IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Fashion Recommendation System Using Resnet50

Author - Bharati Patil, Department of Technology, SPPU(Pune)

Guide- Prof. Sunita Bangal Department of Technology, SPPU(Pune)

Abstract: Fashion recommendation systems are pivotal for enhancing online shopping using deep learning, specifically ResNet-50. Our Fashion Recommendation System (FRS) employs ResNet-50 to process and represent fashion images' key attributes like color and style. Content-based recommendations suggest visually similar items based on user preferences. The FRS evolves through machine learning, delivering improved user engagement and conversion rates in e-commerce fashion. This paper reviews and explores fashion recommendation systems and filtering techniques, filling a gap in academic literature. It serves as a valuable resource for machine learning, computer vision, and fashion retailing professionals.

We trained our model using a large image dataset, including the multiple category labels, descriptions and high-res images of fashion products, which consists of 44k+ images. The results have been promising, indicating potential real-world applications such as searching for a product using its digital copy in large sets of images.

Index Terms: Fashion Recommendation System; E-commerce; Filtering Techniques; Deep learning System; ResNet50 Convolutional Neural Network.

I. INTRODUCTION:

Fashion is a dynamic and ever-evolving industry where trends change rapidly, making it challenging for consumers to navigate the vast array of clothing options available online. In response to this, fashion recommendation systems have emerged as essential toolsfor enhancing the online shopping experience. Thesesystems leverage advanced technologies, such as deep learning, to provide users with personalized clothing suggestions that align with their unique tastes and preferences.

Deep learning techniques have played a pivotal role inrevolutionizing the field of fashion recommendation. Among the various deep learning architectures, the ResNet-50 convolutional neural network (CNN) has gained prominence for its exceptional ability to extract rich and discriminative features from images. By leveraging ResNet-50, fashion recommendation systems can analyze and understand the visual characteristics of clothing items, including color, texture, pattern, and style,with remarkable accuracy.

This introduction sets the stage for exploring the FashionRecommendation System (FRS) that utilizes ResNet-50 as its core technology. In the following sections, we willdelve into how ResNet-50 is employed to process and encode fashion images, creating a robust feature representation that forms the foundation of personalized clothing recommendations. We will also explore the concept of content-based recommendation, wherein the feature representations extracted by ResNet-50 are used to suggest fashion items that closely match users' visual preferences.

Furthermore, we will discuss the adaptability and continuous improvement of the FRS through machine learning algorithms. This adaptability ensures that the system remains up-to-date with changing fashion trends and user preferences, ultimately resulting in improved user engagement, increased conversion rates, and enhanced customer satisfaction in the e-commerce fashion domain.

By implementing the technology of ResNet-50 and advanced recommendation techniques, fashion recommendation systemshave the potential to transform the online shopping experience,making it more enjoyable, personalized, and efficient for consumers. This exploration aims to provide insights into how ResNet-50 and deep learning are revolutionizing the fashion industry by offering tailored and visually appealingrecommendations to users.

II. RELATED WORK

There are some previous works related to building of recommendation systems.

Smart Clothing Recommendation System with Deep Learning In order to recommend a cloth, we develop two inceptions based convolutional neural networks asprediction part and one feed forward neural network as recommender. In this study, we reach to 98% accuracy oncolor prediction, 86% accuracy on gender and cloth's pattern predictions and 75% accuracy on clothing recommendation.

Deep Fashion Recommendation System with Style Feature Decomposition. Due to the mixed informationof style and category, however, the clothes vector oftenrecommends clothes that do not match. To solve this problem, we propose a style feature extraction (SFE) layer, which effectively decomposes the clothes vectorinto style and category. Based on the characteristics thecategory information has small variations in the same class while being distinguished from other classes, we extract and remove the category information from the clothes vector to obtain more accurate style information.

III. SYSTEM ARCHITECTURE

The proposed system is divided into three main parts:

- Image pre-processing
- Recommendation Engine
- Web App

1. IMAGE PRE-PROCESSING

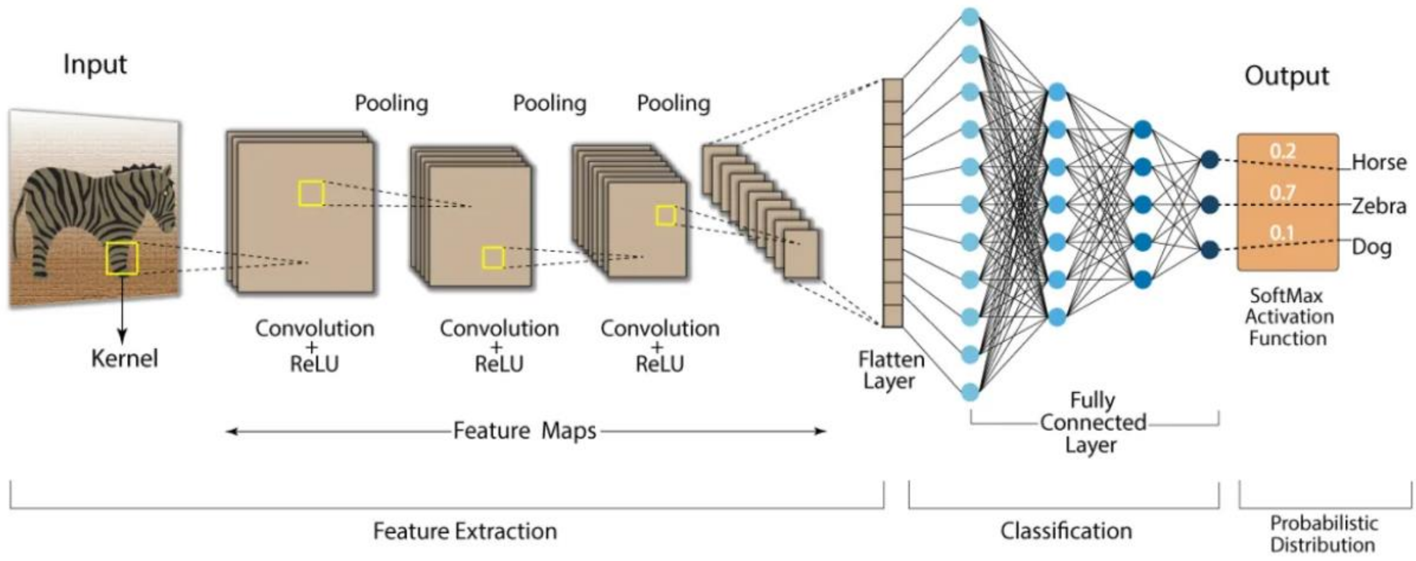

Fig. 1 Diagram for Image Preprocessing

Image preprocessing in the context of ResNet-50 involves preparing images for use with this deep learning architecture. Key steps include resizing images to a fixed size (e.g., 224x224 pixels), normalizing pixel values (typically in the range [0, 1] or standardized), mean subtraction, data augmentation (applying random transformations), and consistent preprocessing during training and inference. These steps ensure that the model processes images effectively, improves training stability, and generalizes well to new data.

The steps to pre-process the image are as follows:

Read image: Image provided by the user is taken as the input and stored in a temporary folder on the server

Resize image: The saved image is resized in accordance with the input size the model is trained with i.e. (224 x 224)

Segmentation: In this stage the saved image is converted from RGB to BGV to aid in better extraction of features.

Flatten: In this stage after pre-processing the saved, the 2D matrix of the image is converted into Vector.

2. RECOMMENDATION ENGINE:

A recommendation engine filters the information using different algorithms and recommends the relevant itemsto users. It first captures the past behavior of a customerand recommends products which the users might be likely to buy. The working of recommendation engine is as follows:

1. **Collection of Data:** Gathering data is the first step in creating the recommendation engine. Data can be either explicit or implicit data. Explicit data can be the input by users such as ratings and comments on products. And order history/return history, Cart events, Page views would be the implicit data, Click thru and search log. For every user visiting the site, dataset will be created.

2. **Analyzing the Data:** The filtering of data is done by Real- time system analysis. The Real-time systems can process data as it's created. This system usually involves tools thatcan process and analyze streams of events. It is required to give in-the-moment recommendations.

Filtering the Data: The next step is to filter the data to getthe necessary data to provide recommendations to the user. Content based filtering approach is used in this project. Content-based filtering uses meta data or characteristics of items to recommend other items similarto what the user likes, based on their previous actions or explicit feedback.

3. **WEBAPP:**

The web app is created using the Streamlit library. Streamlit is a Python library that simplifies the process ofbuilding web applications and interactive dashboards. It allows you to create web interfaces directly from Pythonscripts with minimal code.

IV. IMPLEMENTATION:

1. **Image pre-processing:**

The aim of image processing is to enhance the qualityof image and later on to perform features extraction and classification. It is most commonly used in computer vision, medical imaging, meteorology, astronomy, remotesensing and another related field. Tools used in image processing:

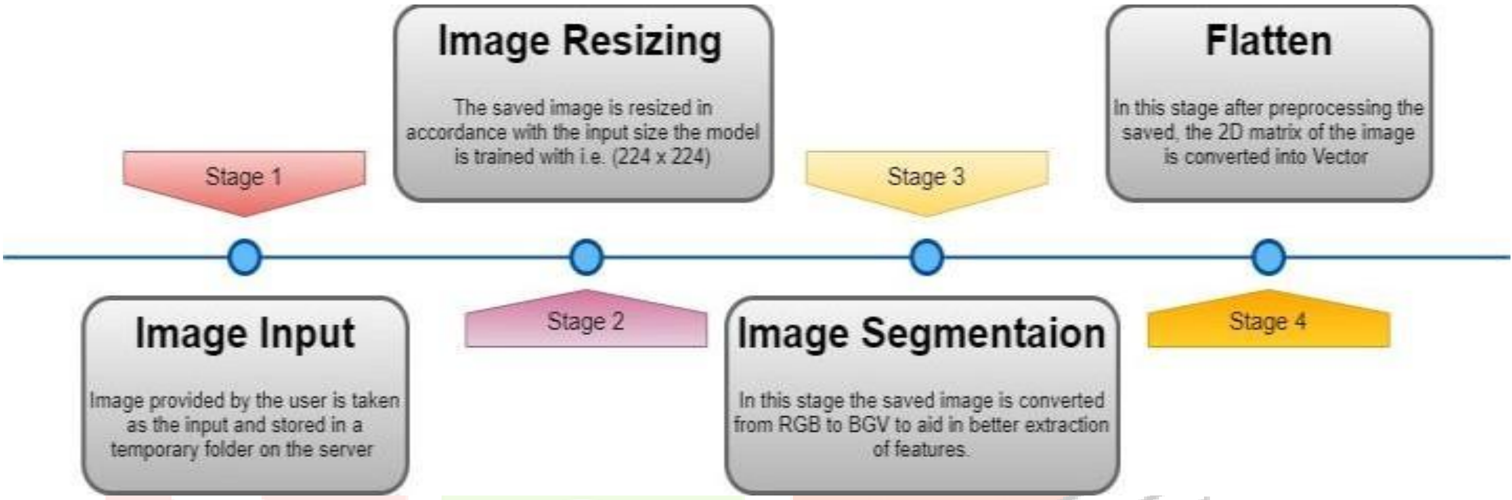

Fig. 2 Flow-chart for Image Preprocessing

Following tools have been used in project for image processing-

1. **TensorFlow and Keras:**

TensorFlow and its high-level API Keras are used for deeplearning tasks, including loading a pre-trained ResNet-50 model, creating a neural network model, and making predictions.

2. **ResNet-50:**

The ResNet-50 architecture is employed for feature extraction from images. It's a pre-trained deep convolutional neural network (CNN) model commonly used for image classification and feature extraction.

3. **PIL (Pillow):**

The Python Imaging Library (PIL), specifically the Pillowlibrary, is used for image manipulation and loading imagesfrom files.

4. **NUMPY:**

NumPy is used for numerical operations and data manipulation, including working with arrays and matrices.

5. **scikit-learn (sklearn):**

scikit-learn is used for implementing the k-nearest neighbors (KNN) algorithm, which is used for finding similar fashion items based on image features.

5. **OpenCV (cv2):**

OpenCV is used for image manipulation and display. It'sused to show the recommended fashion items as images.

6. **TQDM:**

TQDM is used for creating progress bars to track the progress of iterating through fashion images when extracting features.

7. **os:**

The os module is used for file operations and directoryhandling. It's used to manage the storage and retrieval ofimage files.

8. **pickle:**

The pickle library is used for serializing and deserializing Python objects. In the code, it's used to save and load image features and filenames.

2. RECOMMENDATION ENGINE:

Recommendation Engine may be treated as a blackbox which analyze some set of users and shows the items which a single user may like

Fig. 3 Diagram for Recommendation Engine

The major benefits of using a recommendation engine are

1. Increased Sales
2. Cross-selling and Upselling
3. Reduced Abandoned Carts
4. Improved Customer Retention
5. Enhanced User Experience
6. Optimized Inventory Management
7. Dynamic Homepage and Landing Pages
8. Seasonal and Trend-Based Recommendations
9. Personalized Email Marketing
10. Customer Segmentation
11. Data-Driven Insights
12. Competitive Advantage

3.Web App:

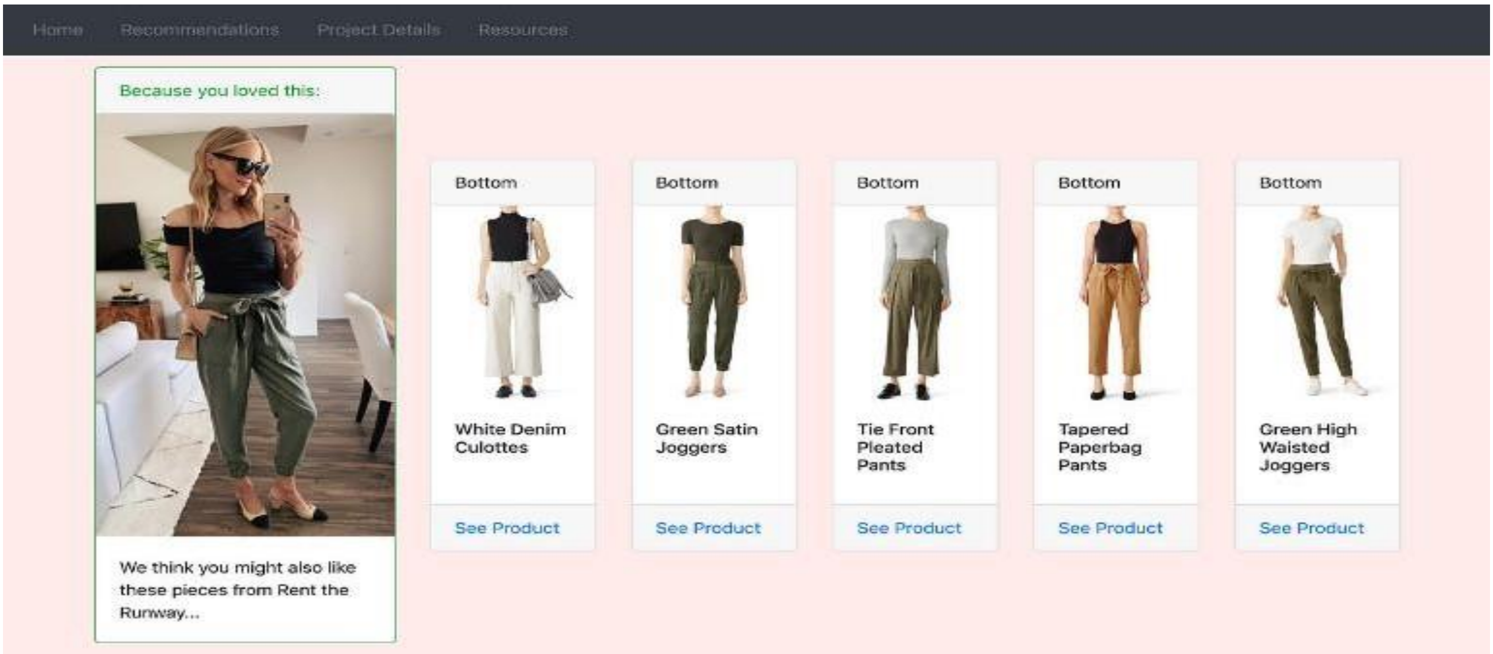

Fig. 4 Diagram for Web App

The web app is created using the Streamlit library. Streamlit is a Python library that simplifies the process of building web applications and interactive dashboards. It allows you to create web interfaces directly from Python scripts with minimal code.

When the Python script run containing the code, it initializes a Streamlit web application. This Streamlit- based web app provides a user-friendly interface for users to upload fashion images, and it uses a pre- trained deep learning model (ResNet-50) and KNN algorithm to provide fashion recommendations based on the uploaded images. Users can see the recommendations displayed in real-time on the web interface.

V. RESULT:

The project is designed to create a Fashion Recommender System (FRS) web application using Streamlit. When code run, it shows the web app interface in web browser. The result of this project is an interactive web application that allows you to upload fashion images and receive personalized fashion recommendations based on the uploaded images. The recommendations are displayed in real-time on the web page, making it a functional Fashion Recommender System.

VI. CONCLUSION

Product recommendations engines are the best way todeliver customers with an improved user experience.Through machine learning, manual curation, and specific algorithms, a product recommendationsengine can help bring customers the relevant productsthey want or need. It allows marketers to provide customers with relevant product recommendations inreal time. As a part of an ecommerce personalization strategy, product recommendations dynamically populate products onto websites, apps, call centers, oremails, enhancing the customer experience. Using specialized algorithms, product recommendation engines are now able to support even the largest of product catalogs. The engine is able to intelligently select which algorithms and filters to apply in any given situation, for any given individual shopper. Thismeans that the marketers can maximize conversions and average order value.

VII. REFERENCES

1. **"Deep Learning" by Ian Goodfellow, YoshuaBengio, and Aaron Courville**:
This book is a comprehensive resource on deeplearning. It covers the fundamentals, advancedtechniques, and practical implementations of deep neural networks.
2. **"Python Deep Learning" by Ivan Vasilev and Daniel Slater:**
This book provides hands-on examples and practical guidance on building deep learning models using Python libraries like TensorFlow and Keras. It's a good resource for understanding how to work with deep learning models.
3. **“Computer Vision Algorithms and Applications” by Richard Szeliski:**
If you're interested in computer vision, this book covers a wide range of topics, from image processing to object recognition and tracking. It provides a solid foundation for understanding computer vision concepts.
4. **"Recommender Systems Handbook" edited by Francesco Ricci, Lior Rokach, Bracha Shapira:**
This handbook is a comprehensive reference on recommendation systems. It covers various recommendation algorithms, evaluation metrics, and real-world applications.

5. **"Hands-On Recommendation Systems with Python" by Rounak Banik:**
This book focuses on practical implementations of recommendation systems using Python. It covers collaborative filtering, content-based recommendation, and hybrid models.

6. **"Streamlit: Build Interactive Web Applications with Python" by Srinivas Reddy Thatiparthy:**
For a deeper understanding of building web applications with Streamlit, this book provides insights and practical examples for creating interactive web interfaces using Python.