Fashion recommendation system using CNN

Anjan M.
anjanmaruthi572@gmail.com
Don Bosco Institute of Technology, Bengaluru, Karnataka

Abhishek V.
abhishekv.dev@gmail.com
Don Bosco Institute of Technology, Bengaluru, Karnataka

C. Balamanikantan
manikutty2227@gmail.com
Don Bosco Institute of Technology, Bengaluru, Karnataka

Dheeraj
dheerajdhruva@gmail.com
Don Bosco Institute of Technology, Bengaluru, Karnataka

Dr. Venugeetha Y.
vgydbit@gmail.com
Don Bosco Institute of Technology, Bengaluru, Karnataka

ABSTRACT

Recommendation systems are the techniques that are used to predict the rating one individual will give to an item or social entity. The items can include books, movies, restaurants and things on which individuals have different preferences. These preferences are being predicted using two approaches first content-based approach which involves characteristics of an item and second collaborative filtering approaches which considers user's past behaviour to evaluate its choices. This thesis proposes a fashion recommendation system which will recommend clothing images supported the style sort of the provided clothing images. In this work, we focus on the images of upper body as well as the lower body clothing and with human model in the images. We have created our own datasets through web scrapping of different e-commerce websites. In this paper we have come up with an idea to build a content-based recommendation system using ResNet-50 convolutional neural network.

Keywords— Recommendation System, Web scraping, Vue.js, Flask, ResNet-50, Web App, Content-based filtering

1. INTRODUCTION

A recommendation program is a comprehensive suite of web applications that includes predicting user responses to options. The recommendation system has been a hot topic for a long time. A recommendation program commonly called Recommendation Techniques, they are simple algorithms that aim to provide the most relevant and accurate information to the user by filtering useful items from a large pool of information resources. Recommendation engines discover data patterns in the data set by studying consumer preferences and generating results related to their needs and interests. In real-time examples like Amazon, they have been using a recommendation engine to suggest products that customers may like.

During the last few decades, with the rise of YouTube, Amazon, Netflix and many other such web services, recommender systems have taken more and more place in our lives. From e-commerce (suggest to buyers articles that could interest them) to online advertisement (suggest to users the right contents, matching their preferences), recommender systems are today unavoidable in our daily online journeys. One common method when designing systems is content-based filtering.

Content-based filtering methods depend on the item description and user preference profile. These methods are better suited to situations where there is known data in an object (name, location, description, etc.), but not the user. Content-based treat recommendation as a specific user problem and learns the likes and dislikes of a person based on item features. The algorithms try to recommend items that are similar to the user's preferences in the past, or are currently evaluating. It does not rely on a user login machine to generate this temporary profile. In particular, various candidate items are compared to user-rated items and are highly recommended. This approach has its roots in information retrieval and data filtering research.

The aim of the project is to build a model capable of doing fashion recommendation by just looking at its image. The model accepts a image and first determines whether the image contains a fashion product or not and recommend it accordingly. The main objective of this work is to:
- Develop a fashion recommendation system which answers the queries related to fashion shopping.
- To identify the fashion type of given input image.
- If the given fashion image is valid then similar set of clothing will be recommended.
- Retrieving the similar search query products from different e-commerce websites.

2. RELATED WORK

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

Smart Clothing Recommendation System with Deep Learning [1] In order to recommend a cloth, we develop two inceptions based convolutional neural networks as prediction part and one feed forward neural network as recommender. In this study, we reach to 98% accuracy on colour prediction, 86% accuracy on gender and cloth's pattern predictions and 75% accuracy on clothing recommendation.

Deep Fashion Recommendation System with Style Feature Decomposition [2] Due to the mixed information of style and category, however, the clothes vector often recommends clothes that do not match. To solve this problem, we propose a style feature extraction (SFE) layer, which effectively decomposes the clothes vector into style and category. Based on the characteristics the category 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.

3. DESIGN
3.1 System Architecture
The proposed system is divided into three parts:
- Image pre-processing
- Recommendation Engine
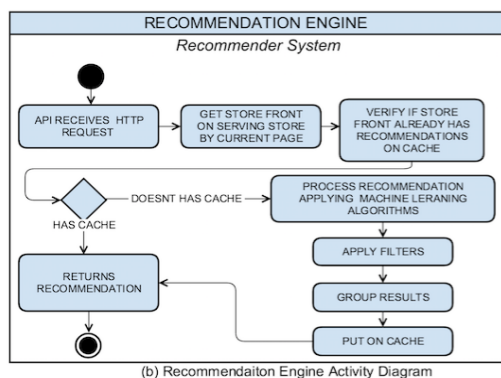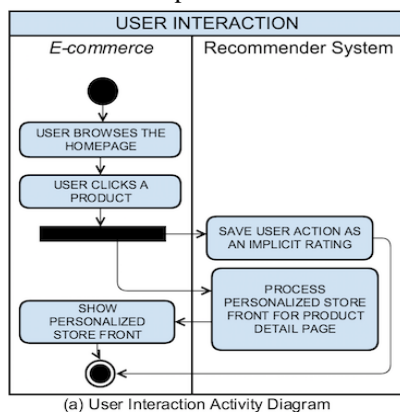- Web Scraping
- Web App

These are the four main components.

(a) User Interaction Activity Diagram

(b) Recommendaiton Engine Activity Diagram
Fig. 1: System Architecture

3.2 Proposed System
3.2.1 Image pre-processing: Image processing is the process of using computer algorithms to perform manipulations on digital images. The main goal of image processing is to refine the image data by removing the distorted noise and by enhancing image pixels. An image is nothing more than a two-dimensional array of number between 0 and 255. It is defined by the mathematical function $f(x,y)$ where x and y are the two co-ordinates horizontally and vertically. The value of $f(x,y)$ at any point is giving the pixel value at that point of an image.

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.

3.2.2 Recommendation Engine: A recommendation engine filters the information using different algorithms and recommends the relevant items to users. It first captures the past behaviour of a customer and recommends products which the users might be likely to buy. The working of recommendation engine is as follows:
- **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.
- **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 that can 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 get the 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 similar to what the user likes, based on their previous actions or explicit feedback.
- **Web Scraping:** Web scraping is the process of automating the process of data extraction in a fast and efficient manner. It implements the use of crawlers or robots that automatically scan specific pages on a website and extract the required information. For the extraction of product data on a large scale, we implement a piece of code (called a 'web scraper') that requests a particular product page on an e-commerce website. In return, the website replies with the requested web page. Once the page is received, the scraper will parse its HTML code and extract relevant data from it. When the data extraction process is completed, the tool finally converts the data into the desired format. Now, since the web scraper is an automated program, it can repeat this process thousands of times on a large number of product pages, and across several e-commerce websites.

3.2.3 Web App
Front End Design: Vue.js framework is used to create a interactive interface for the web app.
Back End Design: Flask framework is used to create a RESTful API.

4. IMPLEMENTATION
4.1 Image Preprocessing
The aim of image processing is to enhance the quality of image and later on to perform features extraction and classification. It is most commonly used in computer vision, medical imaging, meteorology, astronomy, remote sensing and another related field. Tools used in image processing:
- **OpenCV:** Using OpenCV we can read and write images, capture and save videos, process images (filter, transform).
- **Numpy:** NumPy, which stands for Numerical Python, is a library which consists of multidimensional array objects

and a numerous tool for processing those arrays. Numpy can be used in processing powerful N-dimensional array object, sophisticated (broadcasting) functions, useful linear algebra, Fourier transform, and random number capabilities.

- **Pillow:** Pillow extends the PIL base code to create an improved version which is modern and friendly version of PIL. It provides tools for opening, manipulating, and saving images in various formats.

4.2 Recommendation Engine
Recommendation Engine may be treated as a black box which analyze some set of users and shows the items which a single user may like. The major benefits of using a recommendation engine are

- Revenue
- Customer satisfaction

- Drive Traffic
- Deliver Relevant Content
- Engage Shoppers

4.3 Web Scraping
Web scraping is used to extract and process large amounts of data from the web. The ability to scrape data from the web is a helpful in procuring huge amounts of data from the web in a short span of time. Web scraping using Python is an essential tool you can use to extract the data into a useful form that can be used for data analysis.

4.4 Web App
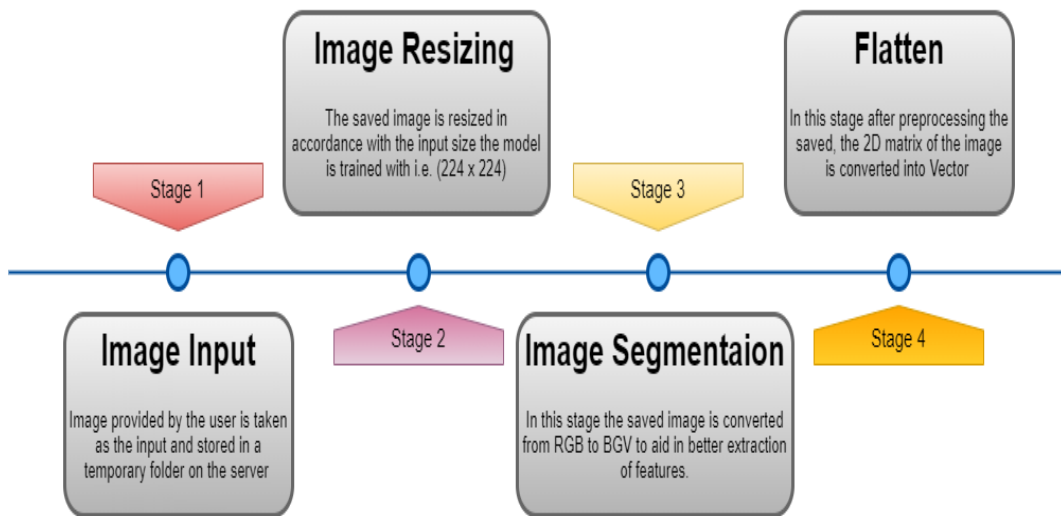Web App is used to display information to respective users obtained from database

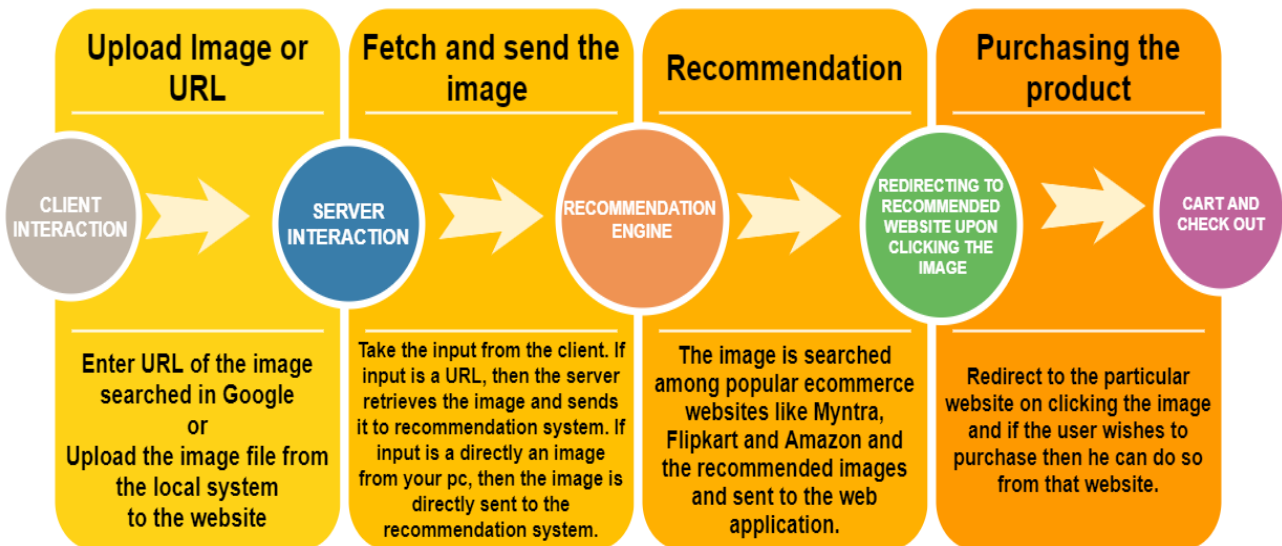**Fig. 2: Steps in Image pre-processing**
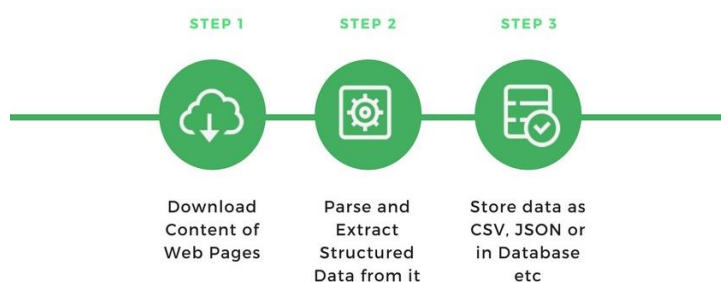

Fig. 3: Recommendation Engine
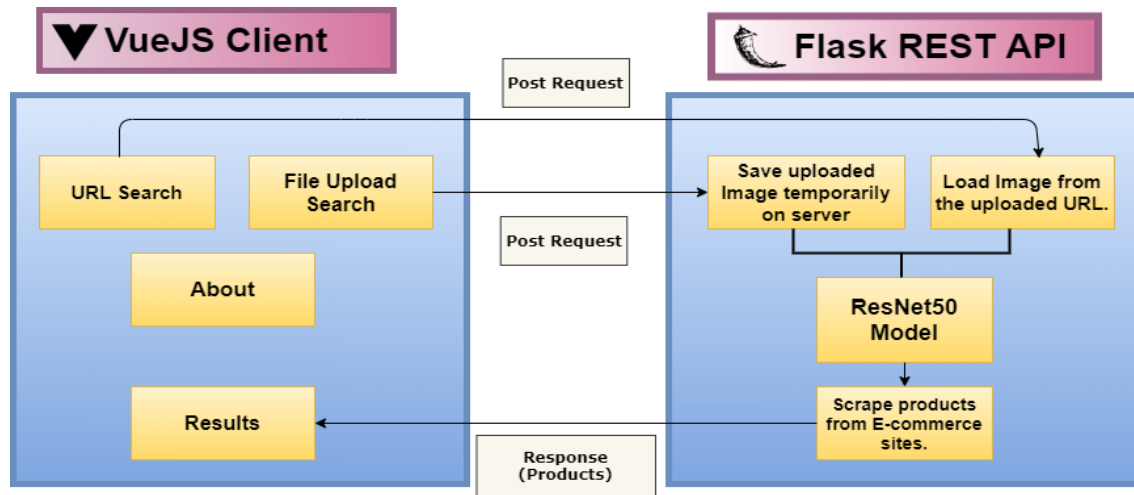

Fig. 4: Web Scraping workflow

Fig. 5: Web App workflow

5. RESULT
This Web App allows the users to find products through an image. It provides an easy to use interface which assists the user in finding a product which they might find visually appealing to them by simply clicking an image of the product and uploading it on the Web App. The user will be presented with products which the model deemed to be similar to the uploaded image. The users can buy the product from the respective E-commerce websites if they wish to do so.

6. CONCLUSION
Product recommendations engines are the best way to deliver customers with an improved user experience. Through machine learning, manual curation, and specific algorithms, a product recommendations engine can help bring customers the relevant products they want or need.

It allows marketers to provide customers with relevant product recommendations in real time. As a part of an ecommerce personalization strategy, product recommendations dynamically populate products onto websites, apps, call centers, or emails, enhancing the customer experience.

Using specialized algorithms, product recommendations 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. This means that the marketers can maximize conversions and average order value.

7. REFRENCES
[1] Batuhan Aşiroglu, Mehmet Ilkay Atalay, Alkan Balkaya, Erden Tu Zu Nkan, Mustafa Da Gtekin, Tolga Ensar : Smart Clothing Recommendation System with Deep Learning, 2019 3rd International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)

[2] Yong-Goo Shin, Yoon-Jae Yeo, Min-Cheol Sagong, Seo-Won Ji, and Sung-Jea Ko: Deep Fashion Recommendation System with Style Feature Decomposition, 2019 IEEE 9th International Conference on Consumer Electronics (ICCE-Berlin)

[3] Kaiming He, Xiangyu Zhang, Shaoqing Ren, Jian Sun: Identity Mapping in Deep Residual Networks, 2016 Cornell University.