

Capstone Project -2

Problem Statement:- The project will simplify the product searching activity by providing the facility to get the most appropriate match of the product based on the image of the product available to the end user. The model also recommends the similar products available, which narrow down the search activity when the user has a specific requirements for the product he/she is willing to buy.

Git hub link-

<https://github.com/shivamkk32/CP-2/blob/main/ReverseImageSearch.ipynb>

Dataset :- The dataset contains a collection of images of different product category along with a csv file that maps the images with their respective attributes.

Dataset

Link-<https://www.kaggle.com/paramaggarwal/fashion-product-images-classifier/data>

Attributes used in the project are ['masterCategory', 'subCategory', 'articleType', 'baseColour', 'productImage']

	masterCategory	subCategory	articleType	baseColour	productImage
0	Apparel	Topwear	Shirts	Navy Blue	15970.jpg
1	Apparel	Bottomwear	Jeans	Blue	39386.jpg
2	Accessories	Watches	Watches	Silver	59263.jpg
3	Apparel	Bottomwear	Track Pants	Black	21379.jpg
4	Apparel	Topwear	Tshirts	Grey	53759.jpg

Grouping the products according to the attributes

```
product_df.groupby(['masterCategory','subCategory','articleType','baseColour']).agg({'productImage':'sum'})
```

This leads to cluster the product images into below form

masterCategory	subCategory	articleType	baseColour	productImage
Accessories	Accessories	Accessory Gift Set	Black	31187.jpg19926.jpg31186.jpg23114.jpg25076.jpg2...
			Blue	19929.jpg17366.jpg25047.jpg23115.jpg25046.jpg2...
			Brown	25055.jpg31204.jpg25064.jpg25062.jpg25065.jpg2...
			Grey	25049.jpg25084.jpg23105.jpg
			Maroon	58920.jpg17367.jpg23106.jpg17368.jpg17372.jpg2...
			Multi	58921.jpg
			Navy Blue	25063.jpg23100.jpg25077.jpg
			Pink	23101.jpg25072.jpg
			Purple	17369.jpg23108.jpg17359.jpg17361.jpg25054.jpg2...
			Red	17360.jpg23112.jpg25083.jpg19933.jpg58924.jpg1...

Model Description :- In this project Resnet50 is used as a base model .A classification CNN model is created on top of Resnet50 by removing the top layer the pre-trained model. The objective of the model is to classify the master category of the image.

The model works with an accuracy of 89 percent.

Model Summary

Model: "sequential_1"

Layer (type)	Output Shape	Param #
resnet50 (Functional)	(None, 3, 3, 2048)	23587712
flatten (Flatten)	(None, 18432)	0
dense (Dense)	(None, 1024)	18875392
dense_1 (Dense)	(None, 512)	524800
dense_2 (Dense)	(None, 256)	131328
dropout (Dropout)	(None, 256)	0
dense_4 (Dense)	(None, 6)	1542
Total params: 43,120,774		
Trainable params: 43,067,654		
Non-trainable params: 53,120		

The list of master categories are {0: 'Accessories', 1: 'Apparel', 2: 'Footwear', 3: 'Free Items', 4: 'Personal Care', 5: 'Sporting Goods'}

Image Preprocessing - To extract the region of interest of the image a pre trained yolov3 model weight is used trained on fashion dataset is used. This creates a rectangular contour around the product items detected .Post detecting the contour grabcut is used to removed the irrelevant part of the image.



This result image is further used for master category classification

Post getting the master category of the image ,to get the most relevant product category the below process is followed.

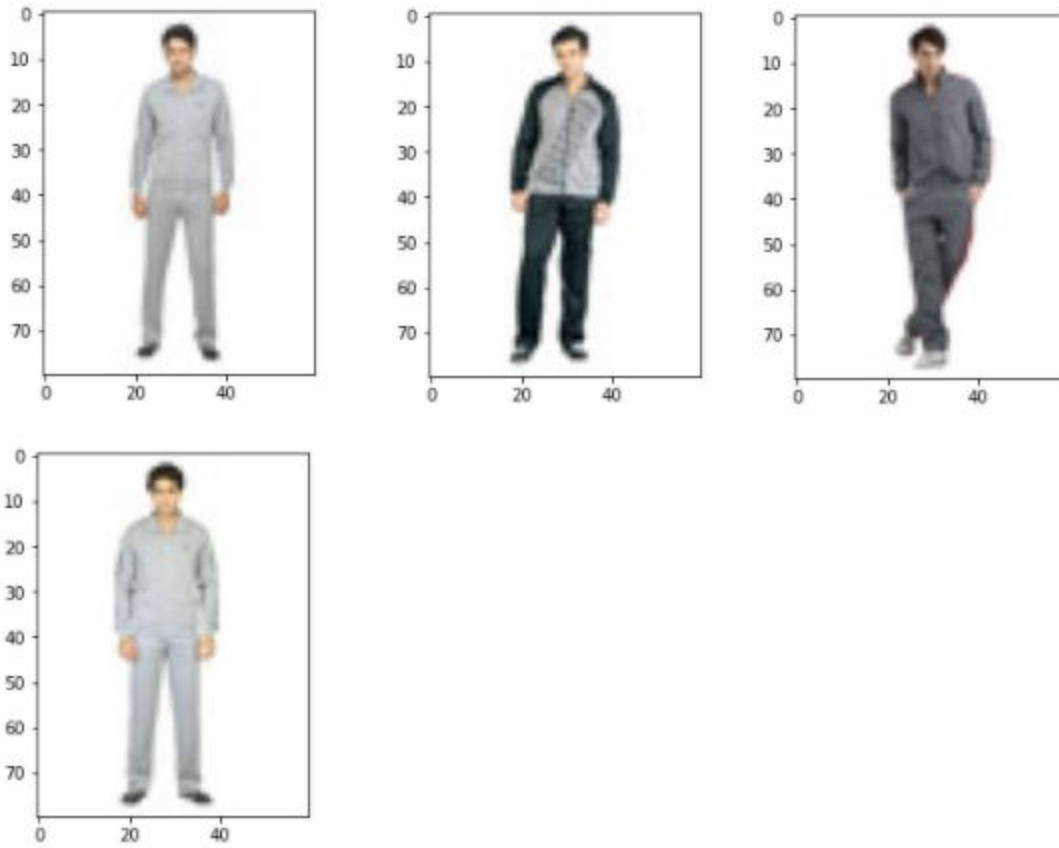
- 1.Feature extraction of the test image
- 2.Feature extraction of a random image from the target category
3. Feature extraction of a random image from a different category

Model for feature extraction

Model: "sequential_10"		
Layer (type)	Output Shape	Param #
resnet50 (Functional)	(None, 3, 3, 2048)	23587712
flatten_9 (Flatten)	(None, 18432)	0
dense_29 (Dense)	(None, 4096)	75501568
dense_30 (Dense)	(None, 4096)	16781312
dense_31 (Dense)	(None, 1000)	4097000
embedding_8 (Embedding)	(None, 1000, 1)	100
Total params: 119,967,692		
Trainable params: 119,914,572		
Non-trainable params: 53,120		

Feature vector is obtained from the model is later normalized.

Post getting the feature vector of the above images triplet loss function is calculated and the image with the least loss value is considered as the most relevant search category



Model Improvement -

1. In place a pre-trained yolo model weight , train the model on own custom dataset to detect the object and identify the sub category the image . This will remove the master category classification CNN model and also reduce the list of target category.
2. Train a siamese network over the dataset to get the most similar products.