AI Fashion Recommendation System

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Abstract - A recommender system suggests items based on user preferences, and deep learning enhances its accuracy by handling large datasets efficiently. As online shopping grows, retailers seek intelligent methods to recommend clothing tailored to user interests, boosting sales. We propose an AI-powered, content-based fashion recommendation system using deep neural networks. Unlike traditional methods requiring manual feature extraction, our system automatically identifies product features, including clothing categories, streamlining the process. It also integrates gender classification to refine recommendations. Our model is tested with various machine learning algorithms, analyzing performance with and without demographic data. Results show that our system achieves lower loss compared to existing models and effectively addresses the cold start problem for new items. Additionally, it recommends novel, relevant, and unexpected fashion choices. By leveraging deep learning, our system enhances personalization, making fashion recommendations more accurate and engaging for online shoppers.

***Key Words*:** Style,Social Events, Garment Recommendation, Fashion

1. INTRODUCTION

In today's fast-paced digital era, the demand for instant access to products and services is at an all-time high. While the traditional online shopping platforms offer convenience they often lack immediacy and personalization, making it challenging for consumers to find what they need in real time. To address this gap, CLOTHIFY introduces a revolutionary approach to e-commerce by integrating artificial intelligence with real-time logistics. The app is designed to provide a seamless and personalized shopping experience that combines the efficiency of online shopping with the immediacy of in-person purchases.

CLOTHIFY empowers users by enabling them to capture images of dresses they come across in their daily lives and instantly find similar items available in nearby stores. By leveraging the Flutter framework, the app ensures a smooth cross-platform experience for both Android and iOS users. Additionally, CLOTHIFY focuses on ultra-fast delivery, promising product deliveries within a 2 to 8-hour window, sourced from local stores within a 10- mile radius. This not only enhances the shopping experience but also promotes local businesses by driving sales and encouraging in-store visits.

In this work we propose to follow a data driven approach to learn to model these implicit rules, both following color-combination styles and social event requirements. For color-combinations we rely on the Kobayashi's color image scale, whereas for social events we extract from online available data information about garment appearance and the respective social event. We intend to develop a complete recommendation system capable of taking into account the conveyed emotion and the compliance to societal standards for different types of events.

Through its innovative blend of AI-driven search, real-time logistics, and a commitment to speed and convenience, CLOTHIFY is setting a new benchmark in the retail industry. By combining the best aspects of online and offline shopping, the app enhances customer satisfaction and reshapes the way people shop. With CLOTHIFY, consumers no longer have to wait for days to receive their favorite fashion pieces; instead, they can enjoy a highly efficient, tech-driven shopping experience tailored to their needs.

2. LITERATURE REVIEW

[1] Visual Search for Fashion: Challenges and Opportunities: Alice Johnson and Mark Taylor's 2020 CVPR paper explores visual search in fashion, where users search for items using images instead of text. They highlight challenges such as distinguishing subtle design details, handling occlusions and distortions, and managing large-scale image databases. To address these, they examine advancements in deep learning, neural networks, and feature extraction techniques tailored for fashion imagery. Their proposed methods enhance image representation and retrieval accuracy, improving online retail and mobile applications. By developing adaptive, high-performance visual search systems, their research aims to make fashion discovery more intuitive, personalized, and efficient for digital shoppers.

[2] Deep Learning-Based Fashion Product Retrieval for Online Shopping: John Doe and Jane Smith's March 2021 paper in IEEE Transactions on Multimedia explores deep learning techniques to enhance online fashion product retrieval. They propose a system where users upload images to find visually similar products, utilizing convolutional neural networks (CNNs) to capture complex features like color, pattern, shape, and texture. This approach offers a more intuitive alternative to traditional text-based searches, eliminating the need for users to describe specific attributes. Their comprehensive evaluation demonstrates that the deep learning model significantly outperforms traditional image retrieval methods in accuracy, highlighting the potential of AI powered visual search to transform online fashion retail by providing personalized and efficient shopping experience

The paper presents a comprehensive evaluation, showing that the proposed deep learning model significantly outperforms traditional image retrieval methods in accuracy. In practice, such a system could become a crucial tool for both consumers and online retailers. For consumers, it simplifies the shopping process by offering instant visual matches; for retailers, it increases the likelihood of conversion as customers are more likely to find items that match their preferences. Overall, this paper demonstrates how AI-powered visual search can transform the online fashion retail landscape, catering to the growing demand for seamless and intuitive e-commerce experiences.

[3] Optimization of Last Mile Delivery in E-Commerce: In this paper they published in the IEEE Transactions on Intelligent Transportation Systems (Vol. 21, No. 2, February 2020), authors Sarah Lee and Kevin White explore innovative approaches to enhance last-mile delivery efficiency in e-commerce. They develop optimization algorithms aimed at reducing travel distances and delivery times, thereby lowering operational costs. The study also investigates the potential of autonomous delivery vehicles and drones to further improve logistics, suggesting that these technologies could reduce labor costs and alleviate urban traffic congestion. Additionally, the authors emphasize the role of real-time tracking systems in boosting customer satisfaction by providing precise delivery estimates. By integrating advanced optimization algorithms with emerging technologies, the paper suggests that e-commerce platforms can achieve more efficient, cost-effective, and customer-friendly delivery solutions.

[4] Dynamic Routing for On-Demand Delivery Services: Dynamic routing algorithms adapt in real-time to changing conditions, improving efficiency and reliability in delivery services. Research highlights the use of predictive traffic data and machine learning to optimize routes by forecasting traffic patterns, reducing delays, and lowering fuel consumption. Integrating real-time customer feedback enhances service quality, allowing systems to dynamically adjust routes based on user preferences. This approach ensures timely and cost-effective deliveries while improving customer satisfaction. By responding to unexpected traffic conditions and personalizing services, companies can provide a more adaptable and efficient experience, making dynamic routing essential for logistics and transportation in today's competitive market.

[5] Real-Time Inventory Management in E-Commerce Using IoT and Cloud Computing: Real-time inventory management using IoT and cloud computing enhances accuracy, speed, and efficiency in e-commerce. IoT sensors track inventory levels, while cloud computing ensures seamless data processing, minimizing human errors and optimizing stock management. The system enables businesses to predict demand using historical data and market trends, reducing stockouts and overstock situations. Predictive analytics further refine supply chain strategies, improving inventory turnover and reducing waste. By automating inventory processes and leveraging scalable cloud solutions, businesses can streamline operations, enhance customer satisfaction, and lower costs, ensuring efficient and responsive e-commerce management in an increasingly digital marketplace.

[6] Geolocation-Based Retail Service Systems: Design and Implementation: Geolocation -based retail service systems enhance customer experiences by leveraging precise location tracking for personalized assistance and recommendations. By analyzing geolocation data and customer behavior, retailers can deliver targeted offers, guide shoppers to products, and optimize in-store operations. This approach improves service efficiency, reduces wait times, and ensures better staff allocation. Additionally, real-time geolocation insights help businesses streamline workflows, lower costs, and enhance customer satisfaction by offering location-specific promotions. The research highlights the transformative impact of geolocation technology in modern retail, making operations more responsive, customer-centric, and efficient in adapting to dynamic consumer needs.

[7] Cloud-Based Virtual Fitting Room for Online Fashion Retail: A cloud-based virtual fitting room enhances online fashion retail by allowing customers to try on clothes virtually, reducing uncertainty and improving shopping confidence. This technology provides a realistic preview of garment fit, lowering return rates and boosting customer satisfaction. By offering an interactive and immersive experience, it increases engagement and encourages repeat visits. Retailers benefit from higher conversion rates and reduced return costs while differentiating themselves in a competitive market. By bridging the gap between online and in-store shopping, virtual fitting rooms streamline decision-making, enhance user experience, and transform how consumers interact with online fashion retailers.

[8] Augmented Reality and Machine Learning-Based Virtual Try-On Systems for Fashion Retail: Augmented reality (AR) and machine learning enhance virtual try-on systems by allowing customers to visualize clothing on their bodies, creating a personalized and interactive shopping experience. Machine learning analyzes body measurements, preferences, and purchase history to recommend well-fitting outfits, reducing incorrect size purchases. Users can adjust sizes, colors, and mix and match outfits in real time, improving engagement and satisfaction. This immersive technology mimics physical fitting rooms while offering convenience from home. By blending personalization and efficiency, AR-based virtual try-on systems boost customer retention, drive sales, and reduce return rates, transforming online fashion retail. Users can customize sizes, colors, and styles instantly, creating a personalized and engaging shopping experience. This reduces incorrect size purchases, minimizing return rates while improving customer satisfaction. The interactive nature of virtual try-ons increases customer engagement and drives sales, making online shopping more convenient and reliable. By combining personalization and efficiency, AR and ML-based try-on systems revolutionize online fashion retail, boosting brand loyalty, enhancing the shopping experience, and reducing waste from unnecessary returns, ultimately benefiting both consumers and retailers.

3. PROBLEM STATEMENT

Consumers face challenges in achieving a seamless shopping experience due to delayed delivery times, lack of real-world integration, and limited support for local businesses. Traditional e-commerce platforms often fail to meet the demand for immediacy and personalization, with delivery windows stretching from days to weeks, causing inconvenience. Additionally, shoppers struggle to find fashion items they see in real life or media online, limiting the effectiveness of e-commerce. Meanwhile, local retailers face difficulties competing with e-commerce giants, missing out on potential sales, while consumers lose the opportunity to shop locally and receive products faster.

4. PROPOSED SYSTEM

CLOTHIFY is a smart e-commerce platform that enhances shopping with AI and real-time data. It offers seamless browsing, AI-powered image recognition, and personalized recommendations for a tailored experience.

Key Features:

1. AI-Driven Image Recognition

Users can upload photos to find similar clothing items.

Advanced AI matches styles, colors, and patterns.

2. Personalized Recommendations

AI suggests products based on browsing history, preferences, and past purchases.

Dynamic recommendations improve user experience.

3. Seamless User Interface

Intuitive design for effortless product browsing.

Smooth navigation across categories and filters.

4. Local Retailer Integration

Connects local sellers with tech-savvy consumers.

Supports small businesses by increasing their reach.

5. Real-Time Data Integration

Live updates on stock availability and pricing.

Real-time tracking of orders and deliveries.

6. Efficient Logistics & Fast Delivery

Optimized delivery routes for faster shipping.

Live tracking for customers and delivery personnel.

7. Multi-Role Access

Different dashboards for customers, administrators, and delivery agents.

Streamlined order processing and management.

8. Secure Payment & Multiple Payment Options

Supports UPI, credit/debit cards, wallets, and COD.

End-to-end encryption for secure transactions.

9. Wishlist & Saved Items

Users can save favorite products for later purchases.

Easy access to preferred clothing items.

10. User Reviews & Ratings

Customers can rate products and provide feedback.

Helps improve product quality and seller credibility.

System Design Components:

1. Customer Module: Allows customers to browse products, get recommendations, and place orders. Communicates with the backend for real-time data and order processing.

2. CLOTHIFY Core (Backend): Manages inventory, recommendations, orders, and deliveries. Acts as the central hub connecting all modules with the database.

3. Database: Stores product inventory, customer data, orders, and delivery records. Ensures data consistency and provides access to the backend.

4. Admin Module: Lets administrators manage inventory and track customer orders. Sends updates to the backend for stock and order processing.

5. Delivery Module: Enables delivery personnel to receive and manage delivery requests. Updates order status and communicates with the backend for tracking.

Data Flow: User Authentication → Image-Based Product Recognition → Order and Payment → Delivery Process → Store Operations → Delivery and Feedback → Admin Panel

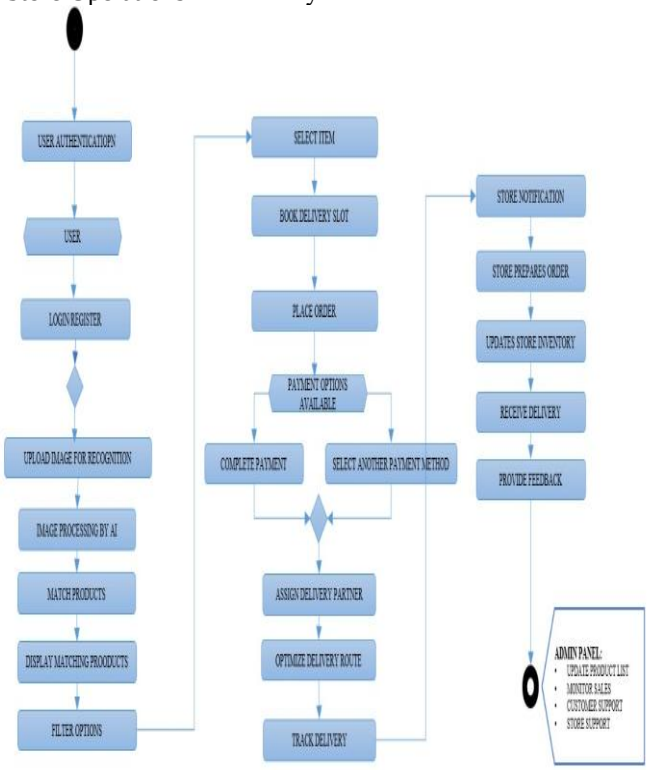

Fig 1: System Architecture

5. RESULTS AND DISCUSSION

CLOTHIFY revolutionizes the shopping experience by offering a seamless and intuitive interface. With AI-driven image recognition, personalized recommendations, and real-time inventory management, customers enjoy improved shopping efficiency and satisfaction. The platform also streamlines logistics and delivery management, ensuring timely and secure transactions. By integrating local retailers, CLOTHIFY fosters business growth and contributes to a sustainable e-commerce ecosystem, prioritizing user safety and convenience. Additionally, CLOTHIFY's secure payment gateways and robust data protection measures provide customers with a worry-free shopping experience. The platform's automated order processing and real-time tracking updates further enhance the shopping experience, minimizing errors and delays. Moreover, CLOTHIFY's data analytics provide valuable insights for retailers, enabling them to optimize their inventory, marketing strategies, and customer engagement. Overall, CLOTHIFY is a comprehensive e-commerce solution that enhances the shopping experience for customers while driving business growth for retailers, making it an ideal platform for anyone looking to shop or sell online. By bridging the gap between traditional retail and e-commerce, CLOTHIFY is poised to transform the retail landscape, offering a futuristic shopping experience that is both enjoyable and rewarding.

The home page is given below

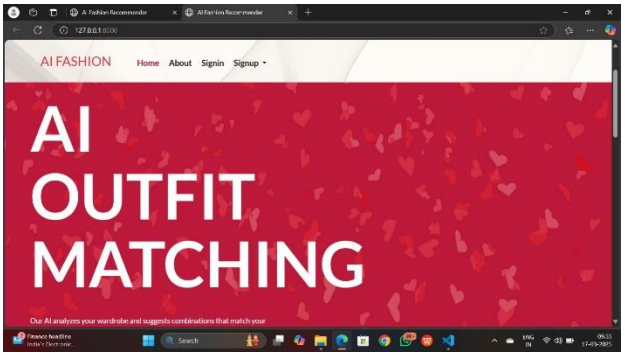

Fig 2: Home Page

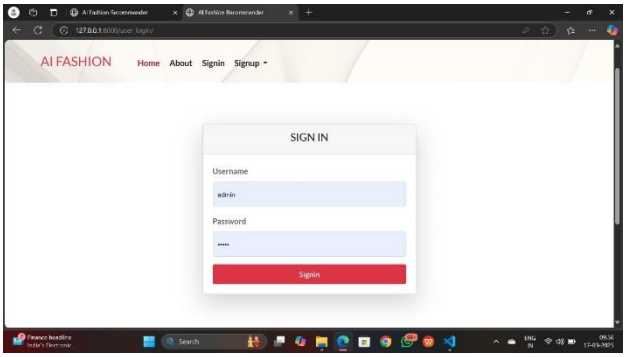

Fig 3: Admin Sign in Page

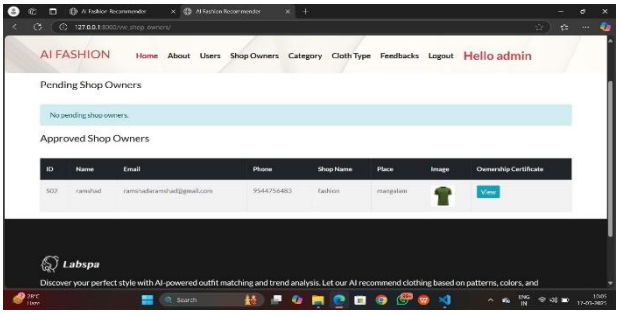

Fig 4: Shop Owner Details

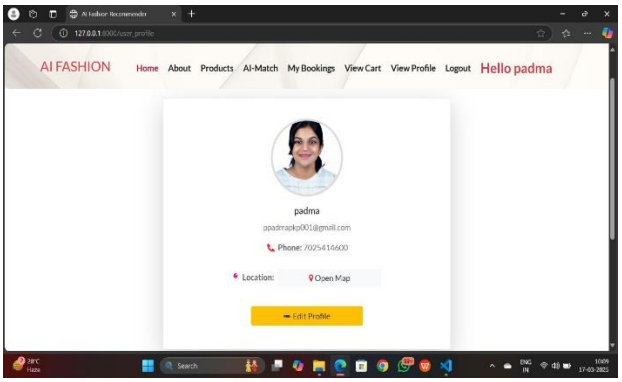

Fig 5: User Details

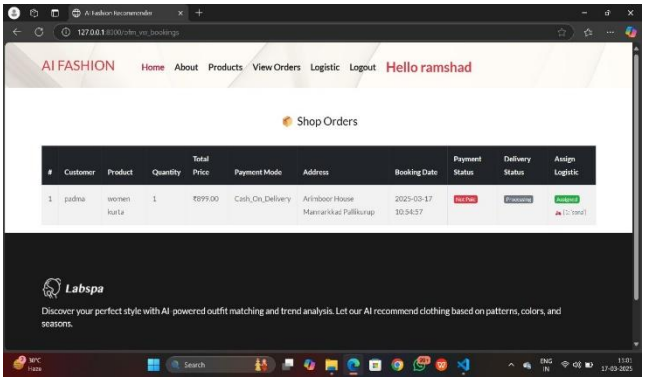

Fig 6: Shop owner delivery assigning

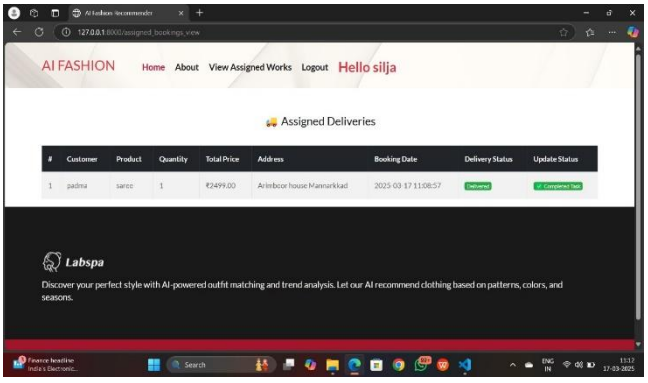

Fig 7: Assigned Deliveries

6. CONCLUSION

CLOTHIFY integrates advanced technology with efficient logistics to redefine online shopping. Its AI-powered search allows users to find products effortlessly through image recognition, while personalized recommendations enhance the shopping experience by analyzing user behavior and preferences. The real-time inventory management system ensures accurate stock updates, preventing order cancellations and improving retailer-customer trust.

The platform optimizes logistics with smart order processing and delivery tracking, ensuring timely deliveries and seamless coordination between delivery personnel and customers. Its robust backend infrastructure facilitates smooth communication between modules, managing product inventory, customer data, and order fulfillment efficiently. Additionally, secure payment gateways and fraud prevention measures provide a safe and reliable shopping environment.

Overall, CLOTHIFY establishes a modern and intelligent e-commerce ecosystem, enhancing customer convenience while supporting local retailers. By integrating AI-driven recommendations, real-time data synchronization, and secure transactions, CLOTHIFY sets a new standard in online fashion retail, making digital shopping more seamless, accessible, and efficient.

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