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Al Outfit Try-On and Suitability Checker

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ABSTRACT

The Al Outfit Try-On and Suitability Checker is an intelligent system developed to improve the online shopping experience by allowing users to virtually try outfits before purchasing them. In current online shopping systems, customers often face difficulty in selecting suitable clothes because they cannot physically try them. This creates confusion about size, fitting, and overall appearance. The proposed system uses Artificial Intelligence, Computer Vision, and Machine Learning techniques to solve this problem. It allows users to capture or upload their image and virtually view how selected outfits look on them. The system processes the user image using OpenCV and detects body landmarks using MediaPipe Pose Detection. Based on body structure and alignment, the outfit is placed over the user image to create a virtual try-on effect. The system then analyzes the fitting and generates a suitability score to indicate how well the outfit matches the user. It also provides simple style suggestions for better outfit selection. The project is developed using Python as the backend language and Tkinter as the user interface. Hugging Face models are used to improve intelligent prediction and outfit suitability analysis. This system helps users make better purchase decisions, reduces product return rates, saves time, and provides a personalized shopping experience. It can be further extended for real-time fashion recommendation systems in e-commerce platforms.

1.INTRODUCTION

1.1 INTRODUCTION OF THE PROJECT

The AI Outfit Try-On and Suitability Checker is a modern application designed to assist users in selecting appropriate clothing

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by virtually trying outfits and receiving intelligent recommendations. The system leverages artificial intelligence, computer vision, and deep learning techniques to simulate how garments look on a person and evaluate their suitability based on body type, occasion, color harmony, and personal preferences. The development of this system involves a combination of data collection, model training, user interface design, and integration of recommendation algorithms.

To begin with, the system requires a dataset consisting of clothing images, human body images, and labeled attributes such as clothing categories, styles, colors, and occasions. These datasets may include both real-world images and annotated fashion datasets. The user provides input in the form of an image or live camera feed. The system processes this input using computer vision techniques to detect the human body, segment it, and identify key features such as body shape, posture, and size.

The next step involves garment representation. Each clothing item in the database is preprocessed and stored with its attributes and visual features. The system uses deep learning models such as convolutional neural networks (CNNs) to extract features from both user images and clothing images. These features are then used to match clothing items with the user's body and preferences.

The virtual try-on component is implemented using image warping and generative models. Techniques like pose estimation help align the clothing with the user's body. The system maps the garment onto the detected body region, adjusting for scale, orientation, and deformation. Advanced models such as Generative Adversarial Networks (GANs) can be used to generate realistic images of the user wearing the selected outfit.

The suitability checker component evaluates how well an outfit fits the user. This includes analyzing color combinations, matching styles, and considering contextual factors such as weather, occasion, and cultural norms. Machine learning models trained on fashion datasets can classify outfits as formal, casual, sporty, or festive. The system also incorporates rule-based logic for color harmony, ensuring that selected outfits follow aesthetic principles.

User preferences play a crucial role in the system. The application allows users to input preferences such as favorite colors, styles,

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brands, and occasions. Over time, the system learns from user interactions using recommendation algorithms and improves its suggestions. Collaborative filtering and content-based filtering can be used to personalize recommendations.

2. LITERATURE SURVEY

The development of AI-based outfit try-on systems and suitability checkers has been widely explored in recent years. Various researchers have contributed to this domain by proposing innovative techniques for virtual clothing simulation and recommendation systems.

One of the foundational works in this area is by Han et al. (2018), who introduced the VITON (Virtual Try-On Network). This model uses a coarse-to-fine approach to synthesize images of a person wearing a target clothing item. The system combines a clothing segmentation module with a refinement network to generate realistic outputs. This work laid the groundwork for many subsequent virtual try-on systems.

Wang et al. (2018) proposed the CP-VTON model, which improved upon VITON by introducing a geometric matching module. This module aligns clothing items more accurately with the user's body using thin-plate spline transformations. The approach significantly enhanced the realism of virtual try-on images and reduced distortions.

Another important contribution is by Jetchev and Bergmann (2017), who explored the use of conditional generative adversarial networks (cGANs) for fashion image generation. Their work demonstrated the potential of GANs in generating high-quality images conditioned on specific attributes, which is crucial for virtual try-on applications.

Liu et al. (2016) focused on deep fashion analysis, introducing a large-scale dataset for clothing recognition and retrieval. Their work enabled the development of robust models for identifying clothing attributes, which are essential for recommendation systems and suitability analysis.

In the domain of outfit recommendation, McAuley et al. (2015) proposed a model that learns visual compatibility between clothing items. Their approach uses deep learning to understand relationships between different fashion items, enabling the system to recommend outfits that are aesthetically pleasing.

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Veit et al. (2015) also contributed to understanding style compatibility by learning embeddings for clothing items. Their model captures semantic relationships between items, allowing for better outfit coordination and recommendation.

Ishikawa et al. (2017) explored personalized fashion recommendation systems. Their work emphasized the importance of user preferences and historical data in generating relevant suggestions. They used machine learning techniques to adapt recommendations based on individual tastes.

Zhao et al. (2017) introduced a framework for fashion compatibility modeling using neural networks. Their approach considers both visual and contextual information, improving the accuracy of outfit recommendations.

In terms of body modeling and pose estimation, Cao et al. (2017) developed OpenPose, a real-time multi-person pose estimation system. This technology has been widely used in virtual try-on systems to accurately detect body keypoints and align clothing items.

Dong et al. (2019) proposed a system that integrates pose estimation with GAN-based image synthesis. Their approach improves the alignment of clothing with complex body poses, resulting in more realistic try-on results.

3.METHODOLOGY

The methodology for developing an AI Outfit Try-On and Suitability Checker involves several stages, including data preprocessing, model development, system integration, and evaluation. Initially, a dataset is collected containing images of clothing items and human subjects. These images are annotated with attributes such as clothing type, color, style, and occasion.

The preprocessing stage involves resizing images, normalizing pixel values, and performing data augmentation techniques such as rotation and flipping. This helps improve the robustness of the model. Human images are processed using pose estimation algorithms to detect key body points and segment different regions.

The model development phase includes training a convolutional neural network to extract features from images. A separate module is used for garment alignment, which maps clothing items onto the user's body using geometric transformations. A

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generative model is then employed to produce realistic images of the user wearing the selected outfit.

The suitability checker is implemented using a classification model trained on labeled fashion data. This model evaluates outfits based on predefined criteria such as color harmony, style compatibility, and appropriateness for specific occasions. Recommendation algorithms are integrated to suggest outfits based on user preferences and historical data.

4.EXISTING METHODS

Existing methods for outfit try-on and suitability checking primarily rely on traditional image processing and basic machine learning techniques. Early systems used 2D image overlay methods, where clothing images were simply superimposed onto user images. These methods lacked realism and failed to account for body shape and pose variations.

Another common approach involved rule-based recommendation systems. These systems used predefined rules for matching clothing items based on color and category. While simple, these methods lacked personalization and adaptability.

Some systems utilized basic content-based filtering, where recommendations were generated based on similarities between clothing items. However, these methods did not consider user preferences or contextual factors, limiting their effectiveness.

In terms of virtual try-on, earlier approaches used manual adjustments and static templates. These systems required significant user input and were not scalable. They also struggled with complex poses and diverse body types.

Overall, existing methods are limited by their inability to produce realistic results and provide personalized recommendations. They lack the advanced capabilities offered by modern AI techniques.

5. PROPOSED SYSTEM

The proposed system introduces an advanced AI-based approach to outfit try-on and suitability checking. It combines deep learning, computer vision, and recommendation algorithms to provide a comprehensive solution.

The system uses a convolutional neural network for feature extraction and a generative adversarial network for realistic image synthesis. A geometric matching

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module ensures accurate alignment of clothing items with the user's body. Pose estimation techniques are used to handle different body positions and orientations.

The suitability checker incorporates both machine learning and rule-based components. It evaluates outfits based on color harmony, style compatibility, and contextual relevance. The system also integrates user preferences to provide personalized recommendations.

A key feature of the proposed system is its ability to learn from user interactions. Feedback mechanisms allow the system to adapt and improve over time. The user interface is designed to be interactive and intuitive, providing a seamless experience.

Compared to existing methods, the proposed system offers improved realism, accuracy, and personalization. It addresses the limitations of earlier approaches and provides a scalable solution for modern fashion applications.

6. OUTPUT SCREENS

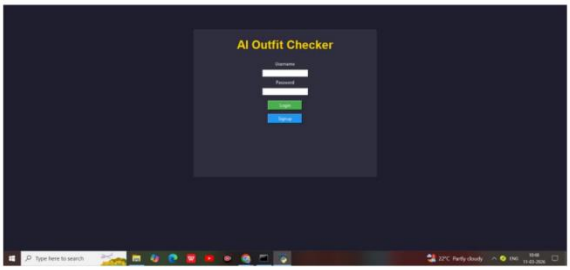

Fig 6.1: Welcome page

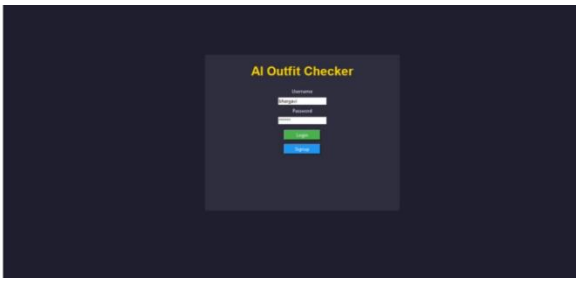

Fig 6.2: Entering the Credientials

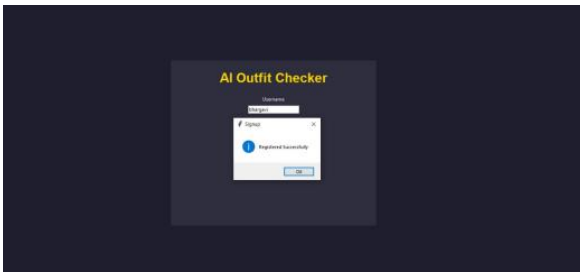

Fig 6.3: Registration Successful Page

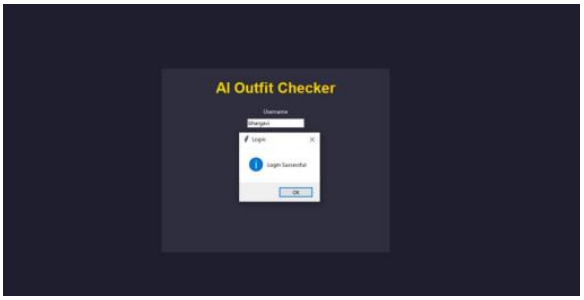

Fig 6.4: Login Successful Page

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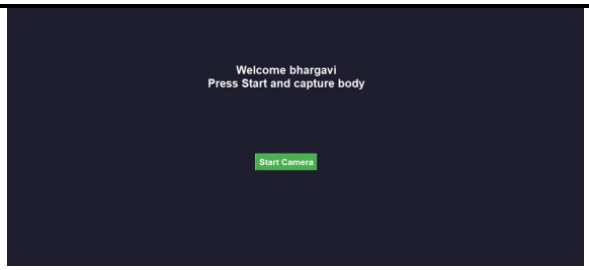

Fig 6.5: Capture Body Page

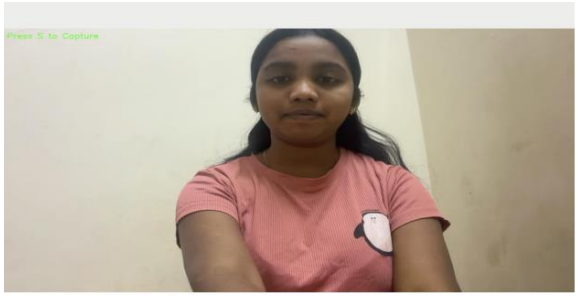

Fig 6.6: Captured Body Page

Fig 6.7: Upload Outfit Page

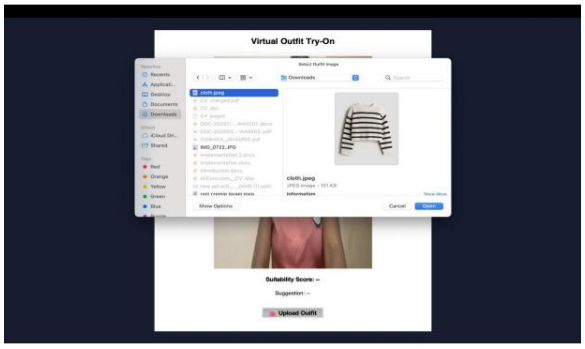

Fig 6.8: Selecting Outfit from the File

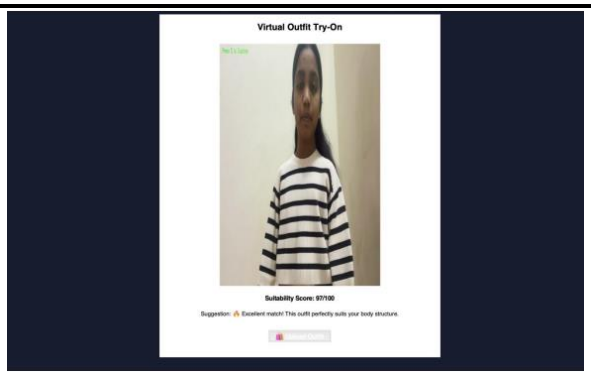

Fig 6.8: AI Virtual Try On of the selected Outfit

7. CONCLUSION

The Smart Dress Suitability Analyzer successfully uses a real-time camera feed along with computer vision techniques to analyze body posture and provide accurate dress suitability feedback. The system generates a suitability score and useful style suggestions, helping users choose appropriate outfits with ease. This project demonstrates how technology can simplify fashion selection and improve user confidence through intelligent and real-time analysis.

8. FUTURE SCOPE

The future scope of the AI Outfit Try-On and Suitability Checker is vast, driven by rapid advancements in artificial intelligence, computer vision, and augmented reality. One of the most promising directions is the integration of real-time augmented reality

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(AR), where users can visualize outfits directly on themselves using mobile devices or smart mirrors. This would eliminate the need for static image uploads and provide a more immersive and interactive experience.

Another significant area of improvement is the enhancement of realism in virtual try-on systems. Future models can leverage more advanced generative techniques to produce highly detailed and accurate representations of fabrics, textures, and lighting conditions. This includes simulating how clothes move with the body, how they wrinkle, and how they respond to environmental factors such as wind or motion.

Personalization will continue to evolve with the integration of more sophisticated recommendation systems. By incorporating user behavior, purchase history, social media trends, and even emotional preferences, the system can provide highly tailored outfit suggestions. The use of reinforcement learning can further improve recommendations by continuously adapting to user feedback.

The system can also be expanded to include cross-domain fashion intelligence. For instance, it can suggest outfits based on cultural norms, regional trends, or specific events. Integration with weather forecasting systems can enable the application to recommend weather-appropriate clothing, enhancing practicality.

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