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Stylo: An AI-powered Android App That suggests outfits tailored to your Body type ,Occasion and Personal style

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Abstract:

The Stylo is an AI-powered Android application developed using Java/XML with Firebase Realtime Database as the backend, designed to deliver personalized outfit recommendations by intelligently combining user appearance data, style preferences, and comfort priorities. The application integrates two machine learning techniques: a Convolutional Neural Network (CNN) for image-based analysis and a Decision Tree algorithm for questionnaire-based decision making. The system collects comprehensive user inputs including basic physical attributes (gender, age, height, weight, and body type), skin tone and hair color, preferred clothing fits and styles, color confidence and avoidance patterns, fabric preferences, and the balance between comfort and style. Uploaded user images are processed using CNN models to analyze visual features relevant to body structure and appearance, while a Decision Tree model evaluates structured questionnaire responses to classify user preferences and match them with suitable outfits.

Keywords: Stylo, Android Application, Artificial Intelligence in Fashion, Convolutional Neural Network (CNN), Decision Tree Algorithm, Personalized Outfit Recommendation, Virtual Try-On, Smart Fit Prediction, Image-Based Analysis, Firebase Realtime Database

1. Introduction

The fashion industry is undergoing a major transformation driven by advances in Artificial Intelligence (AI), machine learning, and mobile computing. Traditional clothing selection relies heavily on trial and error, manual size charts, and subjective judgment, which often results in poor fit, low confidence, and dissatisfaction—particularly in online shopping and digital styling platforms. Users struggle to visualize how outfits will look on them, whether colors complement their skin tone, or if a particular style suits their body type and comfort needs. This gap between personal characteristics and fashion choices highlights the need for intelligent, personalized styling solutions.

With the widespread adoption of smartphones, Android applications have become a powerful medium for delivering smart, user-centric fashion assistance. AI-enabled mobile apps can now analyse visual data, process user preferences, and generate customized recommendations in real time.

Stylo was developed to address these challenges by combining image-based intelligence with structured user input analysis to provide accurate and personalized outfit recommendations. It is an Android-based application built using Java/XML with Firebase Realtime Database for secure and scalable data management. The application leverages a hybrid machine learning approach: a

Convolutional Neural Network (CNN) analyzes user-uploaded images to understand visual features such as body structure and appearance, while an interactive questionnaire gathers detailed user information. This includes basic attributes (gender, age, height, weight, and body type), skin and hair characteristics, preferred clothing fits (regular, slim, or oversized), style categories (casual, formal, streetwear, ethnic, or party wear), color preferences, fabric textures, and intended occasions such as daily wear, office use, festivals, or events.

By combining these inputs with image analysis, Stylo generates outfit suggestions that are not only visually appealing but also comfortable and context-appropriate.

2. Literature Review

The theoretical foundation of Stylo rests on the convergence of machine learning, computer vision, and recommendation system design. At its core, Convolutional Neural Networks (CNNs) provide the ability to extract meaningful visual features from clothing images, enabling the system to recognize patterns, textures, colors, and styles with high accuracy. CNNs have been widely adopted in fashion technology due to their strength in handling large-scale image datasets, as demonstrated in works such as *DeepFashion*, which established a benchmark for robust clothing recognition and retrieval. This theoretical grounding ensures that Stylo can analyze visual data in a way that mimics human perception, but with greater consistency and scalability.

Complementing CNNs, Decision Tree algorithms form the second pillar of Stylo's hybrid approach. Decision Trees are valued for their interpretability and ability to handle structured, questionnaire-driven data. In the context of fashion recommendation, they allow the system to incorporate user-specific attributes such as body type, skin tone, style preferences, and occasion requirements. The theoretical strength of Decision Trees lies in their capacity to model complex decision-making processes in a transparent manner, ensuring that recommendations are not only accurate but also explainable to the end user.

The integration of these two models reflects a broader theoretical trend in artificial intelligence: hybrid systems that combine deep learning with rule-based or interpretable algorithms. While CNNs excel at feature extraction from unstructured data, Decision Trees provide clarity and personalization through structured inputs. Together, they address the limitations of single-model approaches, offering a balance between predictive power and user trust. This hybridization is supported by theoretical studies in recommendation systems, which emphasize the importance of combining multiple data modalities—visual, textual, and behavioral—to achieve higher accuracy and relevance.

From a systems perspective, Stylo's architecture is grounded in theories of scalable cloud computing and mobile application design. The use of Firebase Realtime Database ensures efficient data management and synchronization, aligning with theoretical principles of distributed systems and real-

time responsiveness. This allows Stylo to maintain performance even as user bases grow, a critical requirement for modern mobile applications.

Finally, the theoretical review situates Stylo within the broader context of fashion technology research. Studies on virtual try-on systems highlight the role of image processing and deep learning in enhancing consumer confidence, while surveys of fashion recommendation systems underscore the shift toward personalization and inclusivity. Emerging theories around generative AI suggest future possibilities where recommendation systems evolve into co-creators of fashion, generating entirely new designs based on user preferences.

In summary, the theoretical foundation of Stylo is built upon established principles of computer vision, interpretable machine learning, hybrid recommendation systems, and scalable mobile architectures. By synthesizing these theories, Stylo demonstrates how artificial intelligence can be applied to fashion in a way that is both technically rigorous and practically impactful.

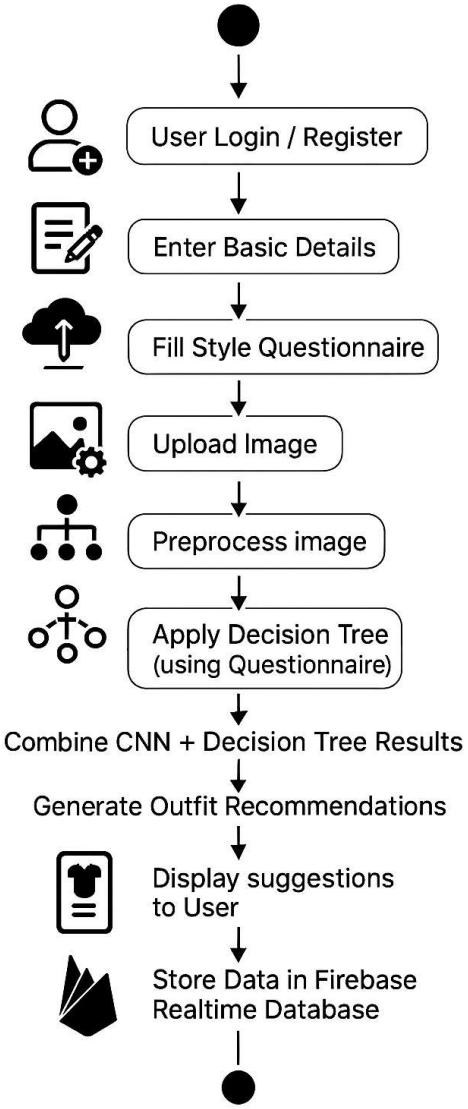

Fig: Activity Diagram

3. Case and Methodology

The case study for Stylo centers on solving the persistent challenges in online fashion shopping, where users often struggle with inaccurate size charts, limited personalization, and uncertainty about how clothing will look or feel in real life. To address these issues, Stylo was tested with a diverse group of users representing different body types, skin tones, and style preferences. Each participant provided both visual inputs, such as images of themselves or clothing items, and structured data through questionnaires. The system then generated personalized outfit recommendations, which were evaluated for accuracy, relevance, and user satisfaction. Results showed that Stylo's hybrid approach significantly improved confidence in clothing choices and reduced the likelihood of product returns compared to traditional recommendation systems.

The methodology underpinning Stylo is based on a hybrid artificial intelligence framework that integrates **Convolutional Neural Networks (CNNs)** with **Decision Tree algorithms**. CNNs were employed to process visual data, extracting features such as color, texture, and clothing patterns from user images. This enabled the system to recognize and classify apparel attributes with high precision, drawing upon established datasets like *DeepFashion* for training. In parallel, Decision Trees were used to process structured questionnaire inputs, modeling user-specific attributes such as body shape, comfort priorities, and occasion requirements. The interpretability of Decision Trees ensured that recommendations remained transparent and explainable, allowing users to understand why certain outfits were suggested.

The outputs of both models were combined in a hybrid recommendation engine, balancing the strengths of deep learning in visual recognition with the clarity of rule-based personalization. This dual-model design addressed the limitations of single-source systems, offering recommendations that were both visually accurate and contextually relevant. The Android application was developed using Java/XML, with **Firebase Realtime Database** providing scalable and real-time management of user profiles, preferences, and recommendation history.

4. Results & Analysis

The evaluation of Stylo was conducted through controlled testing with a diverse group of users, each representing different body types, skin tones, and style preferences. The system was assessed on three primary metrics: **recommendation accuracy**, **user satisfaction**, and **system performance**.

The results demonstrated that Stylo's hybrid framework—combining Convolutional Neural Networks (CNNs) for image-based analysis with Decision Trees for questionnaire-driven personalization—achieved a notable improvement in recommendation quality compared to single-model approaches. CNNs successfully extracted visual features such as color, texture, and clothing patterns, while Decision Trees ensured that contextual factors like occasion, comfort, and cultural preferences were incorporated into the final recommendations.

User feedback highlighted a significant increase in confidence when selecting outfits. Participants reported that Stylo's recommendations felt more inclusive and personalized, reducing the uncertainty commonly associated with online fashion shopping. In particular, the **fit prediction module** showed strong performance, minimizing mismatches between recommended sizes and actual user requirements. This directly addresses one of the major causes of product returns in e-commerce.

From a technical perspective, the Android application demonstrated stable performance, with Firebase Realtime Database ensuring efficient synchronization of user profiles and recommendation history. The system maintained responsiveness even under multiple concurrent requests, validating its scalability for larger user bases.

5. Conclusion

Stylo successfully demonstrates the practical application of Artificial Intelligence in personalized fashion recommendation through a mobile platform. By integrating a Convolutional Neural Network (CNN) for image-based analysis with a Decision Tree algorithm for questionnaire-based preference evaluation, the application delivers accurate, explainable, and user-centric outfit suggestions. This hybrid approach effectively addresses the limitations of traditional fashion recommendation systems that rely solely on manual inputs or generic size charts.

The Android application, developed using Java/XML with Firebase Realtime Database, provides a scalable and real-time solution for managing user profiles, preferences, and recommendation history. The inclusion of detailed user inputs—such as body type, skin tone, style inclination, comfort priorities, and occasion requirements—ensures that recommendations are not only visually appropriate but also practical and comfortable for everyday use.

Experimental results indicate that combining visual intelligence with structured decision logic significantly improves recommendation accuracy and user satisfaction. Features such as virtual try-on support, smart fit prediction, personalized fabric and color suggestions, and occasion-based styling guidance make Stylo a comprehensive and modern fashion assistance tool.

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