WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Fashion Recommender: Try it Virtually.

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A B S T R A C T

Effective recommendation systems are essential in today's e-commerce environments because they help users navigate through a wide range of products, including books, artwork, cafes, and more. These systems are essential in the digital marketplace because they personalize the browsing experience based on user preferences and perceptions. Fashion Recommendation Systems with Virtual Trial Rooms (FRS-VTR) is one of these that has attracted a lot of interest, especially from the retail fashion industry. With the help of these highly customized shopping experiences, users can feel more confident and present a positive image to the public by dressing appropriately. This paper introduces an innovative Fashion Recommendation System coupled with a virtual try-on system, aimed at transforming the e-commerce industry. Unlike traditional methods, our proposed system simplifies the user experience significantly. Users need only upload an image of the desired outfit, and the system intelligently matches it with suitable clothing options. Moreover, users can virtually try on various outfits, eliminating the need for physical touch and enhancing the convenience of the shopping process. By bridging the gap between user preferences and available fashion choices, our system not only caters to individual tastes but also revolutionizes the way users interact with e-commerce platforms. This novel approach not only streamlines the online shopping journey but also fosters a sense of confidence and satisfaction among users, ensuring a seamless and enjoyable shopping experience in the digital realm.

Keywords*: Fashion Recommendation System (FRS), Deep learning, Virtual try-on, Convolutional Neural Network* (*CNN), k-Nearest Neighbors (kNN).*

1. INTRODUCTION

In our digital world, recommender systems have seamlessly integrated into our online experiences, shaping interactions on platforms. These systems, powered by machine learning, analyse user preferences, providing tailored suggestions and transforming e-commerce and content consumption. Among these systems, fashion recommendations have become increasingly influential, offering users personalized clothing suggestions. Clothing, beyond its utilitarian purpose, is a powerful means of expression and communication. Recognizing this, the fusion of fashion recommendations with virtual try-on has emerged as a groundbreaking solution. This integration allows users to effortlessly receive personalized clothing suggestions based on uploaded images. Additionally, users can virtually try on outfits using their device's camera, revolutionizing the retail experience and offering unparalleled convenience to consumers and retailers alike.

Traditionally, product recommendations relied on user behavior data and item similarity metrics. However, our project redefines this approach. We aim to identify apparel types and colours directly from images, leveraging pre-trained neural networks to extract deep visual features. These features form the basis for our Logistic Classifiers, achieving high accuracy in predicting both clothing type and colour. This study explores the transformative potential of integrating image recognition, fashion recommendations, and virtual trial experiences. By doing so, it paves the way for a new era of interactive and personalized online shopping, enhancing the way users engage with fashion in the digital realm.

1.1 Dataset Used

A comprehensive Fashion Product Images Dataset with 44,000 products will be used in our study obtained from Kaggle. Every item has been carefully catalogued, complete with multiple category labels, thorough descriptions, and high-quality images. The comprehensive content of the dataset consists of expertly taken product photos, manually input label attributes, and insightful text that highlights key features of the products. Every product has an ID that makes it easy to reference it individually. For our application, we concentrated on pictures with simple backgrounds and just one identifiable person. Our research is based on this carefully selected dataset, which allows us to precisely investigate virtual trials and fashion recommendation systems.

1.2 Model Used

Why CNN for fashion recommendation? CNNs are unparalleled in deciphering intricate visual patterns in fashion items, capturing essential details like textures and shapes when a user uploads an image. These deep learning insights create a rich dataset. To enhance accuracy further, k-Nearest Neighbors (kNN) steps in, measuring the similarity of these features against the broader dataset for a comprehensive comparison. By combining CNNs' detailed analysis with kNN's dataset-based precision, the system offers highly personalized and reliable fashion suggestions. This synergy optimizes accuracy, making the pairing of CNNs and kNN indispensable for fashion recommendation systems. The collaboration ensures precise matches, offering users

tailored recommendations that reflect not only visual likeness but also the broader context within the dataset, enriching the user experience and solidifying the system's reliability in clothes recognition.

2. MOTIVATION

The inspiration behind our project lies in simplifying the online shopping experience and enhancing user satisfaction. We recognized the challenges faced by users while navigating the vast array of fashion choices online. Often, finding specific items or similar styles can be time-consuming. To address this, we envisioned a Fashion Recommender System where users can upload images of desired items, making the search process effortless. For instance, if someone admires a black shirt online, they can upload the image, and our system will provide similar fashion options. Additionally, the integration of a virtual try-on feature adds a groundbreaking dimension, allowing users to visualize outfits before purchasing, thereby increasing confidence in their choices. Our motivation stems from empowering users with a seamless and personalized online fashion experience, making shopping more enjoyable and efficient.

3. LITERATURE SURVEY

[1] Apparel Classifier and Recommender using Deep Learning. The paper introduces a scalable approach for automatically detecting and tagging clothing products and their colors in images without metadata, using deep learning and transfer learning techniques. The authors employ a pre-trained neural network to extract deep features from query images, which are then used to train Logistic Classifiers for clothing type and color identification. They achieved an 86% accuracy in clothing detection and developed a web application for real-time use. The study emphasizes the importance of visual similarity for product recommendations in e-commerce and proposes a model-based solution for identifying apparel types and colors.

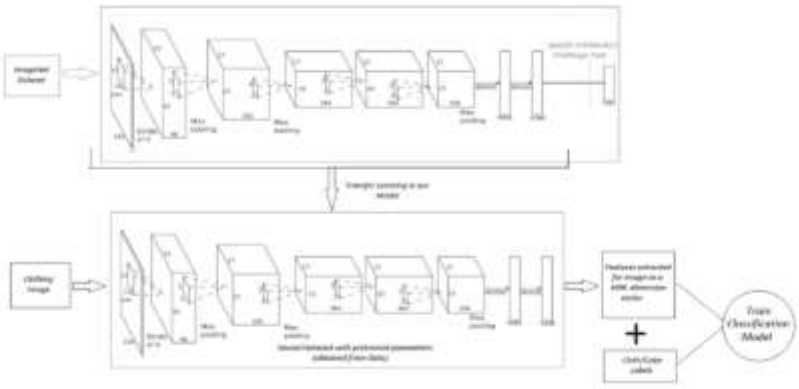

Fig.1: An illustration of the architecture of CNN

[2] ImageNet Classification with Deep Convolutional Neural Networks - The paper presents a groundbreaking deep convolutional neural network trained on 1.2 million images from the ImageNet dataset. The network achieved top-tier performance in classifying images into 1000 categories, outperforming previous methods with top-1 and top-5 error rates of 37.5% and 17.0%, respectively. The model's depth and design were crucial, and its performance degraded significantly with the removal of any convolutional layer. The study emphasizes the need for large datasets and powerful models, showcasing the effectiveness of convolutional neural networks in image recognition tasks. The authors suggest potential improvements through unsupervised pre-training and aim for advancements to match human visual system capabilities, particularly in analyzing video sequences.

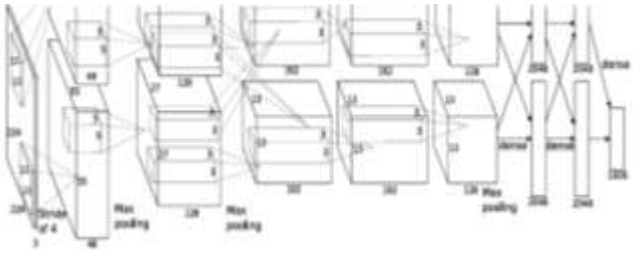

Fig.2: Model used to extract features from images and train the classifier

[3] Towards Photo-Realistic Virtual Try-On by Adaptively Generating↔Preserving Image Content - The Adaptive Content Generating and Preserving Network (ACGPN) addresses challenges in virtual clothing try-on by predicting semantic layouts of reference images. It determines whether to generate or preserve image content based on these layouts. ACGPN consists of three modules: Semantic Generation, Clothes Warping, and Content Fusion. Unlike previous methods, ACGPN generates masks progressively and stabilizes the warping process using second-order difference constraints. This approach significantly improves the quality of virtual try-on images, especially in handling complex poses and interactions between clothing and human body parts.

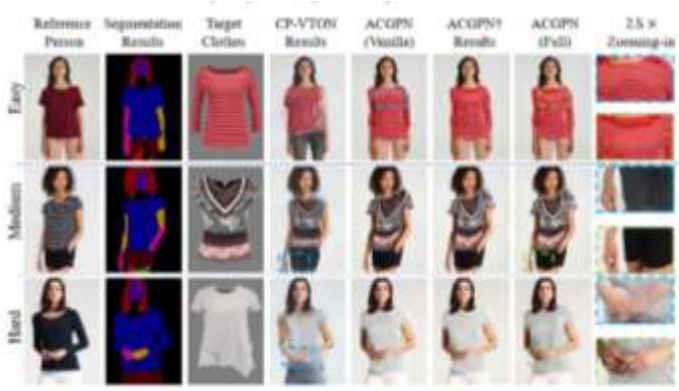

Fig.3. Try-On Task Difficulty Spectrum: Basic, Intermediate, Advanced

[4] DeepPose: Human Pose Estimation via Deep Neural Networks - The paper introduces a novel approach for human pose estimation using Deep Neural Networks (DNNs). Traditional methods face challenges like articulations, occlusions, and limited expressiveness. The proposed method formulates pose estimation as a DNN-based regression problem for body joints, utilizing the entire image as input. The authors design a cascade of DNN regressors, enabling precise pose estimation by capturing context holistically. Unlike previous approaches, this method doesn't rely on explicit feature design or model topology. By leveraging generic convolutional DNNs, the approach achieves state-of-the-art or better performance on various challenging datasets. The study marks a significant step in applying DNNs to human pose estimation, opening avenues for further research on tailored architectures for localization problems.

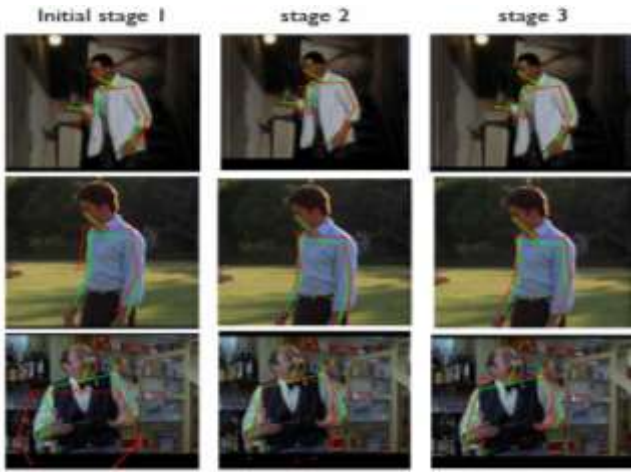

Fig. 4. Predicted poses in red and ground truth poses in green for the first three stages of a cascade for three examples.

FUTURE SCOPE

In the future, integrating facial recognition technology for gender detection can further enhance our fashion recommendation system and virtual try-on room. By identifying the user's gender, the system can provide tailored clothing suggestions, ensuring a personalized shopping experience. Moreover, transitioning the web-based platform into an Android app would increase accessibility and convenience for users, allowing them to enjoy personalized fashion recommendations on their smartphones. This expansion not only broadens user base but also aligns with the increasing trend of mobile e-commerce. Implementing these advancements ensures a seamless, intuitive, and inclusive fashion shopping experience for users, making our platform a go-to destination for personalized fashion advice and outfit choices.

CONCLUSION

Our Fashion Recommendation System serves as a valuable tool for users lacking fashion expertise, providing tailored outfit suggestions based on their wardrobe. While fashion trends evolve over time, our system adeptly cultivates users' fashion sense. The introduction of the Virtual Trial Room feature enhances user experience by enabling virtual outfit trials. Although recommendations depend on existing wardrobe items, our system successfully bridges the gap for fashion novices. Looking ahead, potential enhancements, such as detecting diverse designs and accommodating various occasions, promise an even more versatile and user-friendly platform, meeting the diverse fashion needs of users in the dynamic world of style.

Acknowledgements

We extend our heartfelt gratitude to Prof. Mrs. Rohini S. Jadhav, our esteemed project guide, for her unwavering support, valuable guidance, and patient encouragement throughout this endeavor. Her profound knowledge and insightful critiques have been invaluable, shaping the direction of our research. We also express our thanks to the professors within our college and department for their indispensable contributions and expertise, which enriched our project significantly. Their collective assistance has been crucial to this project's successful conclusion.

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