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Next-Generation Clothing Recommendation System Using AI And User Preference

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Abstract: *This paper presents an AI-based clothing recommendation system designed to improve the online fashion shopping experience. The system uses advanced technologies such as computer vision, deep learning, generative AI, and real-time personalization to provide accurate and personalized outfit suggestions. Unlike traditional recommendation systems, the proposed model understands user preferences through images, text inputs, and user behavior. It can analyze body features and style choices to recommend suitable outfits.*

The system also includes an intelligent virtual try-on feature that allows users to see how clothes may look on them before purchasing. A hybrid recommendation engine combining collaborative filtering, content-based filtering, and AI models is used to improve recommendation accuracy and user satisfaction. The proposed system is scalable, easy to integrate with modern e-commerce platforms, and supports cross-platform usage. Experimental results show that the system improves recommendation quality, user engagement, and overall shopping experience compared to traditional fashion recommendation systems.

Keywords: *recommendation engine*

I. INTRODUCTION

In today's digital world, online shopping has become one of the most popular ways to purchase clothing and fashion products. People prefer online platforms because they provide convenience, a wide variety of choices, and easy access to the latest fashion trends. However, many users still face difficulties while selecting clothes online because they are unsure whether the outfit will suit their body type, style, or appearance.

Traditional online fashion platforms mainly provide basic recommendations based on previous purchases or product popularity. These systems often fail to understand individual user preferences and cannot provide realistic visualization of outfits. As a result, users may experience confusion while choosing clothes, leading to dissatisfaction and higher product return rates. Existing virtual try-on systems are also limited because they mostly rely on static images and do not provide an interactive experience.

To solve these problems, the proposed framework introduces an AI-based clothing recommendation and virtual try-on system. The system analyzes user preferences, body features, and style choices using advanced technologies such as computer vision, deep learning, and recommendation algorithms. It also allows users to try clothes virtually, helping them visualize how outfits may look before making a purchase. This improves personalization, enhances user confidence, and provides a more interactive and realistic online shopping experience.

II. PROBLEM STATEMENT

• Many people face difficulty while purchasing clothes online because they cannot check how the outfit will look on them before buying. This often results in wrong clothing choices, size issues, low customer satisfaction, and increased product returns. Existing shopping platforms do not provide an intelligent system for personalized outfit recommendations and virtual try-on based on the user's appearance and preferences..

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III. OBJECTIVES

1) Recommend clothes based on the user's photo/appearance.
2) Recommend clothes based on the user's skin color, occasion, and body type.
3) Show off your clothes in photos with the help of AI, Pipeline and Open CV
4) Run on Web application

IV. SCOPE

The proposed project focuses on developing a smart AI-powered fashion recommendation system with advanced features that improve personalization and user experience. The system combines Artificial Intelligence (AI), Augmented Reality (AR), computer vision, and recommendation algorithms to provide users with accurate outfit suggestions and realistic virtual try-on capabilities.

One of the key features of the system is personalized outfit recommendation. The application analyzes user inputs such as uploaded photos, style preferences, and body characteristics to suggest clothing that best suits the individual. It considers important factors such as face shape, body type, skin tone, and fashion preferences to generate highly customized recommendations.

Another important feature is the photo upload and 3D avatar creation. Users can upload their images or create a 3D avatar to visualize how outfits will appear on them. This helps users get a realistic preview of clothing before making a purchase and improves confidence while shopping online.

The system also includes an immersive virtual try-on experience using Augmented Reality and AI-based rendering. Users can view outfits in 180° and 360° angles, allowing them to examine clothing from different perspectives. This feature provides a more realistic shopping experience compared to static product images.

The application is designed for cross-platform accessibility, meaning it can be accessed through Android devices, iOS devices, and web browsers. This ensures flexibility and convenience for users across different platforms.

The recommendation engine uses real-time personalization, continuously adapting suggestions based on user behavior, preferences, and interactions. This makes recommendations more relevant and improves user engagement over time.

The project also has future scope for integration with fashion brands and e-commerce platforms, allowing users to directly purchase recommended outfits. Additional future features may include trend analysis, smart wardrobe management, AI fashion assistants, and social sharing capabilities, making the system a complete intelligent fashion shopping platform.

V. LITERATURE SURVEY

TABLE I: LITERATURE SURVEY

Sr. No	Title	Author	Year	Methodology Used	Conclusion
1.	"Generative AI-based Style Recommendation Using Fashion Item Detection and Classification"	Aleksandr Kalinin, Akbar Anbar Jafari, Egils Avots, Cagri Ozcinar, Gholamreza Anbarjafari	2024 June 14th Research Square	Uses YOLOv8 for clothing item detection and GPT-based large language models for generating personalized fashion recommendations. Combines computer vision with NLP for style analysis.	The system provides accurate and high-quality personalized fashion suggestions, showing that combining generative AI with vision models improves recommendation relevance.
2.	" A Review on Clothes Matching and	Atharv Pandit, Kunal Goel, Manav Jain, Neha Katre	August 2020 April 2025 in IJERT (International	Uses multiple approaches like Machine Learning, Fuzzy Logic, Knowledge	The study highlights that combining user attributes with

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	Recommendation Systems based on User Attributes"		Journal Engineering Research and technology).	Graphs, and Latent SVM. Focuses on matching clothes based on attributes such as color, texture, skin tone, and occasion.	intelligent algorithms significantly improves clothing recommendation systems and personalization.
3.	" LuxeVogue: Personalized AI Fashion Recommendation System"	Prof. S. R. Chunamari et al.	April 2025 in IJARCCE (International Journal of Advanced Research in Computer and Communication Engineering)	Uses computer vision techniques like Detectron2 and OpenCV for body shape and skin tone detection. Applies deep learning (ResNet-based models) and recommendation logic for personalized suggestions.	The system successfully delivers personalized fashion recommendations based on physical attributes, improving user experience and engagement.

VI. METHODOLOGY

The proposed system follows a structured methodology:

A. Requirement Analysis

Identify user needs including personalization, visualization accuracy, and usability.

B. System Design

Develop a modular architecture integrating frontend, backend, and AI components.

C. Data Processing

• Image preprocessing for feature extraction
• Text preprocessing for understanding user preferences

D. Model Implementation

• Computer Vision for body feature detection
• NLP for interpreting user input
• Generative AI for outfit creation

E. Integration

Combine AI modules with recommendation engine and user interface.

F. Testing and Validation

Evaluate system performance based on user interaction and feedback.

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VII . ARRCHITETURE DIAGRAM

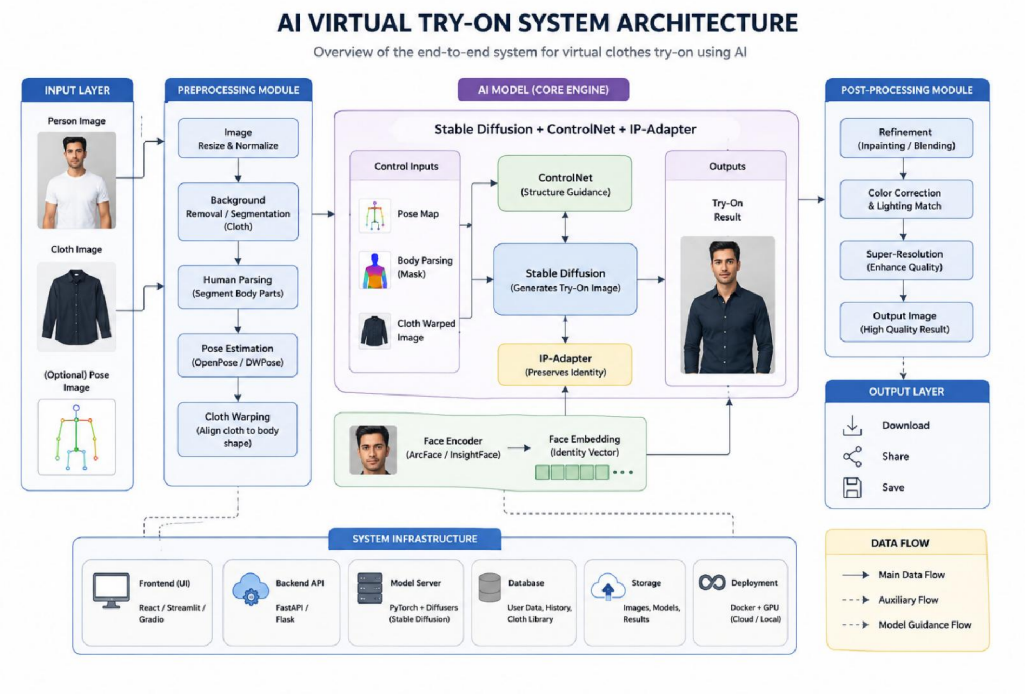

Figure 1. Architecture Diagram

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VIII. FLOWCHART DIAGRAM

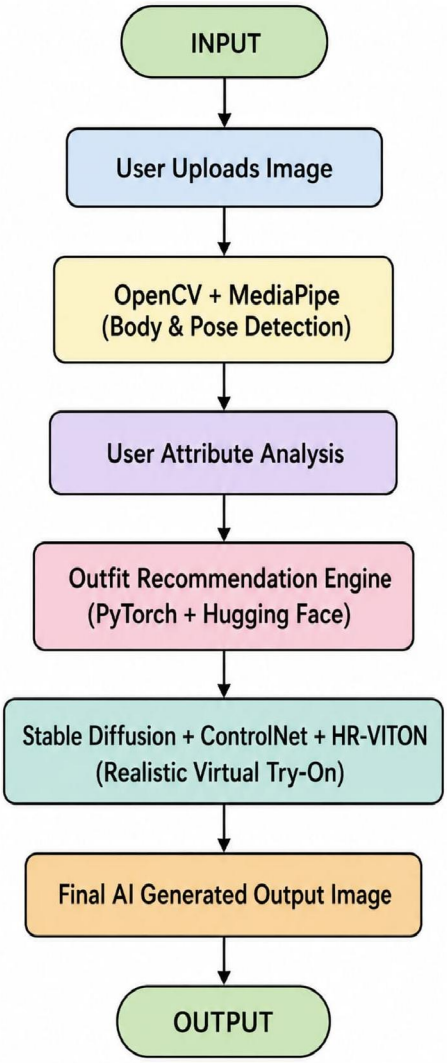

Figure 2 .Flowchart Diagram

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IX . SYSTEM DESIGN

The system is built on a modular architecture with the following components:

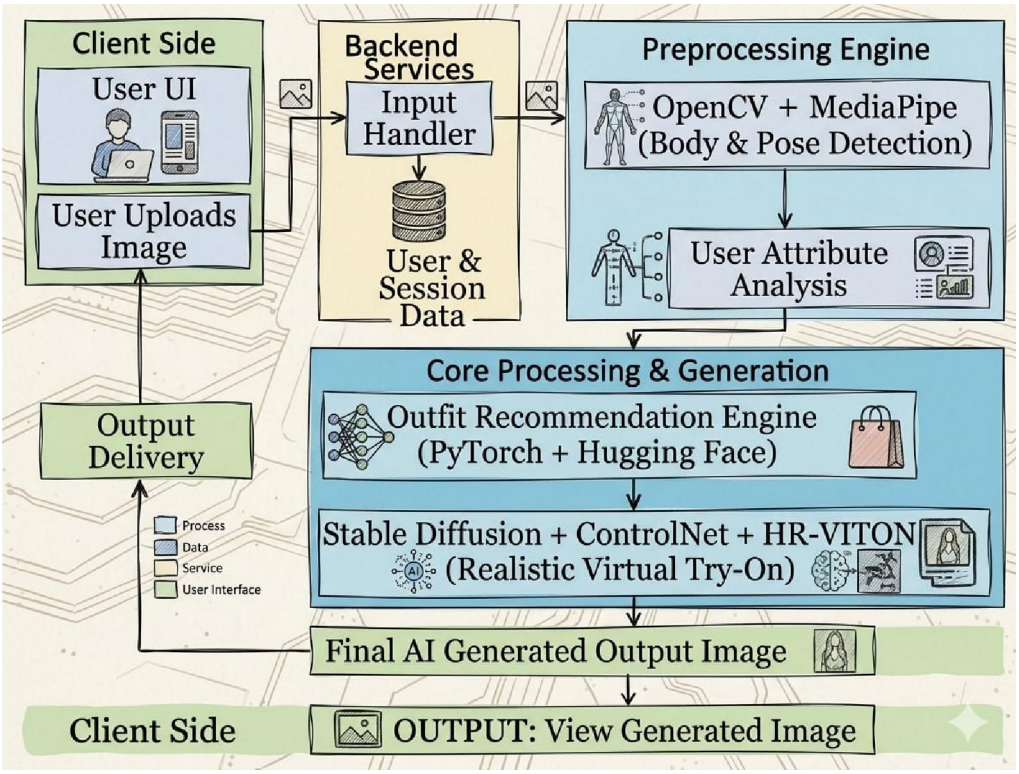

Figure 1. System Diagram

X . SYSTEM FUNCTION

The proposed AI-based fashion assistant performs several key functions to deliver a personalized and interactive user experience:

1. User Input Handling

The system accepts:

• User image (for body and appearance analysis)

• Text input (for style preference, occasion, or requirements)

2. Data Preprocessing

• Image preprocessing (resize, normalization, noise removal)

• Text preprocessing (tokenization, keyword extraction)

3. Feature Extraction

• Extract body features such as shape, size, and proportions using computer vision

• Extract style intent from text using NLP techniques

4. AI-Based Processing

• Computer Vision model analyzes visual features

• NLP model understands user preferences

• Generative AI creates outfit combinations dynamically

5. Recommendation Engine

• Uses hybrid filtering:

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o Content-based (product features)
o Behavior-based (user activity)
• Generates personalized outfit suggestions

6. Virtual Try-On Function

• Applies selected outfit to user image
• Provides realistic visualization using AI rendering

7. Data Storage

• Stores user preferences, history, and outfit data in database

8. Output Generation

• Displays recommended outfits
• Shows virtual try-on results
• Allows user interaction and feedback

XI . RESULTS & DISCUSSION

The proposed AI-based Virtual Try-On and Clothing Recommendation System successfully analyzes user images and generates personalized outfit recommendations with realistic virtual try-on results. The system uses OpenCV and MediaPipe for body and pose detection, PyTorch and Hugging Face for recommendation generation, and Stable Diffusion with ControlNet and HR-VITON for realistic clothing visualization

However, some limitations were observed:

Performance may decrease with low-quality or unclear images.

Complex poses and overlapping objects can affect body detection accuracy.

High computational resources are required for AI image generation models.

Overall, the project demonstrates how Artificial Intelligence, Computer Vision, and Generative AI can be combined to create an intelligent fashion recommendation and virtual try-on platform for future e-commerce applications.

XII. CONCLUSION

This paper presents a multimodal AI-based fashion assistant that integrates computer vision, natural language processing, and generative AI to address the limitations of existing systems. The proposed solution enhances personalization and provides realistic virtual try-on capabilities, improving user experience in online fashion platforms. Future work can focus on advanced 3D modeling and real-time AR integration.

XIII. ACKNOWLEDGMENT

We would like to express our sincere gratitude to all those who supported and guided us throughout the completion of this research work titled “Next-Generation AI-Powered Clothing Recommendation System Using Computer Vision, Generative AI and Real-Time Personalization.”

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