Clothes Recommendation System (DenseNet121)

Bulding Clothes Recommendation System using DenseNet121

Importing libraries

In [1]:
```
import numpy as np
import pandas as pd
import os
import tensorflow.keras as keras
from keras import Model
from keras.applications.densenet import DenseNet201, DenseNet121
from keras.preprocessing import image
from keras.applications.densenet import preprocess_input, decode_predictions
from keras.layers import GlobalMaxPooling2D
from keras.utils.vis_utils import plot_model
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
import cv2
import pathlib
from sklearn.metrics.pairwise import linear_kernel
```

In [3]:
```
path ='C:/Users/tswar/Documents/PERSONAL PROJECTS/ImData'
dataset_path = pathlib.Path(path)
images=os.listdir(dataset_path)
images
```

Out[3]:
```
['.ipynb_checkpoints',
 'clothes-recommendation-system-using-densenet121.ipynb',
 'images',
 'images.csv',
 'styles',
 'styles.csv']
```

Showing 10 images in dataset

In [4]:
```
plt.figure(figsize=(20,20))
for i in range(10, 20):
    plt.subplot(6, 10, i-10+1)
    cloth_img =  mpimg.imread(path +'/images/'+ str(i) +'.jpg')
    plt.imshow(cloth_img)
    plt.axis("off")
plt.subplots_adjust(wspace=-0.5, hspace=1)
plt.show()
```

DataFrame with categories and adding column of image names

In [5]:
```
df = pd.read_csv(path + "/styles.csv", nrows=6000, error_bad_lines=False)
df['image'] = df.apply(lambda x: str(x['id']) + ".jpg", axis=1)
df = df.reset_index(drop=True)
print(df.shape)
df.head(5)
```

```
C:\Users\tswar\AppData\Local\Temp/ipykernel_11684/4026993980.py:1: FutureWarnin
g: The error_bad_lines argument has been deprecated and will be removed in a fu
ture version. Use on_bad_lines in the future.


  df = pd.read_csv(path + "/styles.csv", nrows=6000, error_bad_lines=False)

(2537, 6)
```

Out[5]:

	id	Brand	Description	Rating	Price	image
0	0	Khushal K	Women Black Ethnic Motifs Printed Kurta with P...	4.4	Rs. 1529	0.jpg
1	1	KALINI	Women Teal Yoke Design Kurta with Palazzos & W...	4.5	Rs. 887	1.jpg
2	2	ZIYAA	Floral Leafy Foil Print Kurta Set	3.5	Rs. 641	2.jpg
3	3	AHIKA	Women Black & Green Printed Straight Kurta	4.0	Rs. 526	3.jpg
4	4	Anouk	Women Pink Embroidered Kurta with Palazzos	4.4	Rs. 1049	4.jpg

Setting the Pre-Trained model DenseNet121

In [6]:
```
#image dim
img_width, img_height, chnl = 200, 200, 3

# DenseNet121
densenet = DenseNet121(include_top=False, weights='imagenet', input_shape=(img_wi
densenet.trainable = False

# Add Layer Embedding
model = keras.Sequential([
    densenet,
    GlobalMaxPooling2D()
])

model.summary()
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applicati
ons/densenet/densenet121_weights_tf_dim_ordering_tf_kernels_notop.h5 (https://s
torage.googleapis.com/tensorflow/keras-applications/densenet/densenet121_weight
s_tf_dim_ordering_tf_kernels_notop.h5)
29089792/29084464 [==============================] - 9s 0us/step
29097984/29084464 [==============================] - 9s 0us/step
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 densenet121 (Functional)    (None, 6, 6, 1024)        7037504

 global_max_pooling2d (Globa  (None, 1024)             0
 lMaxPooling2D)

=================================================================
Total params: 7,037,504
Trainable params: 0
Non-trainable params: 7,037,504
_________________________________________________________________
```

Function of model prediction

In [7]:
```
def img_path(img):
    return path + '/images/' + img
def model_predict(model, img_name):
    # Reshape
    img = image.load_img(img_path(img_name), target_size=(img_width, img_height))
    # img to Array
    x   = image.img_to_array(img)
    # Expand Dim (1, w, h)
    x   = np.expand_dims(x, axis=0)
    # Pre process Input
    x   = preprocess_input(x)
    return model.predict(x).reshape(-1)
```

Building data frame of model prediction for all our images from dataset (getting embedding for all

items in dataset)

In [8]:
```
df_copy      = df
df_embedding = df_copy['image'].apply(lambda x: model_predict(model, x))
df_embedding        = df_embedding.apply(pd.Series)
df_embedding.head(5)
```

Out[8]:

	0	1	2	3	4	5	6	7	8	
0	0.002656	0.015560	0.015131	0.010902	0.589306	4.154886	0.001717	0.018514	1.823854	0.001
1	0.002656	0.015560	0.015131	0.010902	0.589306	4.154886	0.001717	0.018514	1.823854	0.001
2	0.001355	0.010881	0.016512	0.015491	0.283380	1.329364	0.001426	0.016255	0.711587	0.002
3	0.002154	0.020783	0.017139	0.007893	0.457105	5.579158	0.001452	0.019316	1.146074	0.002
4	0.001122	0.007291	0.008461	0.011833	0.335641	3.598948	0.001603	0.016844	0.747172	0.002

5 rows × 1024 columns

Computing a cosine similarity to calculate a numeric quantity that denotes the similarity between two images. It is relatively easy and fast to calculate.

In [9]:
```
cosine_sim = linear_kernel(df_embedding, df_embedding)
```

Getting indices

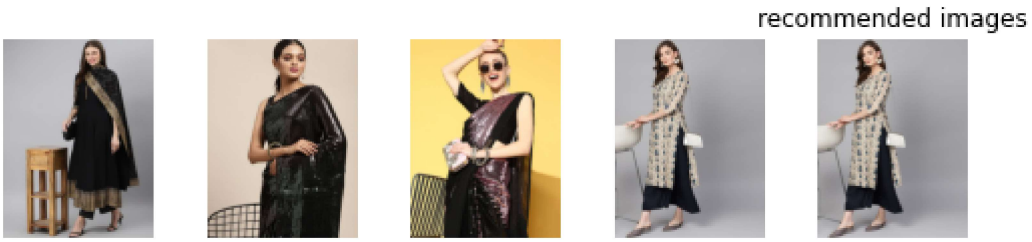
In [10]:
```
indices = pd.Series(range(len(df)), index=df.index)
```

Getting recommendations using the cosine similarity

In [11]:
```
def get_recommendations(index, df, cosine_sim=cosine_sim):
    idx = indices[index]

    # Get the pairwsie similarity scores of all clothes with that one
    sim_scores = list(enumerate(cosine_sim[idx]))

    # Sort the clothes based on the similarity scores
    sim_scores = sorted(sim_scores, key=lambda x: x[1], reverse=True)

    # Get the scores of the 5 most similar clothes
    sim_scores = sim_scores[1:6]

    # Get the clothes indices
    cloth_indices = [i[0] for i in sim_scores]

    # Return the top 10 most similar movies
    return df['image'].iloc[cloth_indices]
```

Checking the result

In [20]:
```
chosen_img_indx = 1

recommendation = get_recommendations(chosen_img_indx, df, cosine_sim)
recommendation_list = recommendation.to_list()
#chosen image
chosen_img =  mpimg.imread(path + '/images/' + df.iloc[chosen_img_indx].image)
plt.title("Chosen image")
plt.imshow(chosen_img)
#recommended images
plt.figure(figsize=(20,20))
j=0
for i in recommendation_list:
    plt.subplot(6, 10, j+1)
    cloth_img =  mpimg.imread(path + '/images/'+ i)
    plt.imshow(cloth_img)
    plt.axis("off")
    j+=1
plt.title("recommended images")
plt.subplots_adjust(wspace=-0.5, hspace=1)
plt.show()
```



In [14]:
```
chosen_img_indx = 259

recommendation = get_recommendations(chosen_img_indx, df, cosine_sim)
recommendation_list = recommendation.to_list()
#chosen image
chosen_img =  mpimg.imread(path + '/images/' + df.iloc[chosen_img_indx].image)
plt.title("Chosen image")
plt.imshow(chosen_img)
#recommended images
plt.figure(figsize=(20,20))
j=0
for i in recommendation_list:
    plt.subplot(6, 10, j+1)
    cloth_img =  mpimg.imread(path + '/images/'+ i)
    plt.imshow(cloth_img)
    plt.axis("off")
    j+=1
plt.title("recommended images")
plt.subplots_adjust(wspace=-0.5, hspace=1)
plt.show()
```