Image Classification

July 27, 2024

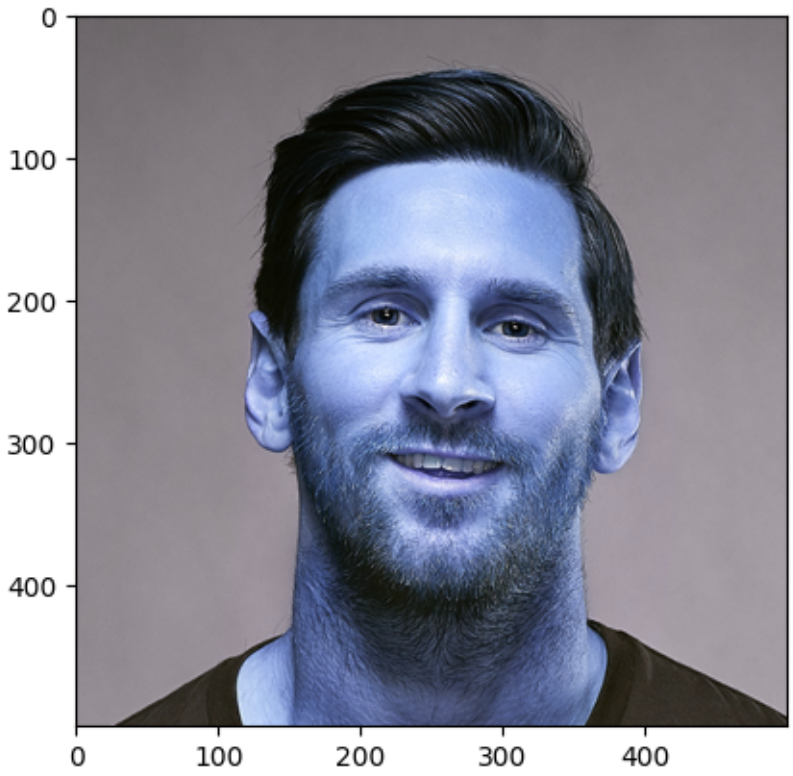
[114]:
```
import numpy as np
import pandas as pd
import cv2
import matplotlib
import seaborn as sn
from matplotlib import pyplot as plt
import warnings
warnings.filterwarnings("ignore")
```

[2]:
```
img=cv2.imread("C:\\Code\\Image␣
 ↪Classifier\\model\\dataset\\lionel_messi\\avatar-leomessi.png")
img.shape
```

[2]:
```
(500, 500, 3)
```

[3]:
```
plt.imshow(img)
```

[3]:
```
<matplotlib.image.AxesImage at 0x238454e7140>
```



[4]:
```
gray_img=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
gray_img.shape
```

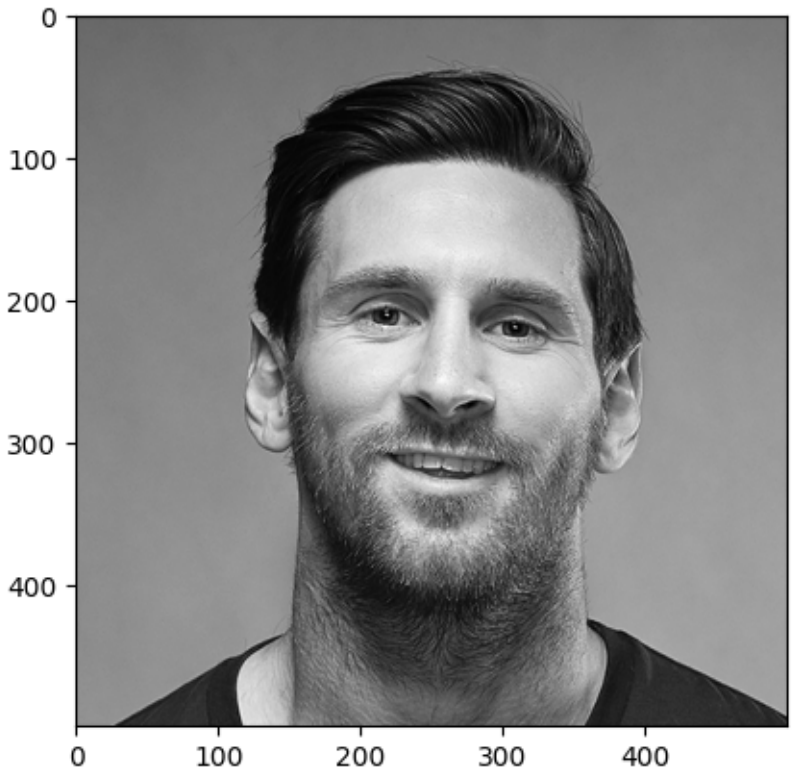
[4]:
```
(500, 500)
```

[5]:
```
gray_img
```

[5]:
```
array([[104, 101, 101, …, 118, 118, 117],
       [103, 103, 104, …, 119, 121, 119],
       [105, 105, 103, …, 120, 119, 121],
       …,
       [142, 146, 145, …,  39,  71,  75],
       [150, 146, 146, …,  41,  40,  59],
       [147, 149, 149, …,  42,  40,  39]], dtype=uint8)
```

[6]:
```
plt.imshow(gray_img,cmap="gray")
```

[6]:
```
<matplotlib.image.AxesImage at 0x23845523c50>
```



[7]:
```
face_cascade=cv2.CascadeClassifier("C:\\Code\\Image␣
↪Classifier\\model\\opencv\\haarcascade\\haarcascade_frontalface_default.xml")
eye_cascade=cv2.CascadeClassifier("C:\\Code\\Image␣
↪Classifier\\model\\opencv\\haarcascade\\haarcascade_eye.xml")
faces=face_cascade.detectMultiScale(gray_img,1.3,5)
faces
```

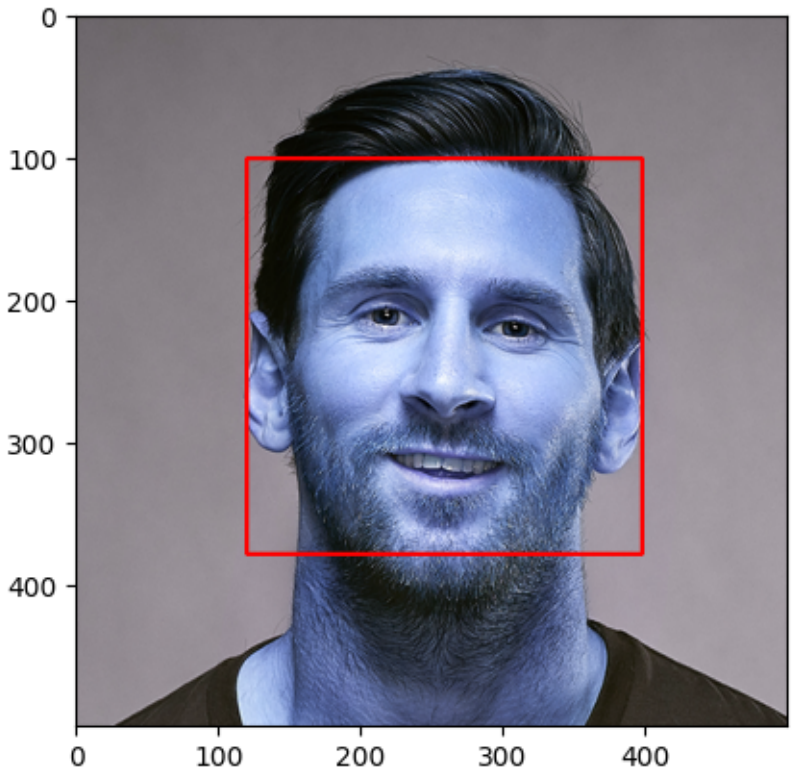
[7]:
```
array([[120, 101, 278, 278]])
```

[8]:
```
x,y,w,h=faces[0]
x,y,w,h
```

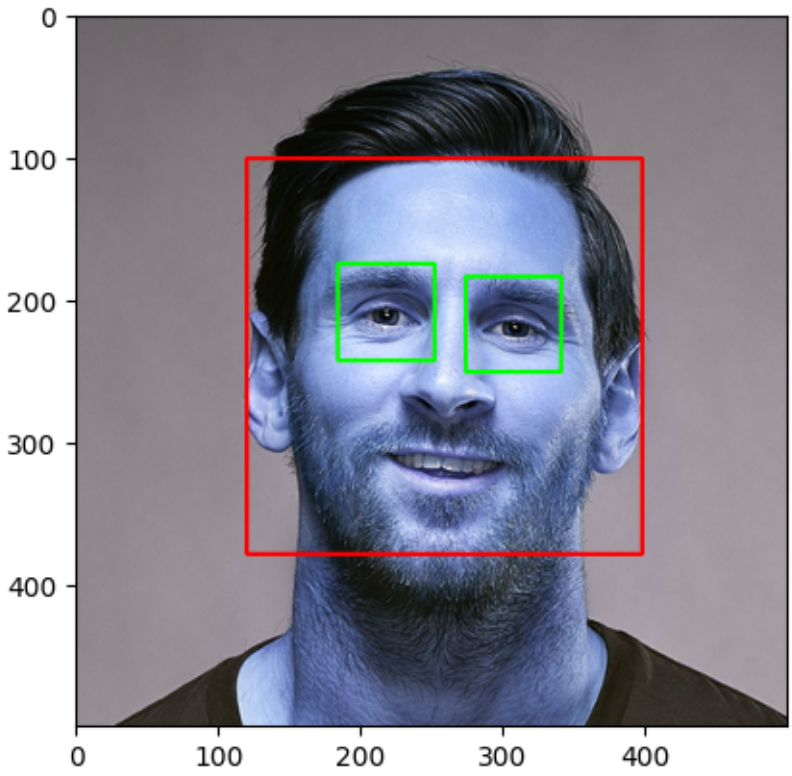
[8]:
```
(120, 101, 278, 278)
```

[9]:
```
face_img=cv2.rectangle(img,(x,y),(x+w,y+h),(255,0,0),2)
plt.imshow(face_img)
```

[9]:
```
<matplotlib.image.AxesImage at 0x238454b1a60>
```

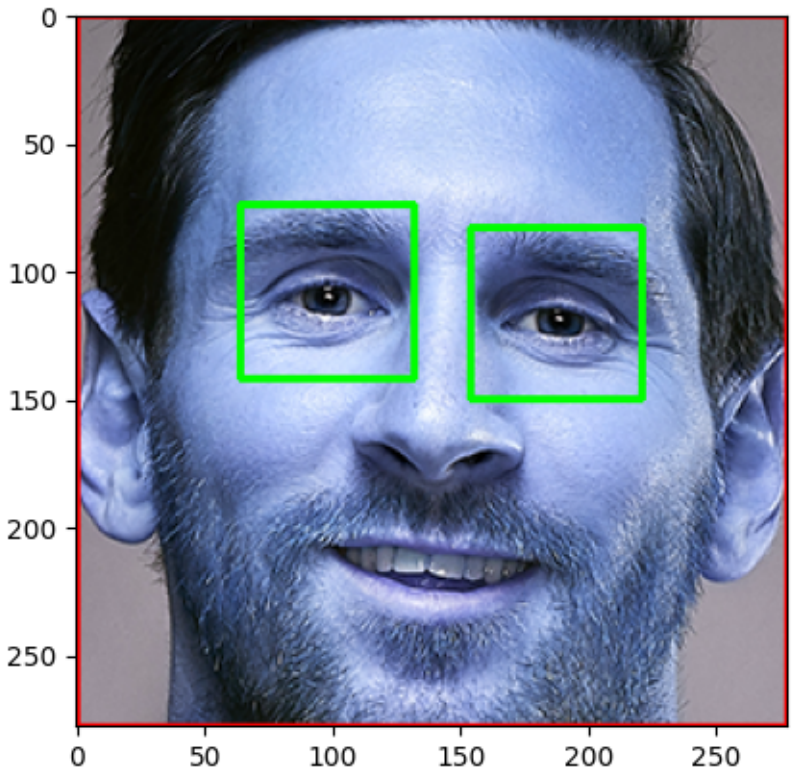


[10]:
```
cv2.destroyAllWindows()
for (x,y,w,h) in faces:
    face_img=cv2.rectangle(img,(x,y),(x+w,y+h),(255,0,0),2)
    roi_gray=gray_img[y:y+h,x:x+w]
    roi_color=face_img[y:y+h,x:x+w]
    eyes=eye_cascade.detectMultiScale(roi_gray)
    for (ex,ey,ew,eh) in eyes:
        cv2.rectangle(roi_color,(ex,ey),(ex+ew,ey+eh),(0,255,0),2)
plt.figure()
plt.imshow(face_img)
plt.show()
```



[11]:
```
plt.imshow(roi_color)
```

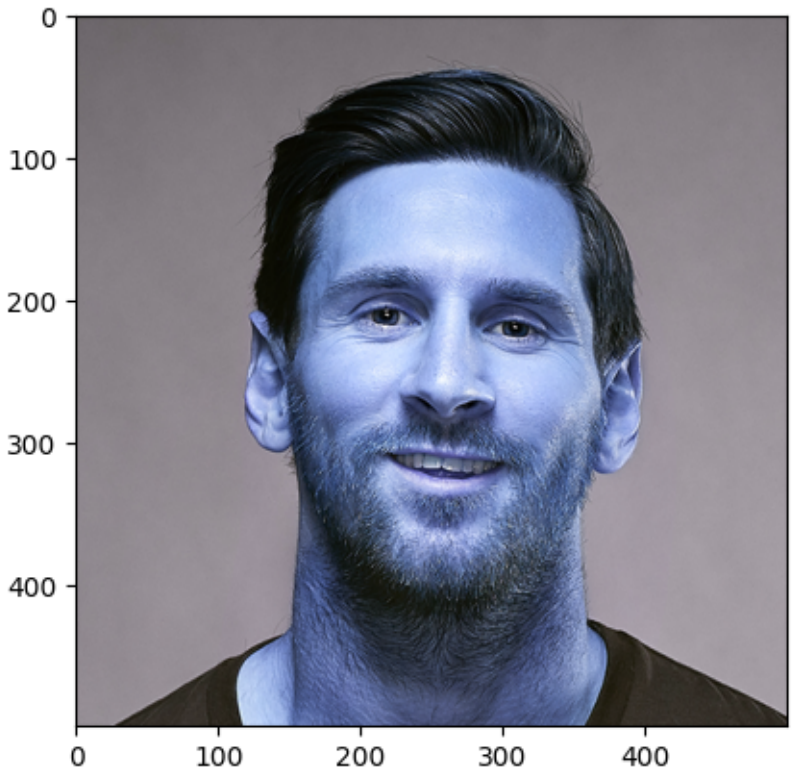
[11]:
```
<matplotlib.image.AxesImage at 0x2384a85fbc0>
```



[12]:
```
def get_cropped_image_if_2_eyes(image_path):
    img=cv2.imread(image_path)
    gray_img=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
    faces=face_cascade.detectMultiScale(gray_img,1.3,5)
    for (x,y,w,h) in faces:
        roi_gray=gray_img[y:y+h, x:x+w]
        roi_color=img[y:y+h, x:x+w]
        eyes=eye_cascade.detectMultiScale(roi_gray)
        if len(eyes)>=2:
            return roi_color
```

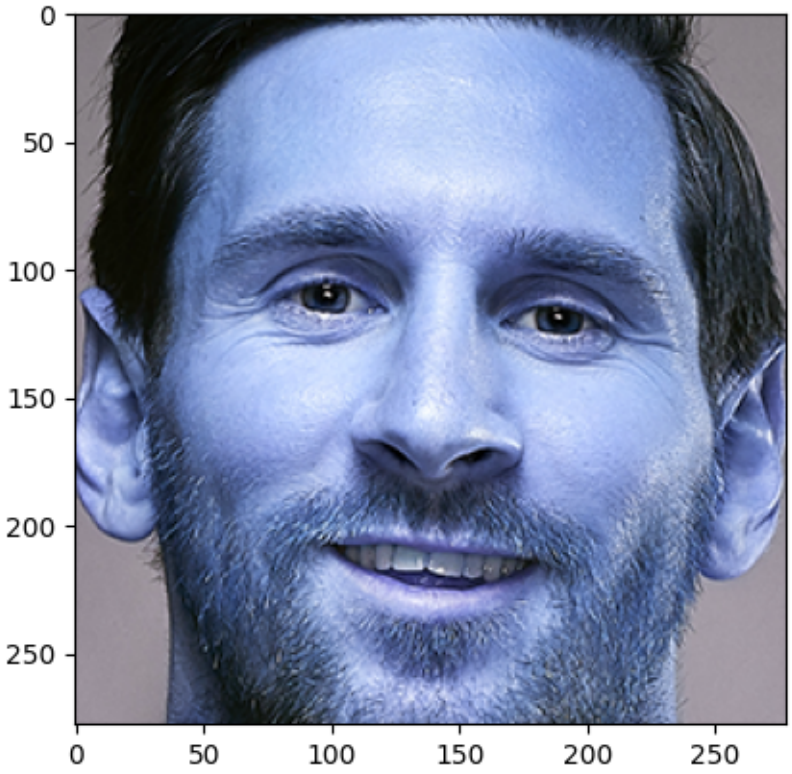
[13]:
```
original_image=cv2.imread("C:\\Code\\Image␣
 ↪Classifier\\model\\dataset\\lionel_messi\\avatar-leomessi.png")
plt.imshow(original_image)
```

[13]:
```
<matplotlib.image.AxesImage at 0x23847789520>
```



[14]:
```
cropped_image=get_cropped_image_if_2_eyes("C:\\Code\\Image␣
↪Classifier\\model\\dataset\\lionel_messi\\avatar-leomessi.png")
plt.imshow(cropped_image)
```

[14]:
```
<matplotlib.image.AxesImage at 0x2384a8a7530>
```



[15]:
```
org_image_obstructed=cv2.imread("C:\\Code\\Image␣
↪Classifier\\model\\dataset\\maria_sharapova\MariaS-W1200.jpg.gallery.jpg")
plt.imshow(org_image_obstructed)
```

[15]: <matplotlib.image.AxesImage at 0x23847741370>

[16]:
```
cropped_image_no_2_eyes=get_cropped_image_if_2_eyes("C:\\Code\\Image␣
↪Classifier\\model\\dataset\\maria_sharapova\MariaS-W1200.jpg.gallery.jpg")
cropped_image_no_2_eyes
```

[51]:
```
path_to_data="C:\\Code\\Image Classifier\\model\\dataset\\"
path_to_cr_data="C:\\Code\\Image Classifier\\model\\dataset\\cropped\\"
```

[52]:
```
import os
img_dirs=[]
for entry in os.scandir(path_to_data):
    if entry.is_dir():
        img_dirs.append(entry.path)
```

[53]:
```
img_dirs
```

[53]:
```
['C:\\Code\\Image Classifier\\model\\dataset\\lionel_messi',
 'C:\\Code\\Image Classifier\\model\\dataset\\maria_sharapova',
 'C:\\Code\\Image Classifier\\model\\dataset\\roger_federer',
 'C:\\Code\\Image Classifier\\model\\dataset\\serena_williams',
 'C:\\Code\\Image Classifier\\model\\dataset\\virat_kohli']
```

[54]:
```
import shutil
if os.path.exists(path_to_cr_data):
    shutil.rmtree(path_to_cr_data)
```

```
os.mkdir(path_to_cr_data)
```

[55]:
```
#we are going to iterate through all the images
cropped_img_dirs=[]
celebrity_file_names_dict={}

for img_dir in img_dirs:
    count=1
    celebrity_name=img_dir.split('\\')[-1]
    print(celebrity_name)
    celebrity_file_names_dict[celebrity_name]=[]

    for entry in os.scandir(img_dir):
        roi_color=get_cropped_image_if_2_eyes(entry.path)
        if roi_color is not None:
            cropped_folder=path_to_cr_data+celebrity_name
            if not os.path.exists(cropped_folder):
                os.makedirs(cropped_folder)
                cropped_img_dirs.append(cropped_folder)
                print("Generating cropped images in folder: ",cropped_folder)

            cropped_file_name=celebrity_name+str(count)+".jpg"
            cropped_file_path=cropped_folder+"\\"+cropped_file_name
            cv2.imwrite(cropped_file_path,roi_color)
            celebrity_file_names_dict[celebrity_name].append(cropped_file_path)
            count=count+1
```

```
lionel_messi
Generating cropped images in folder:  C:\Code\Image
Classifier\model\dataset\cropped\lionel_messi
maria_sharapova
Generating cropped images in folder:  C:\Code\Image
Classifier\model\dataset\cropped\maria_sharapova
roger_federer
Generating cropped images in folder:  C:\Code\Image
Classifier\model\dataset\cropped\roger_federer
serena_williams
Generating cropped images in folder:  C:\Code\Image
Classifier\model\dataset\cropped\serena_williams
virat_kohli
Generating cropped images in folder:  C:\Code\Image
Classifier\model\dataset\cropped\virat_kohli
```

[56]:
```
celebrity_file_names_dict
```

[56]:
```
{'lionel_messi': ['C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi1.jpg',
  'C:\\Code\\Image
```

```
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi2.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi3.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi4.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi5.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi6.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi7.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi8.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi9.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi10.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi11.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi12.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi13.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi14.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi15.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi16.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi17.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi18.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi19.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi20.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi21.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi22.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi23.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi24.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi25.jpg',
```

```
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi26.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi27.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi28.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi29.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi30.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi31.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi32.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi33.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi34.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi35.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi36.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi37.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi38.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\lionel_messi\\lionel_messi39.jpg'],
 'maria_sharapova': ['C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova1.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova2.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova3.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova4.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova5.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova6.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova7.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova8.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova9.jpg',
  'C:\\Code\\Image
```

```
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova10.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova11.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova12.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova13.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova14.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova15.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova16.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova17.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova18.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova19.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova20.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova21.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova22.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova23.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova24.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova25.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova26.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova27.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova28.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova29.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova30.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova31.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova32.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova33.jpg',
```

```
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova34.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\maria_sharapova\\maria_sharapova35.jpg'],
 'roger_federer': ['C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer1.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer2.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer3.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer4.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer5.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer6.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer7.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer8.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer9.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer10.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer11.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer12.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer13.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer14.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer15.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer16.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer17.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer18.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer19.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer20.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer21.jpg',
  'C:\\Code\\Image
```

```
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer22.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer23.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer24.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer25.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer26.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer27.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer28.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer29.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\roger_federer\\roger_federer30.jpg'],
 'serena_williams': ['C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams1.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams2.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams3.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams4.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams5.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams6.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams7.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams8.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams9.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams10.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams11.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams12.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams13.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams14.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams15.jpg',
```

```
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams16.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams17.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams18.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams19.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams20.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams21.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams22.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams23.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams24.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams25.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams26.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams27.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams28.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams29.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams30.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams31.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams32.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams33.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams34.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\serena_williams\\serena_williams35.jpg'],
 'virat_kohli': ['C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli1.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli2.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli3.jpg',
  'C:\\Code\\Image
```

```
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli4.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli5.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli6.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli7.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli8.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli9.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli10.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli11.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli12.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli13.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli14.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli15.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli16.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli17.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli18.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli19.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli20.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli21.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli22.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli23.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli24.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli25.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli26.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli27.jpg',
```

```
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli28.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli29.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli30.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli31.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli32.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli33.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli34.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli35.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli36.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli37.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli38.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli39.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli40.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli41.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli42.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli43.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli44.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli45.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli46.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli47.jpg',
  'C:\\Code\\Image
Classifier\\model\\dataset\\cropped\\virat_kohli\\virat_kohli48.jpg']}
```

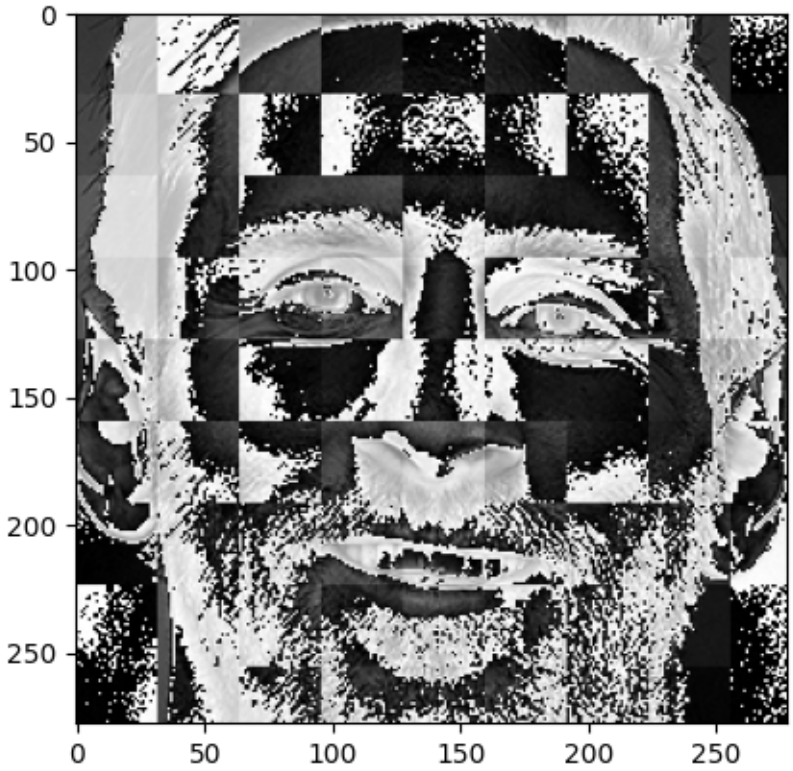
[57]:
```
import pywt

def w2d(img,mode="haar",level=1):
    imArray=img
```

```
    imArray=cv2.cvtColor(imArray,cv2.COLOR_RGB2GRAY)
    imArray=np.float32(imArray)
    imArray=imArray/255
    coeffs=pywt.wavedec2(imArray,mode,level=level)
    coeffs_H=list(coeffs)
    coeffs_H[0]=coeffs_H[0]*0
    imArray_H=pywt.waverec2(coeffs_H,mode)
    imArray_H=imArray_H*255
    imArray_H=np.uint8(imArray_H)
    return imArray_H
```

[58]:
```
im_har=w2d(cropped_image,'db1',5)
plt.imshow(im_har,cmap="gray")
```

[58]: <matplotlib.image.AxesImage at 0x2384dcebe60>



[59]:
```
class_dict={}
count=0
for celebrity_name in celebrity_file_names_dict.keys():
    class_dict[celebrity_name]=count
    count=count+1
class_dict
```

[59]:
```
{'lionel_messi': 0,
 'maria_sharapova': 1,
 'roger_federer': 2,
 'serena_williams': 3,
 'virat_kohli': 4}
```

[60]:
```
x=[]
y=[]

for celebrity_name,training_files in celebrity_file_names_dict.items():
    for training_image in training_files:
        img=cv2.imread(training_image)
        if img is None:
            continue
        scalled_raw_img=cv2.resize(img,(32,32))
        img_har=w2d(img,'db1',5)
        scalled_img_har=cv2.resize(img_har,(32,32))
        combined_img=np.vstack((scalled_raw_img.
 ↪reshape(32*32*3,1),scalled_img_har.reshape(32*32,1)))
        x.append(combined_img)
        y.append(class_dict[celebrity_name])
```

[61]:
```
x=np.array(x).reshape(len(x),4096).astype(float)
x.shape
```

[61]:
```
(165, 4096)
```

[94]:
```
from sklearn.svm import SVC
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.pipeline import Pipeline
from sklearn.metrics import classification_report
```

[95]:
```
x_train, x_test, y_train, y_test = train_test_split(x, y, random_state=0)

pipe = Pipeline([('scaler', StandardScaler()), ('svc', SVC(kernel = 'rbf', C =␣
 ↪10))])
pipe.fit(x_train, y_train)
pipe.score(x_test, y_test)
```

[95]:
```
0.8333333333333334
```

[96]:
```
len(x_test)
```

[96]:
```
42
```

[97]:
```
print(classification_report(y_test, pipe.predict(x_test)))
```

```
              precision    recall  f1-score   support

           0       1.00      0.62      0.77         8
           1       1.00      0.70      0.82        10
           2       0.54      1.00      0.70         7
           3       0.80      1.00      0.89         4
           4       1.00      0.92      0.96        13

    accuracy                           0.83        42
   macro avg       0.87      0.85      0.83        42
weighted avg       0.90      0.83      0.84        42
```

[98]:
```
from sklearn import svm
from sklearn.ensemble import RandomForestClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.pipeline import make_pipeline
from sklearn.model_selection import GridSearchCV
```

[99]:
```
model_params = {
    'svm': {
        'model': svm.SVC(gamma='auto',probability=True),
        'params' : {
            'svc__C': [1,10,100,1000],
            'svc__kernel': ['rbf','linear']
        }
    },
    'random_forest': {
        'model': RandomForestClassifier(),
        'params' : {
            'randomforestclassifier__n_estimators': [1,5,10]
        }
    },
    'logistic_regression' : {
        'model': LogisticRegression(solver='liblinear',multi_class='auto'),
        'params': {
            'logisticregression__C': [1,5,10]
        }
    }
}
```

[100]:
```
scores = []
best_estimators = {}
for algo, mp in model_params.items():
    pipe = make_pipeline(StandardScaler(), mp['model'])
    clf =  GridSearchCV(pipe, mp['params'], cv=5, return_train_score=False)
    clf.fit(x_train, y_train)
```

```
    scores.append({
        'model': algo,
        'best_score': clf.best_score_,
        'best_params': clf.best_params_
    })
    best_estimators[algo] = clf.best_estimator_

df = pd.DataFrame(scores,columns=['model','best_score','best_params'])
```

[101]:
```
df
```

[101]:
```
                 model  best_score  \
0                  svm    0.837000
1        random_forest    0.659000
2  logistic_regression    0.885667

                                    best_params
0        {'svc__C': 1, 'svc__kernel': 'linear'}
1  {'randomforestclassifier__n_estimators': 10}
2                  {'logisticregression__C': 1}
```

0.1 The best score is from logistic regression

[102]:
```
best_estimators
```

[102]:
```
{'svm': Pipeline(steps=[('standardscaler', StandardScaler()),
                        ('svc',
                         SVC(C=1, gamma='auto', kernel='linear', probability=True))]),
 'random_forest': Pipeline(steps=[('standardscaler', StandardScaler()),
                        ('randomforestclassifier',
                         RandomForestClassifier(n_estimators=10))]),
 'logistic_regression': Pipeline(steps=[('standardscaler', StandardScaler()),
                        ('logisticregression',
                         LogisticRegression(C=1, multi_class='auto',
                                            solver='liblinear'))])}
```

[103]:
```
best_estimators['svm'].score(x_test,y_test)
```

[103]:
```
0.9047619047619048
```

[104]:
```
best_estimators['logistic_regression'].score(x_test,y_test)
```

[104]:
```
0.8809523809523809
```

0.2 But svm model works well with test case

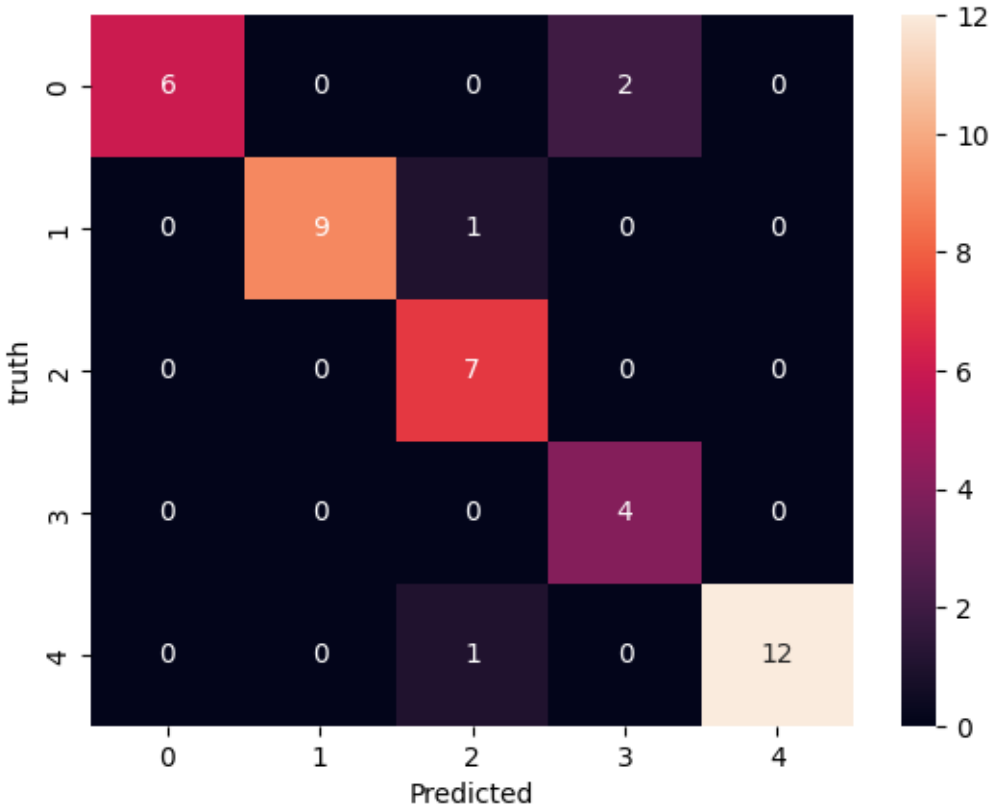
[108]:
```
best_clf=best_estimators['svm']
```

[109]:
```
from sklearn.metrics import confusion_matrix
cm=confusion_matrix(y_test,best_clf.predict(x_test))
cm
```

[109]:
```
array([[ 6,  0,  0,  2,  0],
       [ 0,  9,  1,  0,  0],
       [ 0,  0,  7,  0,  0],
       [ 0,  0,  0,  4,  0],
       [ 0,  0,  1,  0, 12]], dtype=int64)
```

[110]:
```
sn.heatmap(cm,annot=True)
plt.xlabel('Predicted')
plt.ylabel('truth')
```

[110]:
```
Text(50.722222222222214, 0.5, 'truth')
```



[46]:
```
class_dict
```

[46]:
```
{'lionel_messi': 0,
 'maria_sharapova': 1,
 'roger_federer': 2,
 'serena_williams': 3,
 'virat_kohli': 4}
```

[112]:
```
import joblib
joblib.dump(best_clf,'C:\\Code\\Image Classifier\\model\\saved_model.pkl')
```

[112]:
```
['C:\\Code\\Image Classifier\\model\\saved_model.pkl']
```

[113]:
```
import json
with open("C:\\Code\\Image Classifier\\model\\class_dictionary.json","w") as f:
    f.write(json.dumps(class_dict))
```