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Personalized Fashion Recommendation Web Application Utilizing AI

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ABSTRACT: The topic of fashion outfit recommendations has gained a lot of attention nowadays. The topic gets considerably more fascinating and difficult when users individualized fashion is taken into account preferences. Even while previous efforts have effectively increased the accuracy of recommendations, the computing and storage efficiency problem is still poorly understood and frequently disregarded. For effective fashion suggestion, we provide a Image Feature Extraction with ResNet50 model in this word. In order to showcase the efficacy of our approach, we gather an extensive wardrobe dataset together with user label data from a social media platform that focuses on fashion.

KEYWORDS: fashion, recommendation, Image feature, machine learning, effective suggestion.

I. INTRODUCTION

Fashion is a dynamic and powerful medium for representing culture and expressing oneself; it is influenced by media, technology, cultural movements, and historical occurrences. It has a big impact on social connections, the economy, and personal identity in society. In the meantime, artificial intelligence (AI) has attracted a lot of interest, especially in image processing, with significant developments in generative models and deep learning fueled by the widespread use of photos in social media.

AI and fashion design have an efficient and growing collaboration these days. AI technologies are being used more and more in the fashion industry to improve many areas of the design process, such as recommendation, synthesis, and fashion detection. With the right tools and insights, fashion designers can be better equipped to satisfy changing consumer needs, improve creativity, and streamline the design process.

In the fashion sector, it is a vital ally that promotes sustainability, efficiency, and innovation. The purpose of this study is to introduce the development and application of artificial intelligence (AI) in the field of fashion design. Nuno M. Garcia, an associate editor, coordinate d the review of this manuscript and approved it for publication.

Our analysis summarizes over sixty current research accomplishments in the nexus of fashion and computer vision, with a focus on the application of AI to the field of fashion design. The article provides a thorough overview, covering everything from conventional approaches to deep learning techniques, showcasing the variety and innovation of AI technology in the fashion industry. It contains a variety of literary works, such as preprints, conference papers, and journal articles. The literature review covers the period from 2011 to 2023 and highlights the current developments in this field of study.

Personalized outfit recommendations have become a popular and captivating topic of attention in today's fashion world. When consumers' unique fashion choices are considered, the challenge becomes much more fascinating. Although much progress has been made in improving the precision of fashion recommendations, the ongoing problem of computing and storage efficiency is still poorly understood and often disregarded.

Technology's advancement and social media's constant impact have ushered in a time when people want to express their particular styles as much as follow current trends in fashion. Now a day there is huge demand for customized fashion, usually people like to choose their own preferences. Since technology is emerging, the fusion of technology creates great impact.

The previous work in this project is successful in improving the accuracy of the fashion recommendations, through various aspects. The main problem being addressed is storage efficiency, because large datasets need to be stored. Based on the current scenarios, the fashion industry is generating more data now a days. Many varieties of fashion designs are booming therefore it requires more storage to store the data.

To resolve many issues our work introduced a new proposed method of fashion recommendation using pattern recognition and feature extraction. Our proposed idea uses Deep Learning concept, in which ResNet 50 model is applied. It helps in increasing the efficiency of our model and also increases accuracy of the model. It also helps in better recommendations.

In careful assessment, the performance of our proposed model a large dataset is used which consists of many fashion designs similar to the e-commerce platform. This large dataset is used to identify suitable fashion recommendations based on the user's personal preferences and provide effective accuracy of our Deep Learning model.

In our proposed methodology we have used Residual Network 50 model which is the best model for the feature extraction from the images. Since it is a pretrained model it has rich efficiency to track the pattern and perform recommendations. In current there is great update in fashion technology this study helps in improving that fashion technology through our deep learning ResNet 50 model. It makes the fashion recommendation more easier compared with previous existing model and enhance user friendly features.

II. DATASET

In our project fashion recommendation system image dataset plays a crucial role to recommend the relevant fashion design. We have used the dataset which is collected from kaggle.com, there are more than 60,000 images present in that dataset. Among those data of images, we made manual filtering of images based on the classes which are essential of our project.

Then we have preprocessed the data by converting all the file type to jpeg file format. In our dataset we mainly focused on filtering the dress, shoe & similarly other fashion related outfits. For single outfit more than 100 images are trained. Our model is efficient in examining this filtered data more clearly.

Our model can work more effectively with this large amount of fashion outfit dataset. In our dataset more than 100 classes are available with different fashion patterns. For example, if checked pattern is searched through our model means more similar checked shirt will be recommended.

III. METHODOLOGY

Our methodology focuses on creating an efficient fashion outfit recommendation system involves a systematic approach integrating deep learning techniques. The following expresses the importance of each step in this proposed system of fashion outfit recommendation system.

A. Image Dataset Collection:

We have collected the 60,000 images based on fashion outfits to perform the fashion recommendation system using deep learning. Since deep learning model requires huge number of datasets.

A.1. Importing Essential Libraries:

We have installed the necessary python library to implement this fashion outfit recommendation system using python pip command. After installing required libraries the libraries are imported into the program to execute it. We have used certain libraries such as Tensorflow, keras to access the ResNet 50 model, then Numpy library is used to perform basic numerical, pickle for data storage, similarly other libraries are imported.

A.2. Loading Pre-trained ResNet50 Model:

In our proposed system to extract the features from the fashion outfit ResNet 50 Model is used. To apply this model imagenet weights was used in our proposed system. To implement neural network layer in ResNet 50 model, Global Max Pooling 2D layer is utilized which is the final layer of the model. It is imported using Sequential function from keras library.



A.3. Feature Extraction Function:

A specialized function is defined to extract features from individual images. This function processes each image, utilizing the pre-trained ResNet50 model and normalizing the resulting feature vector.

B. Feature Extraction:

The extracted features using ResNet50 model was utilized using user defined function name `extract_feature`. In which image path and model will be passed as an argument to the function. Then images will be converted into array format using numpy library. After preprocessing using various function, then `flatten()` function will be applied. Then normalized image will be extracted as the predicted output. Then empty feature list will be created and extracted feature will be applied with the help of pickle library.

C. Model Training:

The ResNet50 model, having been trained on a vast dataset like ImageNet, possesses an innate ability to recognize and understand complex visual features. By excluding the top layer of the model (which is unnecessary for our feature extraction task), we harness the power of ResNet50's lower layers to capture high-level representations of fashion-related elements.

D. Model Evaluation and Persistence:

Precision, recall, and F1 score gauge recommendation accuracy. Inference time and resource utilization assess computational efficiency. User feedback, via surveys, gauges practical effectiveness and user satisfaction. K-fold cross-validation ensures model robustness. Diversity metrics prevent bias and monotony in recommendations.

E. Integration with Streamlit:

The extracted features and filenames are leveraged in conjunction with Streamlit for creating the frontend of our fashion recommendation system. Streamlit utilizes the pre-processed information to produce personalized fashion outfit recommendations.

F. Model Prediction:

In this proposed system of Fashion outfit recommendation using deep learning model will predict the similar images based on the patterns present inside the fashion outfits. For example, if the dress has straight lined pattern means, similar dress will be recommended with different colors. So that user can experience many variety of designs with similar patterns.

This system also helps in explore more similar patters with different colors and different sizes. Since Other Deep Learning will have multiple neural networks, it will consume more time to recommend the model in real time. Therefore our proposed model has single network with multiple layers is fast and efficient in predicting the output.

IV. IMPLEMENTATION

TABLE 1: Showing and describing the used equipment

Equipment	Specification
Programming Languages	Python,HTML,CSS,JavaScript
Data File format	Images (Jpeg,Png)
Operating System	Windows
RAM	8GB (Minimum)
Software used	VsCode, Google Chrome Web browser

Sample Accuracy:

Accuracy of the Model

```

Flags:
WARNING: tensorflow: From D:\Image-Recommendation-System\venv\Lib\site-packages\keras\src\layers\normalization\batch_normalization.py:979:
The name tf.nn.fused_batch_norm is deprecated. Please use tf.compat.v1.nn.fused_batch_norm instead.
1/1 [-----] 4s 4s/step 2916/2916 [00:00:00.00, 16857.8117/s]
Recommended Image 1: images2\2500.jpg (Similarity: 76.32%)
Recommended Image 2: images2\4830.jpg (Similarity: 74.63%)
Recommended Image 3: images2\5453.jpg (Similarity: 74.14%)
Recommended Image 4: images2\3719.jpg (Similarity: 71.65%)
Recommended Image 5: images2\4839.jpg (Similarity: 70.75%)
(venv) PS D:\Image-Recommendation-System
    
```

Fig1. Accuracy of the model

The above image represents the sample recommendation accuracy of the model over the data uses as sample count of 6000 from the huge dataset of 60,000.

Accuracy Curve of the Model

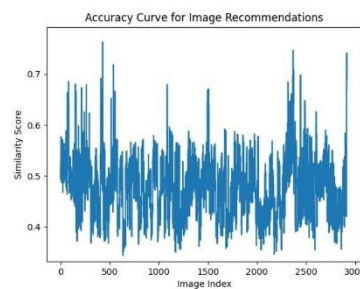


Fig2. Accuracy curve of the model

The above diagram represents the accuracy curve of the model used in fashion outfit recommendation system.

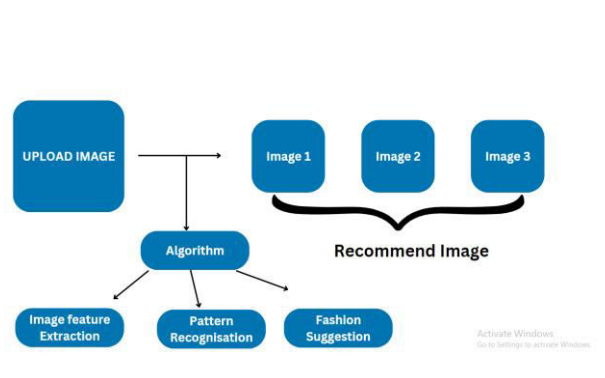


Fig3. Flow chart of Fashion Recommendation System

The above diagram represents the flow chart fashion recommendation system.

V. FUTURE SCOPE OF THE PROPOSED SYSTEM

- Used in Ecommerce store for fashion sales.
- Enhances more user friendliness.
- Eases the searching process similar patterns.

- Time consumption is less than manual work

VI. RESULT

The system offers users a diverse range of fashion choices, enhancing their shopping experience and ensuring personalized style recommendations. Its efficient algorithms contribute to a seamless integration of technology and fashion, demonstrating the potential for AI to elevate the way individuals engage with and navigate the world of textiles.

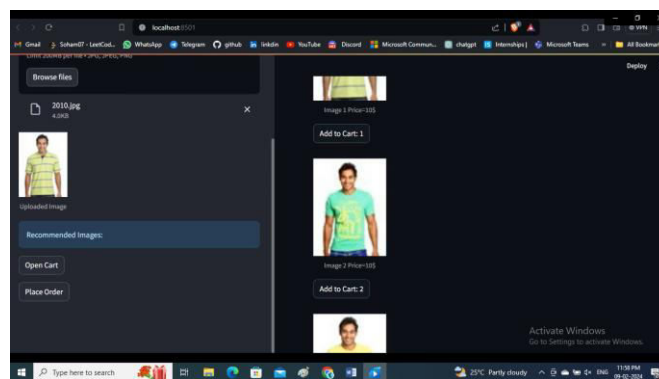


Fig4. Output

The above diagram represents the same output of fashion recommendation system.

VII. CONCLUSION

By applying emerging technology in our proposed system has been successfully implemented the personalized fashion recommendation systems. Using our proposed resnet50 pretrained model has effectively applied and extracted more complex and insightful patterns from the provided input and predicted the better results. The conversion of images to array and passes to the model also does not create much data loss compared with other models.

In our proposed system model evaluation was implemented using accuracy score. For 6000 data, our model having accuracy of more than 76% for recommending the first similar pattern based fashion outfit. By using this knowledge we came to know if we use more than 6,000 data that is if we applied 60,000 data of fashion outfit means our product will predict more accurately it may show the accuracy score of more than 98% percentage.

The challenge address in this proposed fashion outfit recommendation is while providing 60,000 data the requirement of the system should high with more GPU capacity to support our deep learning model. It also takes more time to look into all the images to train the model. Anyhow the accuracy will be very high and prediction will be also more accurate when we implement this.

In this proposed project, we can able to analyse the fusion of the fashion and technology which provides great impact and meaningful prediction. By providing users with tailored recommendations based on their unique preferences, we contribute to a more engaging and personalized fashion experience. The journey from image dataset curation to model deployment underscores our commitment to excellence and innovation in the realm of personalized fashion recommendations. This project serves not only as a testament to the capabilities of modern deep learning but also as a springboard for future advancements in the ever-evolving landscape of fashion technology.

Looking ahead, the project sets the stage for exciting future directions in the realm of personalized fashion recommendations. The dynamic nature of fashion trends and user preferences opens avenues for continuous model refinement and adaptation. Integrating real-time data streams, incorporating user feedback loops, and exploring advancements in neural network architectures are potential areas for enhancement. Collaboration with the fashion industry and data-driven insights could further elevate the system's ability to stay ahead of evolving style preferences. The ongoing evolution of technology ensures that our project serves as a foundation, inviting continuous innovation and refinement to keep pace with the ever-changing landscape of fashion.

Beyond its technical accomplishments, the project holds significant implications for both the technology and fashion sectors. The successful fusion of deep learning and fashion has the potential to influence how users interact with style recommendations, fostering a more personalized and enjoyable experience. The efficiency gains achieved through model persistence strategies set a precedent for sustainable and accessible AI applications. As personalized fashion recommendations become more prevalent, our project contributes to a paradigm shift in how technology can enhance self-expression and individuality through clothing choices. The impact extends not only to end-users but also to businesses aiming to leverage data-driven insights for more effective engagement and customer satisfaction in the ever-evolving landscape of the fashion industry.

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