**Project Title**

**FASHION RECOMMENDATION SYSTEM**

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A close-up of a logo

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**Abstract**

The Fashion Recommender System aims to enhance online shopping experiences by suggesting visually similar clothing items based on user-uploaded images. Using deep learning techniques, the system extracts visual features from an image using a pre-trained ResNet50 model and compares them to a dataset of clothing items. The top visually similar items are recommended to the user using a content-based filtering approach. This application can significantly help users discover related fashion products more efficiently, increasing engagement and satisfaction

**Introduction**

With the rapid growth of online retail, personalized recommendation systems have become vital tools for improving customer experience. Traditional recommendation systems often rely on collaborative filtering, which depends on user ratings and preferences. However, in the fashion domain, visual similarity plays a crucial role. This project introduces a deep learning-based fashion recommender system that uses visual features extracted from images to recommend similar apparel. It uses a content-based approach where similarity is calculated using features derived from a convolutional neural network.

**Related Work**

Several approaches have been proposed in fashion recommendation:

* **Collaborative Filtering** (CF): CF-based methods use user behavior (ratings, purchases) to recommend items. However, CF struggles with the cold start problem and lacks visual interpretation.
* **Content-Based Filtering**: These approaches use metadata (e.g., brand, color, size) or visual features. CNN-based content filtering has gained popularity due to its ability to capture rich image representations.
* **Hybrid Models**: Combine both CF and content-based techniques for better accuracy.

In this project, we focus solely on visual content-based recommendation using deep learning, as it is more aligned with the visual nature of fashion products.

**Methodology**

** Data Preprocessing**

* **All clothing images are resized to 224x224.**
* **Features are extracted using the ResNet50 model without the final classification layer.**

** Feature Extraction**

* **Use ResNet50 (ImageNet weights) and GlobalMaxPooling2D to obtain 1D feature vectors.**
* **Normalize feature vectors using L2 norm.**

** Feature Storage**

* **All feature vectors and filenames are saved using pickle in featurevector.pkl and filenames.pkl.**

** Recommendation System**

* **For an uploaded image:**
  + **Extract features using the same model.**
  + **Use NearestNeighbors with Euclidean distance to find the 5 most similar images.**
* **Display the results via a Streamlit web interface.**

**Hardware/Software Required**

**Hardware**

* **Processor: Intel Core i5 or higher**
* **RAM: 8GB or more**
* **GPU: Optional (for faster feature extraction, recommended if using large datasets)**

**Software**

* **OS: Windows/Linux/MacOS**
* **Python 3.x**
* **Libraries:**
  + **TensorFlow/Keras**
  + **Streamlit**
  + **OpenCV**
  + **NumPy**
  + **PIL**
  + **scikit-learn**
  + **pickle**

1. **Experimental Results**
2. The model was tested using various clothing images.
3. The recommendation engine successfully retrieved top 5 similar fashion images with high visual similarity.
4. Performance:
   1. **Feature Extraction Time:** ~0.5 seconds/image on CPU
   2. **Recommendation Time:** ~0.2 seconds for nearest neighbor search
5. The testing script (test.py) validated accuracy by displaying similar images using OpenCV.
6. Streamlit interface (main.py) allowed easy and intuitive testing for real users.

**Conclusions**

**This project successfully demonstrates a content-based fashion recommendation system that uses deep learning to suggest visually similar clothing items. The integration of ResNet50 for feature extraction and the simplicity of Streamlit for deployment makes it both powerful and user-friendly. The system can be further extended to support real-time fashion apps or e-commerce platforms.**

**Future Scope**

1. **Multi-feature Filtering**: Combine visual similarity with attributes like color, brand, price, etc.
2. **Real-time Search**: Enhance performance for large-scale databases using FAISS or Annoy for fast approximate nearest neighbor search.
3. **Hybrid Recommendation**: Integrate collaborative filtering for improved personalization.
4. **Fashion Trend Analysis**: Include trend analysis and suggestions based on current market data.
5. **Mobile App Integration**: Deploy on mobile platforms for user-friendly access.

**GitHub Link of Your Complete Project**

**https://github.com/shivanishuklaz/fashion-recommendation-system**