CAPSTONE PROJECT REPORT

FACE DETECTION AND RECOGNITION

NAME: Keshav Anand

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Problem Statement:

Build a machine learning model for Face Detection and Recognition

Prerequisites

Prerequisites: Python 3.6: This setup requires that your machine has latest version of python. The following url https://www.python.org/downloads/ can be referred to download python. Once you have python downloaded and installed, you will need to setup PATH variables (if you want to run python program directly, detail instructions are below in how to run software section). To do that check this: https://www.pythoncentral.io/ add-python-to-path-python-is-not-recognized-as-an-internal-or-externalcommand/. Setting up PATH variable is optional as you can also run program without it and more instruction are given below on this topic.

Anaconda: Download anaconda and use its anaconda prompt to run the commands. To install anaconda check this url https://www.anaconda.com/download/ You will also need to download and install below 3 packages after you install either python or anaconda from the steps above Sklearn (scikit-learn) numpy scipy if you have chosen to install python 3.6 then run below commands in command prompt/terminal to install these packages pip install -U scikit-learn pip install numpy pip install scipy if you have chosen to install anaconda then run below commands in anaconda prompt to install these packages conda install -c scikitlearn conda install -c anaconda numpy conda install -c anaconda scipy

Dataset Used:

The data source used for this project is captured from live images using opencv module. The screenshot of the process is shared

Implementation

Screenshots of Source Code are :

Importing libraries

In [1]:
```
import keras
import cv2
import os
import numpy as np
from PIL import Image
import matplotlib.pyplot as plt
```

Transforming the photos

In [2]:
```
datagen = keras.preprocessing.image.ImageDataGenerator(
    rotation_range=30,
    width_shift_range=0.0,
    height_shift_range=0.0,
    horizontal_flip=True,
    vertical_flip=True,
    rescale=None,
    preprocessing_function=None
)
```

Creating data for face detection

In [3]:
```
def mark_images(f):
    ex = -1
    img = cv2.resize(cv2.imread(f), (640, 480))
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    face_detector = cv2.CascadeClassifier(cv2.data.haarcascades + 'haarcascade_frontalface_default.xml')
    faces = face_detector.detectMultiScale(gray, 1.3, 5)
    for (x,y,w,h) in faces:
        cv2.rectangle(img, (x,y), (x+w,y+h), (255,0,0), 2)
        plt.imshow(gray[y:y+h,x:x+w])
        plt.show()
        face_id = input('\n Assign an ID number and press enter ')
        im = np.expand_dims(np.expand_dims(gray[y:y+h,x:x+w], 0), 3)
        datagen.fit(im)
        for x, val in zip(datagen.flow(im, save_to_dir='C:\\Users\\KESHAV\\Desktop\\capstone\\face\\dataset', save_prefix="User_" + str(f
ace_id), save_format='jpg'),range(100)):
            ex = 1
```

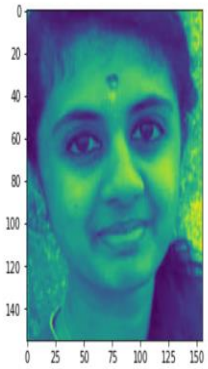
capturing face data

In [4]:
```
cam = cv2.VideoCapture(0)
cam.set(3, 640)
cam.set(4, 480)
face_detector = cv2.CascadeClassifier(cv2.data.haarcascades + 'haarcascade_frontalface_default.xml')

face_id = input('\n Assign an ID number and press enter ')
print("\n  Look the camera and wait ...")

ex = -1
while(True):
    ret, img = cam.read()
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    faces = face_detector.detectMultiScale(gray, 1.3, 5)

    for (x,y,w,h) in faces:

        cv2.rectangle(img, (x,y), (x+w,y+h), (255,0,0), 2)
        cv2.imshow('image', img)
        im = np.expand_dims(np.expand_dims(gray[y:y+h,x:x+w], 0), 3)
        datagen.fit(im)


        for x, val in zip(datagen.flow(im, save_to_dir='C:\\Users\\KESHAV\\Desktop\\capstone\\face\\dataset', save_prefix="User_" + str(f
ace_id), save_format='jpg'),range(100)):
            ex = 1

    k = cv2.waitKey(100) & 0xff
    if k == 27:
        break
    if ex == 1:
        break
print("\n Exiting Program and cleanup stuff")
cam.release()
cv2.destroyAllWindows()
```

```
 Look the camera and wait ...

 Exiting Program and cleanup stuff
```

If want to add any other image from the folder

In [5]:
```
mark_images('kavya.jpg')
```



Training the model

if there is an error for the .DS_STORE use -->" find . -name ".DS_Store" -delete " for the folder

In [6]:
```
path = 'C:\\Users\\KESHAV\\Desktop\\capstone\\face\\dataset'
recognizer = cv2.face.LBPHFaceRecognizer_create()
detector = cv2.CascadeClassifier(cv2.data.haarcascades + 'haarcascade_frontalface_default.xml')
def getImagesAndLabels(path):
    imagePaths = [os.path.join(path,f) for f in os.listdir(path)]
    faceSamples=[]
    ids = []
    for imagePath in imagePaths:
        PIL_img = Image.open(imagePath).convert('L')
        img_numpy = np.array(PIL_img,'uint8')
        id = int(os.path.split(imagePath)[-1].split("_")[1])
        faces = detector.detectMultiScale(img_numpy)
        for (x,y,w,h) in faces:
            faceSamples.append(img_numpy[y:y+h,x:x+w])
            ids.append(id)

    return faceSamples,ids
print ("\n Training faces. It will take a few seconds. please Wait ...")
faces,ids = getImagesAndLabels(path)
recognizer.train(faces, np.array(ids))
recognizer.write('C:\\Users\\KESHAV\\Desktop\\capstone\\face\\trainer\\trainer.yml')
print("\n  {0} faces trained. Exiting Program".format(len(np.unique(ids))))
```

```
 Training faces. It will take a few seconds. please Wait ...

  2 faces trained. Exiting Program
```

Face detection

In [7]:
```
recognizer = cv2.face.LBPHFaceRecognizer_create()
recognizer.read('C:\\Users\\KESHAV\\Desktop\\capstone\\face\\trainer\\trainer.yml')
faceCascade = cv2.CascadeClassifier(cv2.data.haarcascades + 'haarcascade_frontalface_default.xml')
font = cv2.FONT_HERSHEY_SIMPLEX
id = 0
names = ['none','KESHAV','kavya']
```

In [11]:
```
cam = cv2.VideoCapture(0)
cam.set(3, 640)
cam.set(4, 480)

minW = 0.1*cam.get(3)
minH = 0.1*cam.get(4)
```

In [12]:
```
while True:
    ret, img =cam.read()
    gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
    ret, img =cam.read()
    gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)

    faces = faceCascade.detectMultiScale(
        gray,
        scaleFactor = 1.2,
        minNeighbors = 5,
        minSize = (int(minW), int(minH)),
       )
    for(x,y,w,h) in faces:
        cv2.rectangle(img, (x,y), (x+w,y+h), (0,255,0), 2)
        id, confidence = recognizer.predict(gray[y:y+h,x:x+w])

        if (confidence < 100):
            id = names[id]
            confidence = "  {0}%".format(round(confidence))
        else:
            id = "unknown"
            confidence = "  {0}%".format(round(confidence))

        cv2.putText(
                    img,
                    str(id),
                    (x+5,y-5),
                    font,
                    1,
                    (255,255,255),
                    2
                   )
        cv2.putText(
                    img,
                    str(confidence),
                    (x+5,y+h-5),
                    font,
                    1,
                    (255,255,0),
                    1
                   )
```

```
    cv2.imshow('camera',img)
    k = cv2.waitKey(10) & 0xff # Press 'ESC' for exiting video
    if k == 'q':
        break
cam.release()
cv2.destroyAllWindows()
```