Image Scraping and Classification Project

Submitted by:

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I am making this project to increase my knowledge.

INTRODUCTION

Problem Statement:

Images are one of the major sources of data in the field of data science and AI. This field is making appropriate use of information that can be gathered through images by examining its features and details. We are trying to give you an exposure of how an end-to-end project is developed in this field.

The idea behind this project is to build a deep learning-based Image Classification model on images that will be scraped from e-commerce portal. This is done to make the model more and more robust.

This task is divided into two phases: Data Collection and Mode Building.

Data Collection Phase

In this section, you need to scrape images from e-commerce portal, Amazon.com. The clothing categories used for scraping will be:

- Sarees (women)
- Trousers (men)
- Jeans (men)

Need to scrape images of these 3 categories and build your data from it. That data will be provided as an input to your deep learning problem. You need to scrape minimum 200 images of each categories. There is no maximum limit to the data collection. You are free to apply image augmentation techniques to increase the size of your data but make sure the quality of data is not compromised.

Model Building Phase

After the data collection and preparation is done, need to build an image classification model that will classify between these 3 categories mentioned above. We can play around with optimizers and learning rates for improving your model's performance.

Analytical Problem Framing

With the help of Selenium I have scrapped data from Amazon.com for three categories Sarees (women), Trousers (men), Jeans (men).

```
# Importing Libraries
import selenium
import pandas as pd
import time

# Importing selenium webdriver
from selenium import webdriver

# Importing required Exceptions which needs to handled
from selenium.common.exceptions import StaleElementReferenceException, NoSuchElementException

#Importing requests
import requests
```

```
#webdriver
driver=webdriver.Chrome(r"C:\Users\SAGAR KADAM\Downloads\chromedriver_win32 (2)\chromedriver.exe")
time.sleep(3)
```

- Sarees (women)

```
#opening the homepage of amazon.in
driver.get('https://www.amazon.in/s?rh=n%3A1968256031&fs=true&ref=lp_1968256031_sar')
```

```
urls=[]
max_page=7 #maximum number of pages to extract
max_p_d=2 #page number digits
for i in range (2, max_page +1):
    url=f"https://www.amazon.in/s?i=apparel&rh=n%3A1968256031&fs=true&page={i}&qid=1632122277&ref=sr_pg_{i}"
    urls.append(url)

urls
```

```
['https://www.amazon.in/s?i=apparel&rh=n%3A1968256031&fs=true&page=2&qid=1632122277&ref=sr_pg_2',
 'https://www.amazon.in/s?i=apparel&rh=n%3A1968256031&fs=true&page=3&qid=1632122277&ref=sr_pg_3',
 'https://www.amazon.in/s?i=apparel&rh=n%3A1968256031&fs=true&page=4&qid=1632122277&ref=sr_pg_4',
 'https://www.amazon.in/s?i=apparel&rh=n%3A1968256031&fs=true&page=5&qid=1632122277&ref=sr_pg_5',
 'https://www.amazon.in/s?i=apparel&rh=n%3A1968256031&fs=true&page=6&qid=1632122277&ref=sr_pg_6',
 'https://www.amazon.in/s?i=apparel&rh=n%3A1968256031&fs=true&page=7&qid=1632122277&ref=sr_pg_7']
```

```
links1=[]
driver.execute_script("window.scrollTo(0,document.body.scrollHeight)")
time.sleep(2)
try:
    for l in driver.find_elements_by_xpath('//*[@class="a-section aok-relative s-image-tall-aspect"]/img'):
        if l.get_attribute('src') and 'https' in l.get_attribute('src'):
            links1.append(l.get_attribute('src'))
except NoSuchElementException:
    links1.append("-")
for i in urls:
    driver.get(i)
    try:
        for l in driver.find_elements_by_xpath('//*[@class="a-section aok-relative s-image-tall-aspect"]/img'):
            if l.get_attribute('src') and 'https' in l.get_attribute('src'):
                links1.append(l.get_attribute('src'))
    except NoSuchElementException:
        links1.append("-")
```

```
len(links1)
```

```
364
```

```python
import os
import io
import requests
from PIL import Image

for i, url in enumerate(links1):
    file_name = f"S{i}.jpg"

    if i <=280:
        os.chdir(r'D:\Clothing\train\Saree')
        baseDir=os.getcwd()
        try:
            image_content = requests.get(url).content

        except Exception:
            print(f"ERROR - unable to download {url} \n")

        try:
            image_file = io.BytesIO(image_content)
            image = Image.open(image_file).convert('RGB')

            loc = os.path.join(baseDir, file_name)

            with open(loc, 'wb') as f:
                image.save(f, "JPEG", quality=85)
            print(f"SAVED - {url} - AT: {loc}")
        except Exception:
            print(f"ERROR - unable to download {url} \n")
    elif i <=350:
        os.chdir(r'D:\Clothing\validate\Saree')
        baseDir=os.getcwd()
        try:
            image_content = requests.get(url).content

        except Exception:
            print(f"ERROR - unable to download {url} \n")

        try:
            image_file = io.BytesIO(image_content)
            image = Image.open(image_file).convert('RGB')

            loc = os.path.join(baseDir, file_name)

            with open(loc, 'wb') as f:
                image.save(f, "JPEG", quality=85)
            print(f"SAVED - {url} - AT: {loc}")
        except Exception:
            print(f"ERROR - unable to download {url} \n")
    else:
        os.chdir(r'D:\Clothing\test')
        baseDir=os.getcwd()
        try:
            image_content = requests.get(url).content

        except Exception:
            print(f"ERROR - unable to download {url} \n")

        try:
            image_file = io.BytesIO(image_content)
            image = Image.open(image_file).convert('RGB')

            loc = os.path.join(baseDir, file_name)

            with open(loc, 'wb') as f:
                image.save(f, "JPEG", quality=85)
            print(f"SAVED - {url} - AT: {loc}")
        except Exception:
            print(f"ERROR - unable to download {url} \n")
```

```
SAVED - https://m.media-amazon.com/images/I/91H5HBp9qBL._AC_UL320_.jpg - AT: D:\Clothing\train\Saree\S0.jpg
SAVED - https://m.media-amazon.com/images/I/91jBPCeWCAS._AC_UL320_.jpg - AT: D:\Clothing\train\Saree\S1.jpg
SAVED - https://m.media-amazon.com/images/I/310YyTHkonL._AC_UL320_.jpg - AT: D:\Clothing\train\Saree\S2.jpg
SAVED - https://m.media-amazon.com/images/I/91GKFgnS5uL._AC_UL320_.jpg - AT: D:\Clothing\train\Saree\S3.jpg
SAVED - https://m.media-amazon.com/images/I/91WCQ88UV5L._AC_UL320_.jpg - AT: D:\Clothing\train\Saree\S4.jpg
```

Firstly, we will start by importing required libraries and databases.

```
# import the libraries as shown below

from tensorflow.keras.layers import Input, Lambda, Dense, Flatten
from tensorflow.keras.models import Model
from tensorflow.keras.applications.resnet50 import ResNet50
from tensorflow.keras.applications.resnet50 import preprocess_input
from tensorflow.keras.preprocessing import image
from tensorflow.keras.preprocessing.image import ImageDataGenerator,load_img
from tensorflow.keras.models import Sequential
import numpy as np
from glob import glob
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

```
# re-size all the images to this
IMAGE_SIZE = [224, 224]

train_path = 'D:/Clothing/train' #location of train path
valid_path = 'D:/Clothing/validate' #location of test path
```

Import the library as shown below and add preprocessing layer to the front. Here we will be using imagenet weights.

```
resnet = ResNet50(input_shape=IMAGE_SIZE + [3], weights='imagenet', include_top=False)
```

```
# don't train existing weights
for layer in resnet.layers:
    layer.trainable = False
```

```
# useful for getting number of output classes
folders = glob('D:/Clothing/train/*')
```

```
# our layers - you can add more if you want
x = Flatten()(resnet.output)
```

```
prediction = Dense(len(folders), activation='softmax')(x)

# create a model object
model = Model(inputs=resnet.input, outputs=prediction)
```

Let's view the structure of the model:

```
model.summary()
```

```
Model: "model"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
input_1 (InputLayer)         [(None, 224, 224, 3)      0
_________________________________________________________________
conv1_pad (ZeroPadding2D)    (None, 230, 230, 3)       0
_________________________________________________________________
conv1_conv (Conv2D)          (None, 112, 112, 64)      9472
_________________________________________________________________
conv1_bn (BatchNormalization (None, 112, 112, 64)      256
_________________________________________________________________
conv1_relu (Activation)      (None, 112, 112, 64)      0
_________________________________________________________________
pool1_pad (ZeroPadding2D)    (None, 114, 114, 64)      0
_________________________________________________________________
pool1_pool (MaxPooling2D)    (None, 56, 56, 64)        0
_________________________________________________________________
conv2_block1_1_conv (Conv2D) (None, 56, 56, 64)        4160
_________________________________________________________________
conv2_block1_1_bn (BatchNorma (None, 56, 56, 64)       256
_________________________________________________________________
conv2_block1_1_relu (Activati (None, 56, 56, 64)       0
_________________________________________________________________
conv2_block1_2_conv (Conv2D) (None, 56, 56, 64)        36928
_________________________________________________________________
conv2_block1_2_bn (BatchNorma (None, 56, 56, 64)       256
_________________________________________________________________
conv2_block1_2_relu (Activati (None, 56, 56, 64)       0
_________________________________________________________________
conv2_block1_0_conv (Conv2D) (None, 56, 56, 256)       16640
_________________________________________________________________
conv2_block1_3_conv (Conv2D) (None, 56, 56, 256)       16640
_________________________________________________________________
conv2_block1_0_bn (BatchNorma (None, 56, 56, 256)      1024
_________________________________________________________________
conv2_block1_3_bn (BatchNorma (None, 56, 56, 256)      1024
_________________________________________________________________
conv2_block1_add (Add)       (None, 56, 56, 256)       0
                                                        conv2_block1_0_bn[0][0]
                                                        conv2_block1_3_bn[0][0]
```

Lets specify cost and optimization methods to use:

```
model.compile(
  loss='categorical_crossentropy',
  optimizer='adam',
  metrics=['accuracy']
)
```

I have used the Image Data Generator to import the images from the dataset.

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator

train_datagen = ImageDataGenerator(rescale = 1./255,
                                   shear_range = 0.2,
                                   zoom_range = 0.2,
                                   horizontal_flip = True)

test_datagen = ImageDataGenerator(rescale = 1./255)
```

```
# Make sure you provide the same target size as initialied for the image size
training_set = train_datagen.flow_from_directory('D:/Clothing/train',
                                                 target_size = (224, 224),
                                                 batch_size = 32,
                                                 class_mode = 'categorical')
```

```
Found 983 images belonging to 3 classes.
```

```
test_set = test_datagen.flow_from_directory('D:/Clothing/validate',
                                            target_size = (224, 224),
                                            batch_size = 32,
                                            class_mode = 'categorical')
```

```
Found 170 images belonging to 3 classes.
```

Let's fit the model:

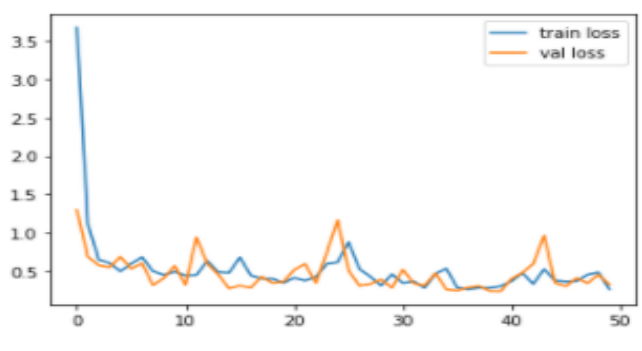
```
# Run the cell. It will take some time to execute
r = model.fit_generator(
  training_set,
  validation_data=test_set,
  epochs=50,
  steps_per_epoch=len(training_set),
  validation_steps=len(test_set)
)
```

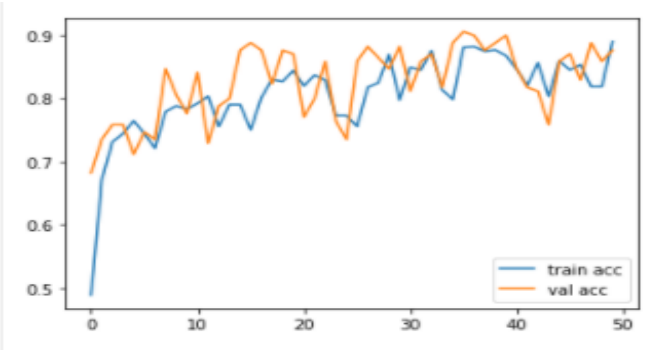
```
Epoch 1/50
31/31 [==============================] - 107s 3s/step - loss: 3.6734 - accuracy: 0.4893 - val_loss: 1.2987 - val_accuracy:
0.6824
Epoch 2/50
31/31 [==============================] - 98s 3s/step - loss: 1.1206 - accuracy: 0.6714 - val_loss: 0.6916 - val_accuracy: 0.
7353
Epoch 3/50
31/31 [==============================] - 98s 3s/step - loss: 0.6520 - accuracy: 0.7314 - val_loss: 0.5791 - val_accuracy: 0.
7588
Epoch 4/50
31/31 [==============================] - 97s 3s/step - loss: 0.6079 - accuracy: 0.7447 - val_loss: 0.5520 - val_accuracy: 0.
7588
Epoch 5/50
31/31 [==============================] - 97s 3s/step - loss: 0.5000 - accuracy: 0.7650 - val_loss: 0.6892 - val_accuracy: 0.
7118
Epoch 6/50
31/31 [==============================] - 101s 3s/step - loss: 0.5994 - accuracy: 0.7447 - val_loss: 0.5347 - val_accuracy:
0.7471
Epoch 7/50
```

Let's have a view at accuracy and loss with the help of graph:

```
# plot the loss
plt.plot(r.history['loss'], label='train loss')
plt.plot(r.history['val_loss'], label='val loss')
plt.legend()
plt.show()
plt.savefig('LossVal_loss')

# plot the accuracy
plt.plot(r.history['accuracy'], label='train acc')
plt.plot(r.history['val_accuracy'], label='val acc')
plt.legend()
plt.show()
plt.savefig('AccVal_acc')
```





I have saved the model with the help of h5 file.

```
from tensorflow.keras.models import load_model

model.save('model_resnet50.h5')
```

With the help of saved model lets predict the data for test set:

```
1  y_pred = model.predict(test_set)
```

```
1  y_pred
```

```
[9.52050567e-01, 5.39246692e-08, 4.79494184e-02],
[2.56385114e-02, 5.07229148e-10, 9.74361420e-01],
[3.45090001e-07, 9.99999642e-01, 1.74707786e-08],
[1.87611300e-03, 3.52652059e-08, 9.98123825e-01],
[1.78535911e-03, 9.98054266e-01, 1.60412688e-04],
[2.81328010e-08, 1.00000000e+00, 3.71023070e-08],
[9.99128640e-01, 1.00156349e-07, 8.71315366e-04],
[8.85318995e-01, 5.89021568e-07, 1.14680342e-01],
[3.99160216e-09, 2.59644450e-16, 1.00000000e+00],
[1.13305659e-05, 9.99971986e-01, 1.66418977e-05],
[4.66057332e-04, 9.98090446e-01, 1.44349260e-03],
[1.29598344e-03, 9.98689234e-01, 1.48085574e-05],
[4.76938821e-02, 1.04874394e-08, 9.52306092e-01],
[9.96194243e-01, 7.78229492e-07, 3.80491395e-03],
[3.89383110e-16, 1.00000000e+00, 1.38062018e-11],
[9.55161989e-01, 2.37732376e-08, 4.48380597e-02],
[1.60035864e-01, 1.34241782e-04, 8.39829862e-01],
[7.05225579e-03, 5.45047962e-09, 9.92947698e-01],
[1.29695937e-01, 4.13365484e-08, 8.70303988e-01],
[8.29987228e-01, 2.09644786e-05, 1.69991747e-01]
```

I have used Numpy library to make the prediction readable.

```
1  import numpy as np
2  y_pred = np.argmax(y_pred, axis=1)
```

```
1  y_pred
```

```
array([1, 0, 1, 0, 1, 2, 0, 1, 1, 2, 1, 1, 2, 0, 1, 0, 1, 2, 1, 2, 1, 2,
       2, 1, 0, 1, 0, 0, 1, 2, 2, 0, 2, 2, 2, 0, 2, 0, 1, 2, 1, 1, 0, 0, 2,
       1, 1, 1, 2, 0, 1, 0, 2, 2, 2, 0, 2, 0, 1, 2, 2, 0, 2, 2, 0, 1, 1,
       2, 2, 1, 2, 1, 1, 1, 0, 1, 2, 0, 1, 2, 0, 0, 1, 0, 0, 1, 2, 1, 0,
       1, 2, 0, 1, 2, 1, 1, 1, 2, 1, 2, 0, 1, 1, 2, 1, 0, 1, 2, 2, 2, 1,
       1, 2, 2, 0, 2, 1, 1, 1, 2, 0, 0, 0, 0, 0, 2, 1, 1, 2, 0, 2, 0, 2,
       1, 0, 1, 0, 1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2, 1, 0, 2, 1, 2, 2,
       2, 1, 0, 1, 1, 2, 0, 0, 0, 1, 1, 2, 2, 2, 1, 0], dtype=int64)
```

```
1  from tensorflow.keras.models import load_model
```

```
1  model=load_model('model_resnet50.h5') # Load the saved model
```

```
1  img=image.load_img('D:/Clothing/test/S361.jpg',target_size=(224,224)) #testing on new image
```

```
1 x=image.img_to_array(img)
2 x
```

```
array([[[255.,  255.,  255.],
        [255.,  255.,  255.],
        [255.,  255.,  255.],
        ...,
        [255.,  255.,  255.],
        [255.,  255.,  255.],
        [255.,  255.,  255.]],

       [[255.,  255.,  255.],
        [255.,  255.,  255.],
        [255.,  255.,  255.],
        ...,
        [255.,  255.,  255.],
        [255.,  255.,  255.],
        [255.,  255.,  255.]],

       [[255.,  255.,  255.],
        [255.,  255.,  255.],
        [255.,  255.,  255.],
        ...,
        [255.,  255.,  255.],
        [255.,  255.,  255.],
        [255.,  255.,  255.]],

       ...,

       [[255.,  252.,  254.],
        [255.,  252.,  254.],
        [255.,  253.,  254.],
        ...,
        [251.,  255.,  255.],
        [251.,  255.,  255.],
        [254.,  255.,  255.]],

       [[255.,  253.,  252.],
        [255.,  254.,  252.],
        [254.,  254.,  254.],
        ...,
        [253.,  254.,  255.],
        [253.,  254.,  255.],
        [254.,  255.,  255.]],

       [[254.,  254.,  252.],
        [254.,  254.,  252.],
        [253.,  255.,  252.],
        ...,
        [255.,  253.,  255.],
        [255.,  254.,  255.],
        [255.,  253.,  255.]]], dtype=float32)
```

```
1 x.shape #shape of the image
```

```
(224, 224, 3)
```

```
1 x=x/255 # rescaling the image
```

```
1 import numpy as np
2 x=np.expand_dims(x,axis=0)
3 img_data=preprocess_input(x)
4 img_data.shape # new shape of the image
```

```
(1, 224, 224, 3)
```

```
1 img_data
```

```
array([[[[-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         ...,
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ]],

        [[-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         ...,
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ]],

        [[-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         ...,
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ],
         [-102.939   , -115.779   , -122.68    ]],

        ...,

        [[-102.942924, -115.790764, -122.68    ],
         [-102.942924, -115.790764, -122.68    ],
         [-102.942924, -115.78684 , -122.68    ],
         ...,
         [-102.939   , -115.779   , -122.69569 ],
         [-102.939   , -115.779   , -122.69569 ],
         [-102.939   , -115.779   , -122.68392 ]],

        [[-102.95077 , -115.78684 , -122.68    ],
         [-102.95077 , -115.78292 , -122.68    ],
         [-102.942924, -115.78292 , -122.68392 ],
         ...,
         [-102.939   , -115.78292 , -122.68784 ],
         [-102.939   , -115.78292 , -122.68784 ],
         [-102.939   , -115.779   , -122.68392 ]],

        [[-102.95077 , -115.78292 , -122.68392 ],
         [-102.95077 , -115.78292 , -122.68392 ],
         [-102.95077 , -115.779   , -122.68784 ],
         ...,
         [-102.939   , -115.78684 , -122.68    ],
         [-102.939   , -115.78292 , -122.68    ],
         [-102.939   , -115.78684 , -122.68    ]]]], dtype=float32)
```

```
1 model.predict(img_data)
```

```
array([[7.423415e-14, 1.000000e+00, 6.745252e-10]], dtype=float32)
```

```
1 a=np.argmax(model.predict(img_data), axis=1) #prediction over test image
```

```
1 a==1 # checking that its a saree or not as 1 is denotation for saree
```

```
array([ True])
```

```
1 a==0 # checking that its a jeans or not as 0 is denotation for jeans
```

```
array([False])
```

```
1 a==2 # checking that its a trouser or not as 0 is denotation for trouser
```

```
array([False])
```

CONCLUSION

In this Image Scraping and Classification Project, firstly with the help of selenium I have scrapped images of saree, jeans and trouser from Amazon.com. With the help of tensorflow library I have build image classification model. Started with adding pre-processing layer and then created model object.

With the help of compile method specified cost and optimization method to use. Image data Generator and flow from directory methods to import images and equalized same target size as initialized for the image size. Fitted the model.

Lastly, I have tried to review data loss and accuracy with the help of graph. Saved file with the help of h5. I have the loaded the saved model and then predicted over new image.