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Stylemate: A Conversational AI And AR-Based Personalized Shopping Experience

Ms. Natasha Balraj Bogam [1], Ms. Shreya Mahesh Diddi [2], Ms. Kashish Manoj Patel [3]

[1]B. Tech Student, Department of CSE – Artificial Intelligence and Data Science, Shree Siddheshwar Women's College of Engineering, Solapur

[2]B. Tech Student, Department CSE – Artificial Intelligence and Data Science, Shree Siddheshwar Women's College of Engineering, Solapur

[3]B. Tech Student, Department of CSE – Artificial Intelligence and Data Science, Shree Siddheshwar Women's College of Engineering, Solapur

ABSTRACT

In an era of redefining the retail experience through e-commerce, the aspects of personalization and user interaction have become key drivers for customer satisfaction and brand loyalty. This paper proposes an adaptive next-generation e-commerce platform with the use of Artificial Intelligence (AI), Natural Language Processing (NLP), and Augmented Reality (AR) to create a highly personalized and interactive shopping experience. The system has an intelligent AI-based chatbot with real-time, natural-language dialogue for determining user preferences based on body type, skin tone, and emotional response. It has hyper-personalized fashion and accessory suggestions with deep learning algorithms and sentiment analysis. A virtual try-on option using AR allows users to try clothes with a webcam, mobile camera, or uploaded pictures, thereby bridging the gap between offline and online shopping. Further, the platform focuses on sustainability through green product filters and real-time feedback based on user engagement and mood. Through the synergy of emotion-aware AI and immersive AR, our system proposes to transform the online fashion experience to make it more interactive, inclusive, and sustainable.

Keywords: AI, NLP, AR, e-commerce, chatbot, personalized shopping

1. INTRODUCTION

Customers are increasingly looking for more immersive and customized shopping experiences in the rapidly changing world of digital retail. Leading the way in embracing digital trends, the fashion industry now requires platforms that comprehend the needs, preferences, and emotions of the customer in addition to making product recommendations. The visual assurance and human-like interaction that physical shopping provides are absent from traditional online shopping.

StyleMate suggests a comprehensive e-commerce solution that uses augmented reality (AR), natural language processing (NLP), and artificial intelligence (AI) to close this gap. The platform's goal is to mimic an intelligent fashion stylist who can communicate, suggest, and display outfit options based on the individual's preferences, body type, and emotional condition. The use of AR to provide virtual try-ons and real-time facial

recognition emotional analysis improves the user experience by making it more intuitive, interesting, and fulfilling.

Additionally, the platform responds to the values of modern consumers by emphasizing accessibility, inclusivity, and sustainability. StyleMate aims to redefine fashion retail by utilizing state-of-the-art technology to seamlessly connect the digital and physical worlds.

2. LITERATURE REVIEW

A literacy survey of e-commerce users from various socioeconomic backgrounds, ages 18 to 45, was carried out to confirm the necessity and applicability of such an intelligent shopping platform. The goal was to comprehend:

- Customer pain points when shopping for fashion online and awareness of AR/AI
- Interest in tailored style advice
- The significance of inclusive fashion options and sustainability

Important Survey Findings:

- 85% of participants were irritated by incorrect sizing and the inability to "try before buying."
- 72% of respondents expressed interest in an AI assistant that could make fashion recommendations based on preferences and body type.
- When told about AR try-on features, 90% of respondents thought the concept was interesting, while 68% were not aware of their existence.
- If given a clear filter, 60% of respondents said they would favor fashion items with ethical and sustainable sources.
- 70% of respondents acknowledged that their mood affects their wardrobe selections and that they would appreciate suggestions based on their feelings.

These findings support the market's high demand for a shopping assistant that is perceptive, emotional, and visually stimulating.

3. PROPOSED APPROACH

The proposed system is an AI-powered e-commerce platform that uses immersive technology, emotional intelligence, and personalization to transform the fashion shopping experience. Three key technologies are integrated into the platform: machine learning (ML), augmented reality (AR), and natural language processing (NLP). Conversational AI chatbots engage with users in real-time to learn about their preferences, moods, and physical attributes, including skin tone, size, and shape. The system makes personalized clothing and accessory recommendations based on this input.

With the help of a webcam, smartphone camera, or uploaded photos, users can virtually try on clothing with the AR module, providing a realistic image of how the item will fit and look. The platform integrates emotion-based recommendation systems that use sentiment analysis and facial expressions to further improve user engagement.

Recommendations are continuously improved by real-time feedback mechanisms based on sentiment, dwell time, and user reactions. This all-encompassing strategy guarantees a highly personalized and thoughtful shopping experience that connects online and physical retail.

Qualities:

1. AI Closet Organizer: Assists users in creating a virtual wardrobe and makes recommendations for fresh outfit combinations or capsule wardrobes based on previous purchases.
2. Voice Shopping Assistant: Make voice-based interaction and search possible for a more user-friendly experience.
3. Occasion-Based Outfit Generator: Make fashion recommendations based on forthcoming occasions (such as weddings, interviews, or trips).
4. Social Styling: Allow users to poll for feedback before making a purchase or share their outfits with friends.
5. Inclusive Fit Predictor: AI-powered advanced body scanning that increases fit accuracy for users who are plus-sized or differently abled.

4. IMPLEMENTATION

Front-end interfaces, AI-powered back-end services, and real-time augmented reality modules must all be integrated for the suggested e-commerce platform to be implemented. To guarantee scalability and ease of maintenance, the system is constructed with a modular architecture.

- **Frontend:** Created with Flutter for mobile and React.js for the web, this platform offers a dynamic and responsive user experience. WebAR SDKs like 8thWall and DeepAR are used to embed the AR try-on feature.
- **Integration of Chatbots:** Pre-trained NLP models like BERT are used for language comprehension and intent recognition in the conversational AI, which is constructed using Python- based frameworks like Rasa or Dialogflow.
- **Recommendation Engine**: Using scikit-learn and TensorFlow, a hybrid model that combines content-based and collaborative filtering was implemented.
- **Emotion Detection**: OpenCV and deep learning models trained on datasets such as FER2013 make facial emotion recognition possible. This aids in capturing facial expressions in real time while browsing or interacting with chatbots.
- **The AR module**: which was created with Unity and ARKit for iOS and ARCore for Android, enables clothing to be projected onto uploaded or live images. WebXR APIs and Three.js are used for web-based AR.
- **Database & Storage**: MongoDB is used to store product catalogs, while Firebase is used for real-time data synchronization (user profiles, chats, and preferences). Images and AR assets are stored on AWS S3.
- **Feedback Loop**: The recommendation retraining pipeline incorporates real-time user feedback, such as clicks, likes, or expression shifts, which is analyzed using Kafka streams.

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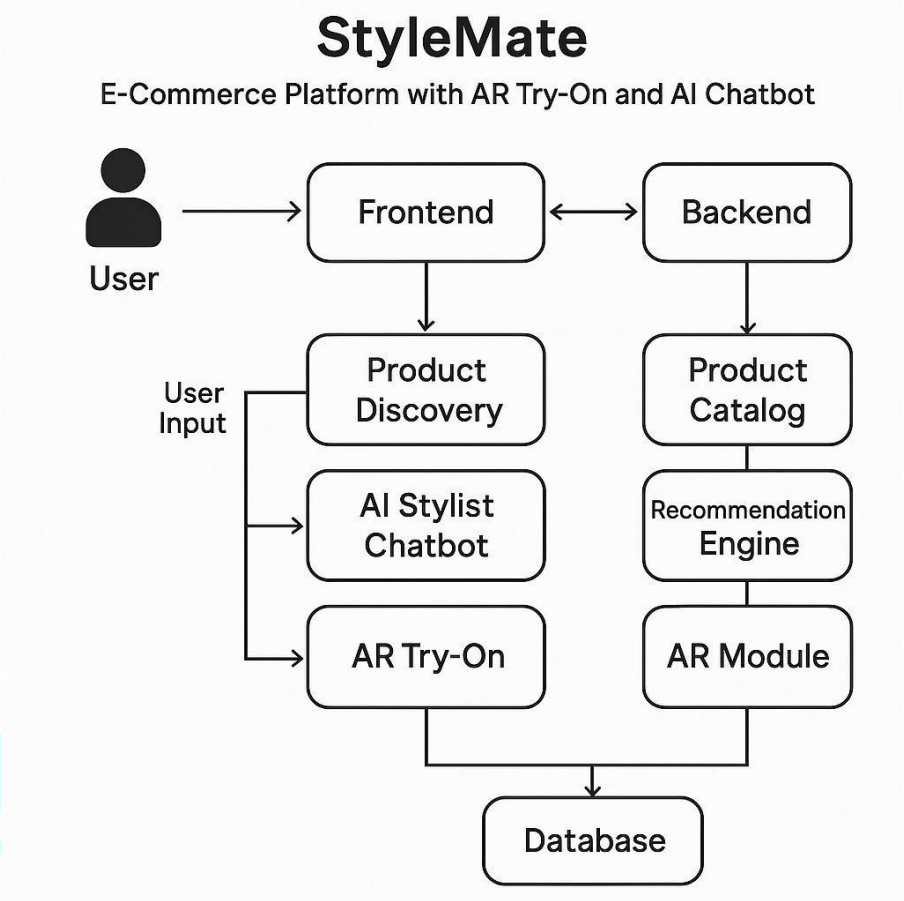

Figure 1 flow-chart

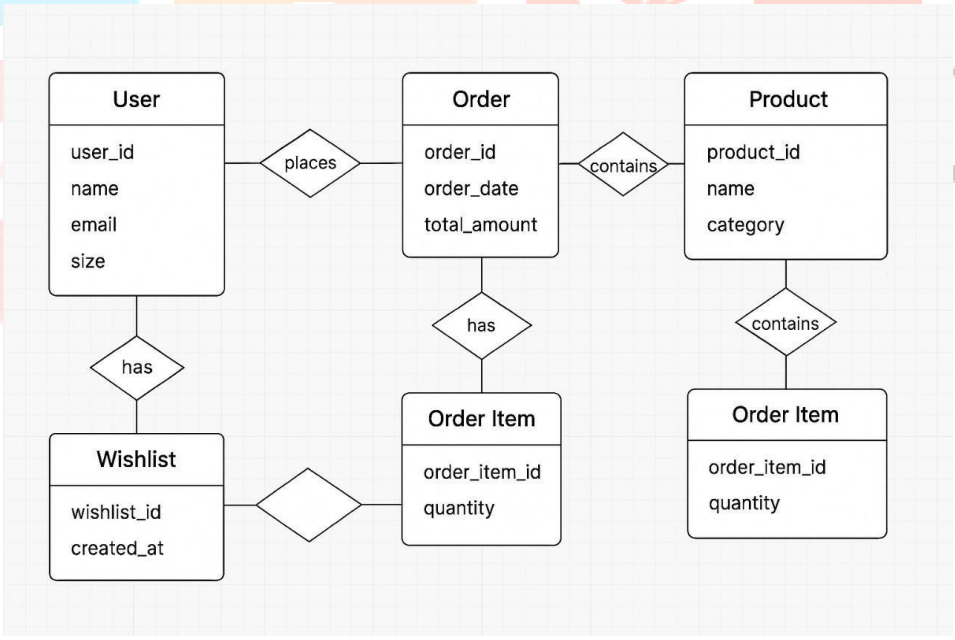

Figure 2 Class Diagram

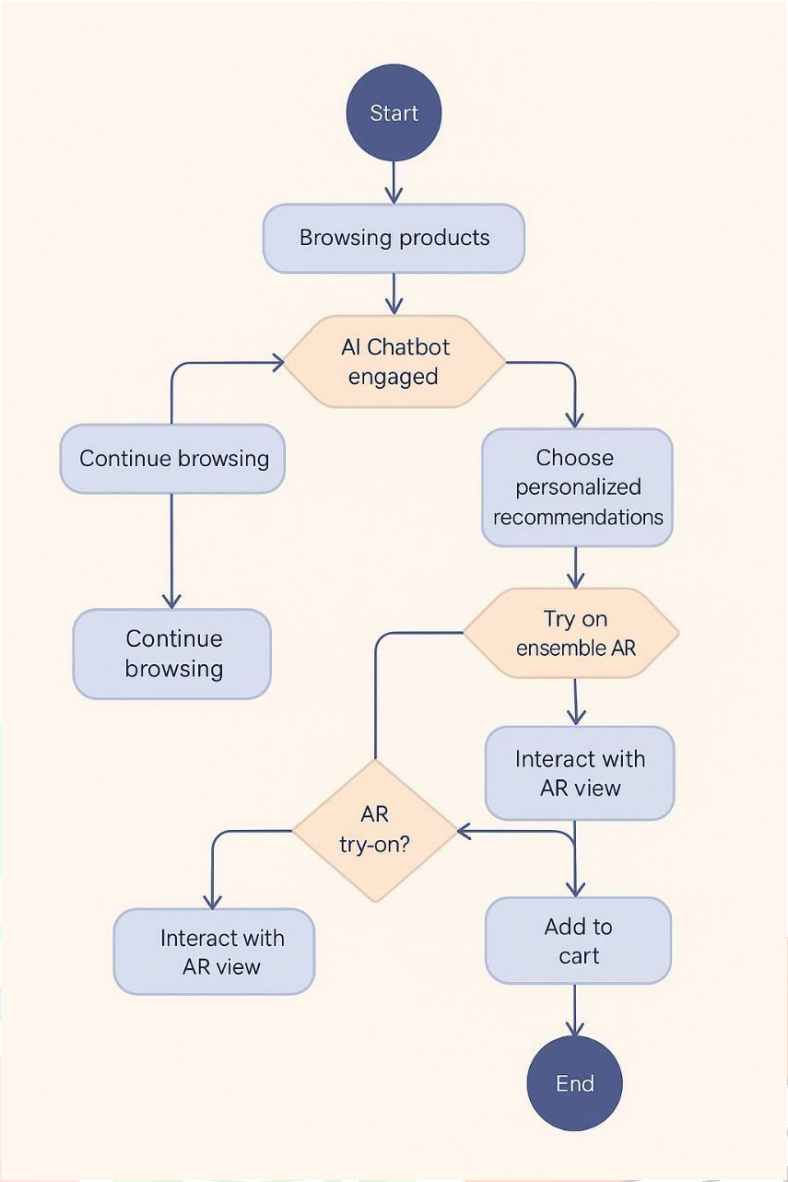

Figure 3 activity diagram

5. USE-CASE

1. *Actor for Personalized Shopping Assistant:*

- User Objective: Receive suggestions that are appropriate in terms of tone, size, and style.

- Flow: The user chats with the AI assistant, providing basic information such as body type, preferred color, and occasion. The AI then provides a list of recommended outfits, which the user can try on using an AR module.

2. *Real-Time Suggestions Based on Emotions*

- Performer: User

- Objective: Allow recommendations to be influenced by mood

The process involves the user perusing products, the webcam identifying facial expressions such as interest or frustration, and the system dynamically updating suggestions (e.g., switching to casual/comfortable styles when the user appears stressed).

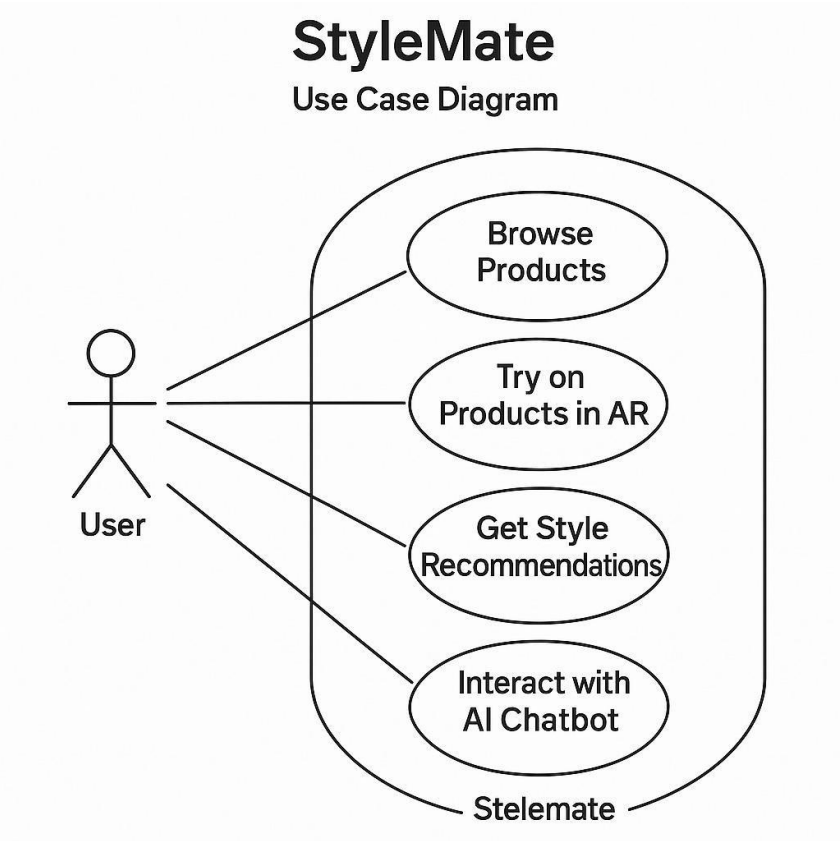

Figure 4 use-case

6. CONCLUSION

The StyleMate platform is an example of how the combination of augmented reality, natural language processing, and artificial intelligence can change the face of online fashion retail. The system solves major e-commerce issues like high return rates, low user engagement, and a lack of trust in online purchases by providing hyper-personalized recommendations that take into account not only user preferences and body profiles but also real-time emotional cues. By bridging the experience gap between online and physical shopping, the AR-powered virtual try-on feature gives users the confidence to make better purchasing decisions. By adding sustainability filters, the platform becomes even more in line with the ideals of consumers who care about the environment, encouraging ethical consumption and brand loyalty.

The platform's scalable and modular design guarantees that it can adjust to changing user demands and technological advancements. An important step toward developing an intelligent, interesting, and inclusive shopping experience has been taken with the integration of emotion-aware recommendation engines and real-time feedback loops. Together, these developments establish StyleMate as a trailblazing product that can raise the bar for immersive, user-focused e-commerce.

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