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Personality Based Clothing Recommendation Using Deep Learning and Artificial Intelligence

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Abstract
A Personality-Based Clothing Recommendation System using Deep Learning and Artificial Intelligence aims to provide personalized outfit suggestions by analyzing both user personality traits and clothing image features. Traditional recommendation systems rely mainly on purchase history or manual preferences, which often fail to capture a user's unique style identity. This system integrates AI-driven personality profiling with CNN-based clothing image classification to generate accurate and meaningful recommendations. Convolutional Neural Networks (CNN) are used to classify clothing images into style categories by analyzing colour, texture, and design patterns. Meanwhile, personality traits—derived using psychological models such as the Big Five—are mapped to relevant fashion styles. By combining personality analysis and visual feature extraction, the system delivers customized outfit recommendations that better align with individual behaviour, preferences, and identity. This AI-powered approach enhances user engagement and helps e-commerce platforms offer human-like styling assistance.

Keywords: Recommendation Systems, Body Size Measurement, Deep Learning, User Preference Modelling, Computer Vision, AI, CNN, Fashion Analytics, Personalized Styling, Style Suggestion, Big Five Personality Traits (OCEAN).

1. Introduction

In recent years, the rapid growth of e-commerce and digital fashion platforms has transformed the way people choose and purchase clothing. However, selecting outfits that match an individual's personality, body type, and personal preferences remains a challenging task. Most existing clothing recommendation systems rely on basic factors such as purchase history or trending items, which often fail to deliver truly personalized suggestions.

To address this limitation, the Personality-Based Clothing Recommendation System using Deep Learning and Artificial Intelligence is proposed. This system aims to provide intelligent and customized clothing suggestions by integrating multiple user-centric factors, including personality traits, body measurements, image inputs, and AI-based prompts**.**

The system utilizes the Five-Factor Personality Model (Big Five traits)—Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism—to understand the user's behavioral characteristics and

style preferences. In addition, body measurements such as height, weight, and body shape are considered to ensure proper fit and comfort in clothing recommendations.

To enhance accuracy, the system incorporates Deep Learning techniques, particularly Convolutional Neural Networks (CNN), to analyze clothing images and extract features such as color, pattern, texture, and style. Furthermore, users can upload images or provide AI prompts (e.g., occasion, mood, preferred style), enabling the system to generate more context-aware and flexible recommendations.

By combining psychological analysis, physical attributes, and visual data processing, the system creates a comprehensive user profile. This hybrid approach improves recommendation accuracy and overcomes the limitations of traditional systems, making it a powerful tool for personalized fashion assistance.

Overall, this system enhances user experience by simplifying the decision-making process, reducing confusion, and delivering clothing suggestions that align with both personal identity and practical needs.

In today's digital era, fashion recommendation systems play an important role in enhancing user experience in online shopping platforms. However, most existing systems rely only on historical data such as purchase behavior or browsing patterns, which limits personalization.

This project introduces a Personality-Based Clothing Recommendation System that combines Artificial Intelligence (AI) and Deep Learning (DL) techniques to deliver smarter and more personalized suggestions. The system considers multiple factors such as:

- Five-Factor Personality Traits (Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism)
- Body Measurements (height, weight, body shape)
- Image Upload (user or clothing images)
- AI Prompt-based Preferences (occasion, style, color, mood)

Using Random Forest (or ML models) for personality prediction and Convolutional Neural Networks (CNN) for clothing feature extraction, the system generates recommendations that closely match the user's personality and physical attributes.

This integrated approach bridges the gap between psychological behavior and fashion intelligence, making recommendations more meaningful and human-like.

2. Literature Survey

Recent advancements in recommendation systems have focused on integrating deep learning techniques with psychological and behavioral analysis to enhance personalization. One important approach is the use of personality-aware recommendation systems, where the Big Five personality traits are incorporated into neural network models. This method enables the system to better understand user preferences and behavior patterns, leading to more accurate and satisfying recommendations compared to traditional approaches.

In addition to deep learning, machine learning techniques such as Random Forest, Support Vector Machines, and ensemble models have been widely used for predicting personality traits from user data. Among these, Random Forest has shown strong performance due to its robustness and ability to generalize well across different datasets. These personality prediction models can be effectively integrated into recommendation systems to further improve their adaptability and user-centric design.

In the domain of fashion recommendation, deep learning—especially Convolutional Neural Networks (CNNs)—has proven highly effective for visual feature extraction. CNN-based models analyze important attributes such as color, texture, and patterns from clothing images, enabling accurate classification and

similarity-based recommendations. This significantly enhances the quality of fashion recommendations compared to conventional methods.

Furthermore, deep learning-based fashion image analysis improves scalability and automation in identifying clothing styles and categories. These systems are capable of handling large datasets and delivering real-time recommendations with high accuracy.

Overall, the reviewed studies demonstrate that combining personality modeling with deep learning techniques creates more intelligent, adaptive, and efficient recommendation systems. The integration of psychological factors and visual analysis not only improves recommendation relevance but also increases user satisfaction, highlighting the future potential of AI-driven personalization technologies.

3. Proposed System

The proposed Personality-Based Clothing Recommendation System is an intelligent and advanced solution that uses Artificial Intelligence (AI) and Deep Learning (DL) to provide accurate and personalized clothing suggestions. Unlike traditional systems, this approach considers multiple user-specific factors such as personality traits, body measurements, image data, and AI prompt-based preferences**.**

The system analyzes the user's personality using the Five-Factor Model (Big Five traits) to understand behavioral patterns and fashion preferences. It also incorporates body measurement analysis to ensure proper fitting and comfort of clothing. Additionally, users can upload images, which are processed using Convolutional Neural Networks (CNN) to extract features like color, texture, pattern, and style.

The system further enhances flexibility by allowing users to provide AI prompt-based inputs, such as occasion, mood, or preferred clothing style. All these inputs are combined using a hybrid recommendation engine**,** which integrates machine learning predictions, deep learning outputs, and filtering techniques to generate highly personalized clothing recommendations.

4. Abbreviations and Acronyms

- **AI (Artificial Intelligence):** Technology that enables machines to simulate human intelligence.
- **ML (Machine Learning):** A subset of AI that allows systems to learn from data.
- **DL (Deep Learning):** A branch of ML that uses neural networks for complex data analysis.
- **CNN (Convolutional Neural Network):** A deep learning model used for image processing and feature extraction.
- **RF (Random Forest):** A machine learning algorithm used for classification and prediction tasks.
- **UI (User Interface):** The platform through which users interact with the system.
- **API (Application Programming Interface):** A set of rules that allows communication between software components.
- **DB (Database):** A structured collection of data used by the system.
- **SQL (Structured Query Language):** A language used to manage and manipulate databases.
- **BFM (Big Five Model):** A personality model consisting of five traits: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism.

5. System Architectur

Figure: System Architecture

The proposed Personality-Based Clothing Recommendation System is designed using deep learning and artificial intelligence techniques to deliver personalized fashion suggestions. The architecture consists of three main components: Model Builder, System Processing Module, and User Interface.

The Model Builder is responsible for developing and training the models. It begins with user login, followed by data preprocessing to clean and prepare personality and fashion datasets. A personality prediction model is built using the Random Forest algorithm, which analyzes user personality traits. Simultaneously, a clothing model is developed using Convolutional Neural Networks (CNN) to learn and extract visual features from clothing images. Once both models are trained, they are stored and made ready for use in the recommendation process.

In the System Processing Module, two types of data are handled: personality data and fashion image data. The personality data is processed through a personality analysis module using the Random Forest model to identify user traits. On the other hand, fashion image data is processed using CNN-based feature extraction to capture important attributes such as color, texture, and patterns of clothing items. These outputs are then sent to the recommendation engine.

The Recommendation Engine acts as the core component of the system. It uses a matching algorithm to combine personality traits with clothing features and generate personalized clothing recommendations. The engine ensures that the suggested items align with both the user's preferences and personality characteristics.

The User Interface allows users to interact with the system. Users first register and provide their requirements or preferences. Based on this input, the system processes the data and provides customized clothing recommendations. Finally, users can view the results and logout from the system.

Overall, this architecture integrates machine learning and deep learning models to create an intelligent, user-centric recommendation system that enhances personalization and improves user satisfaction.

6. Methodology

- Initialize the system and load the trained Random Forest and CNN models along with the required datasets.
- The user logs into the system or creates a new account to access the recommendation service.
- The user fills a questionnaire based on the Big Five personality traits, Image upload and AI Prompt to capture personality preferences.
- The collected data is cleaned, formatted, and converted into a suitable form for machine learning models.
- The Random Forest model analyzes questionnaire responses to identify the user's personality traits.
- The CNN model processes clothing images and extracts important features such as color, pattern, texture, and style.
- The system combines personality results and clothing features to find suitable clothing styles. Based on the matching results, the system generates personalized clothing recommendations.
- The recommended clothing items are displayed to the user through the interface.
- The user logs out and the system ends the session.

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8. Conclusion

The proposed Personality-Based Clothing Recommendation System effectively integrates deep learning, artificial intelligence, and psychological modeling to provide highly personalized clothing suggestions. By combining the Big Five personality traits, user body measurements, and visual features extracted from clothing images, the system is able to align recommendations with both individual preferences and behavioral patterns.

The use of Random Forest for personality prediction ensures robust and accurate understanding of user traits, while Convolutional Neural Networks (CNN) efficiently analyze clothing images to capture color, texture, pattern, and style. This combination enables the recommendation engine to generate suggestions that are not only visually appealing but also psychologically compatible with the user.

Additionally, features such as image upload and AI-based prompts allow users to guide the system according to their specific tastes or occasions, making the platform more flexible and interactive. The methodology demonstrates the significant role of AI-driven personalization in modern fashion systems and highlights how integrating psychology, machine learning, and image analysis can lead to higher user satisfaction, better decision-making, and enhanced overall experience.

In conclusion, this system represents a next-generation approach to intelligent fashion recommendation, offering an adaptive, user-centric solution that goes beyond traditional recommendation methods by considering both personal traits and visual aesthetics.

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