purchase products.

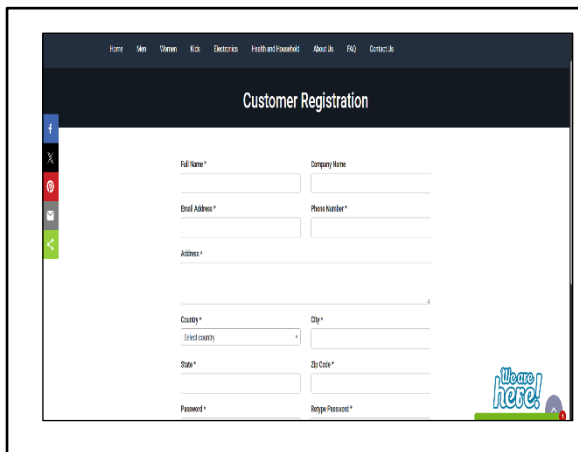


Fig 2. User Registration Form

Figure 3 illustrates the **user login page**, where registered users can enter their **email and password** to access their accounts. The page provides an option to reset the password in case of forgotten credentials. New users can click on the **'Register'** button to create an account.

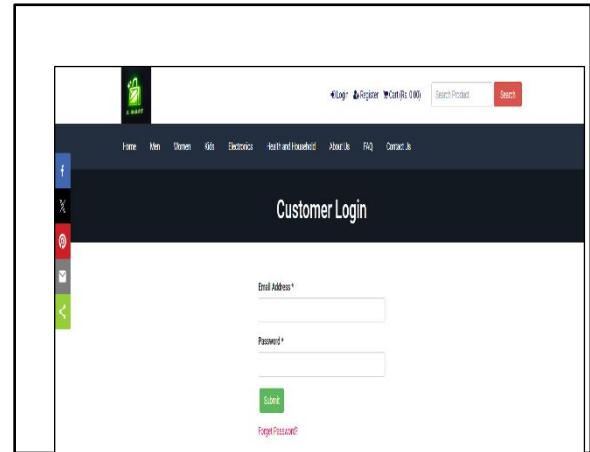


Fig 3. User Login Form

Figure 4 displays the recommendation system, which suggests products based on the user's recent searches and browsing activity. The system analyses past interactions to personalize product recommendations, enhancing the shopping experience by presenting items that align with the user's interests.

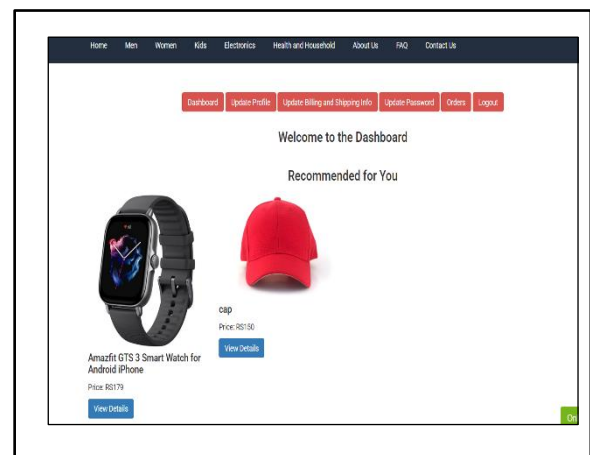


Fig 4. User Recommendation System

Figure 5 showcases the desktop view of the e-commerce platform with an integrated network adaptation feature. The console log highlights the system's ability to detect device type, network speed, and user location, allowing dynamic content adjustments. A failed resource load error indicates a missing context detection script, which may affect the adaptive content delivery.

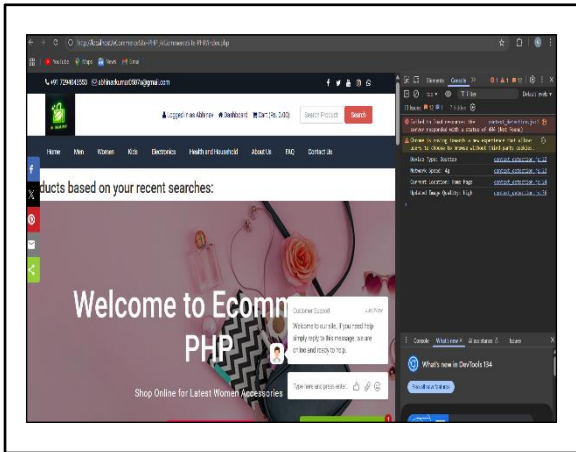


Fig 5. Desktop View with Network Adaptation

Figure 6 illustrates the mobile view of the e-commerce platform, demonstrating how the system adapts to different devices and user preferences. The device selection dropdown offers various smartphone models, enabling developers to test the site's responsiveness. The network speed and image quality dynamically adjust based on the selected device, optimizing the user experience across different platforms.

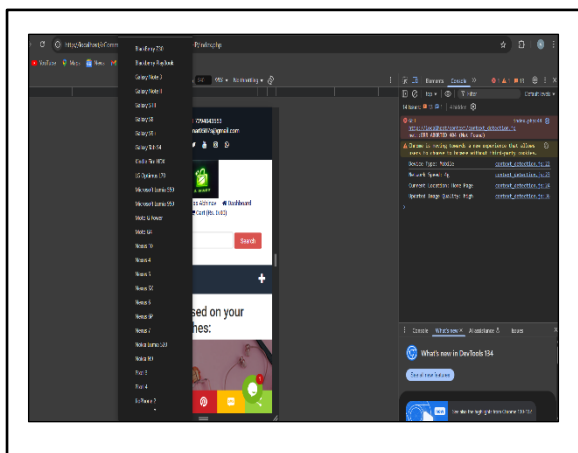


Fig 6. Mobile View with Device Selection

Figure 7 displays the admin login interface, where administrators input their ID and password to access their portal. In case of a forgotten password, admins can utilize the "Forgot Password" option to retrieve their credentials.

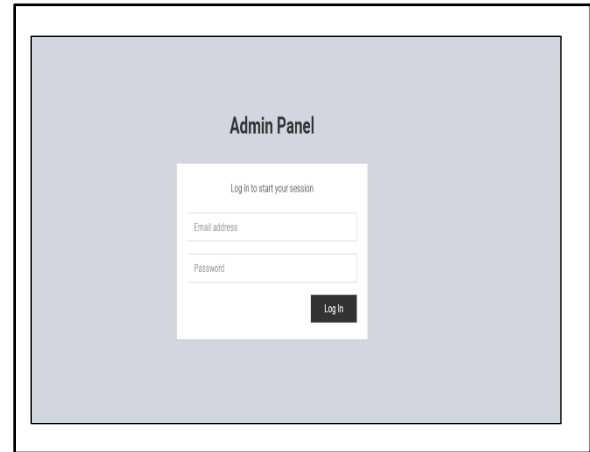


Fig 7. Admin Login

Figure 8 showcases the **Admin Dashboard**, which provides an overview of key metrics related to the e-commerce platform. The dashboard includes statistics such as the number of **products**, **pending and completed orders**, **active customers**, **subscribers**, and **available shipping**. It also categorizes products into **top, mid, and end categories** for better management. The left sidebar contains navigation options for **website settings**, **product management**, **order management**, **customer registration**, and **other administrative functions**, allowing administrators to efficiently oversee and manage the platform.

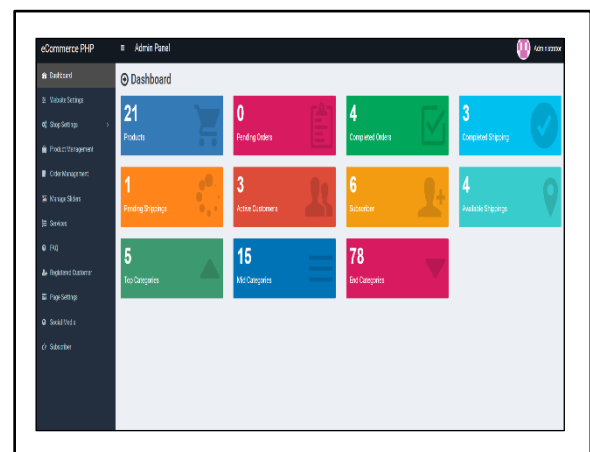


Fig 8. Admin Dashboard

IV. CONCLUSION AND FUTURE SCOPE:

The development of our AI-driven adaptive e-commerce platform provides a smart, efficient,

and personalized shopping experience by leveraging AI, real-time user context analysis, and adaptive content delivery. This system enhances user engagement by dynamically adjusting product recommendations, media compression, and page layouts based on device type, network speed, and user behaviour. By optimizing content delivery, our platform ensures faster loading times, reduced bandwidth consumption, and a seamless shopping experience across both desktop and mobile devices.

Several key conclusions can be drawn from the project:

- **Automation improves efficiency** by reducing manual product curation and dynamically adapting content.
- **The AI-driven interface enhances usability** compared to static e-commerce platforms.
- **Personalized shopping experiences** increase customer satisfaction and engagement.
- **Adaptive content delivery reduces server load** and optimizes bandwidth usage.
- **Security and reliability are ensured** through encrypted transactions and robust authentication measures.
- **Scalability and flexibility** allow for future upgrades and enhancements to the platform.

Moving forward, several innovations can be integrated to further enhance the system's capabilities, such as a virtual try-on feature, demand-based pricing, and advanced machine learning functionalities. By incorporating these advancements, our e-commerce platform will continue to evolve, adapting to emerging technologies and market demands. The integration of AI, blockchain, and immersive technologies will enhance security, improve user experiences, and increase sales conversions, making it a truly next-generation online shopping solution.

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