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"TO IDENTIFY GENDER, DETECT AGE & EMOTIONS USING PYTHON"

by

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Certificate

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❖ ABSTRACT -

With the growing number of apps, automatic age, emotion, and gender classification has become more useful, especially with the rise in use of online platforms and social media.

Picture processing is the process of improving image photos collected from camera sources, satellites, aeroplanes, and images captured in ordinary life. The image is processed using a variety of procedures and computations based on the analysis.

There are two main processes in **IMAGE PROCESSING**, followed by easy steps. Picture upgrades are the enhancements to an image with the purpose of producing additional high-quality images that may be used by other programmes. The other process is the most widely used method for **EXTRACTING DATA** from a photograph. Segmentation is the splitting of an image into distinct pieces.

Procedures for determining the age and gender of multiple faces are followed by a variety of approaches. The convolution network extracts features from the neural network. The image is processed into one of the age classes based on the prepared models. The highlights are taken care of a little bit more and sent off to the preparing frameworks.

❖ Introduction -

The main goal of this article is to <u>identify gender, detect age and emotion</u> to use the <u>FER2013 data set</u> and <u>library DEEPFACE</u>.

In this Python Project, we will use Deep Learning to accurately identify the gender, emotion and age of a person from a single image of a face.

We will use the Fer-2013 dataset here and pre-trained models from the Deep-face library which is created by Facebook for facial recognition attributes.

The predicted gender may be one of 'Male' or 'Female', the predicted age is an integer [approximate] and the detected emotion may be Happy, Sad, Neutral, Fear, Angry and Surprised after analysing and comparing the image with the images in dataset.

In this project we used libraries like Open cv, Matplotlib, Deepface –

• What is Computer Vision?

Computer vision is the study of how computers can see and recognise digital images and videos in the same way that humans do. The difficulties it confronts are largely due to a lack of understanding of biological vision. Computer vision is the process of capturing, processing, analysing, and comprehending digital images in order to extract high-dimensional data from the real environment and generate symbolic or numerical data that

MAY BE USED TO MAKE CHOICES. OBJECT RECOGNITION, VIDEO TRACKING, MOTION ESTIMATION, AND IMAGE RESTORATION ARE ALL COMMON TECHNIQUES USED IN THIS PROCEDURE.

• WHAT IS OPEN CV?

THE ACRONYM OPEN CV STANDS FOR "OPEN SOURCE COMPUTER VISION." IT'S AN OPEN-SOURCE COMPUTER VISION AND MACHINE LEARNING LIBRARY, AS THE NAME SUGGESTS. THIS LIBRARY CAN HANDLE REAL-TIME IMAGE AND VIDEO PROCESSING WHILE ALSO PROVIDING ANALYTICAL CAPABILITIES. IT WORKS WITH THE TENSOR FLOW, CAFFE, AND PYTORCH DEEP LEARNING FRAMEWORKS.

• WHAT IS DEEP FACE?

DEEPFACE IS A FACEBOOK RESEARCH GROUP'S DEEP LEARNING FACIAL RECOGNITION TECHNOLOGY. IN DIGITAL PHOTOS, IT RECOGNISES HUMAN FACES. THE PROGRAMME USES A NINE-LAYER NEURAL NETWORK WITH OVER 120 MILLION CONNECTION WEIGHTS THAT WAS TRAINED ON FOUR MILLION IMAGES UPLOADED BY FACEBOOK USERS.[1][2] ACCORDING TO THE FACEBOOK RESEARCH TEAM, THE DEEPFACE METHOD ACHIEVES AN ACCURACY OF 97.35 PERCENT 0.25 PERCENT ON THE LABELED FACES IN THE WILD (LFW) DATA SET, WHILE HUMAN BEINGS ACHIEVE 97.53 PERCENT.

TO REFINE THE ALGORITHMS AND PROVIDE A NORMALISED RESULT, DEEPFACE STARTS BY EMPLOYING ALIGNED VERSIONS OF VARIOUS EXISTING DATABASES. THESE MODELS, HOWEVER, ARE INSUFFICIENT TO GENERATE ACCURATE FACIAL RECOGNITION IN ALL CASES.

DeepFace has a two-step process. First, it corrects an image's angles such that the subject's face is facing forward. It does this by using a 3-D representation of a face. The deep learning algorithm then generates a numerical description of the face. If DeepFace finds a description for two photos that is similar enough, it assumes that they share a face.
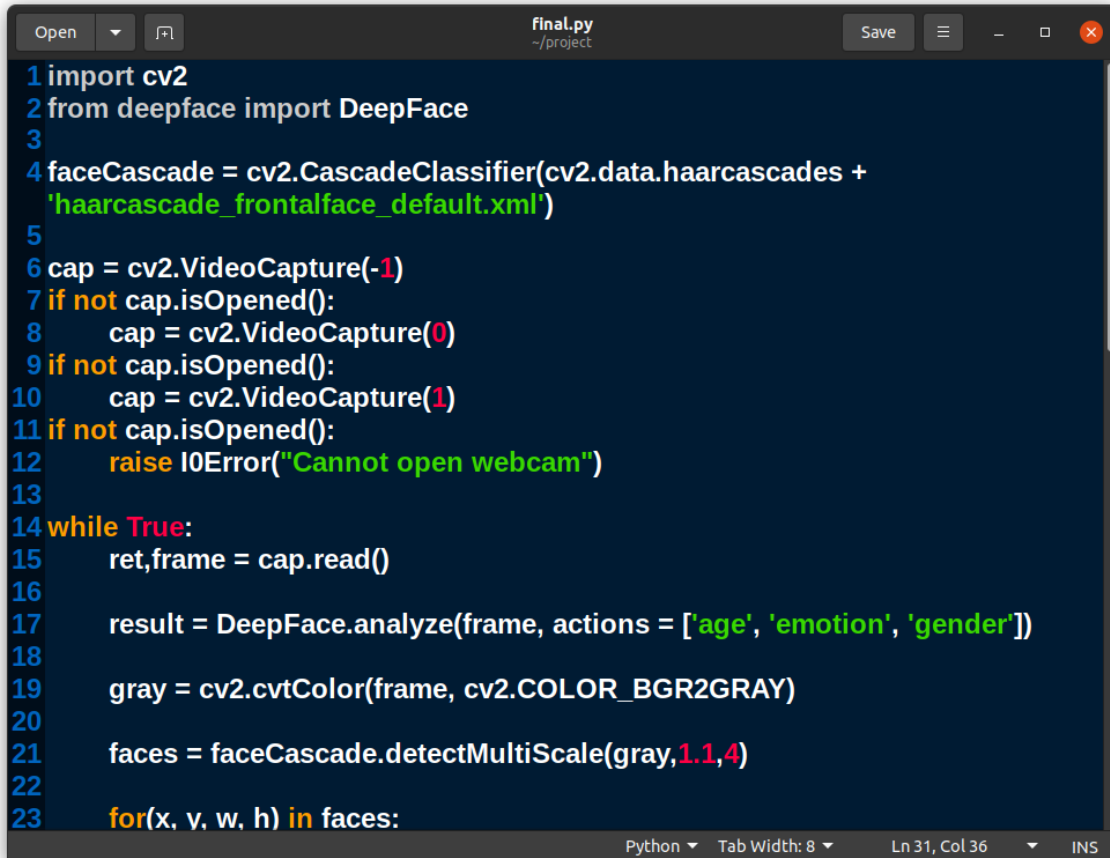
❖ Literature review –

I wrote the majority of the Python script myself, relying solely on the OpenCV library to communicate with the pre-trained model. A Python library is a group of interconnected modules. It contains code bundles that can be reused in a variety of apps. It simplifies and facilitates Python programming for programmers. Machine learning, data science, data visualisation, and other industries rely heavily on Python libraries.

OpenCV is a free and open-source computer vision library. It gives the machine the ability to distinguish faces or objects. The CV is an abbreviated form of computer vision in OpenCV, which is defined as a branch of research that aids computers in comprehending the content of digital images.

DeepFace is a deep learning facial recognition tool developed by a Facebook research group. DeepFace begins by using aligned versions of several existing databases to refine the algorithms and deliver a normalised result. These models, on the other hand, are insufficient to provide reliable facial recognition in all circumstances; instead, it corrects the angles of a picture such that the subject's face faces forward. It accomplishes this by utilising a three-dimensional depiction of a face. The face is then numerically described by the deep learning algorithm. DeepFace assumes that two photographs have the same face if their descriptions are comparable enough.

❖ MᴇᴛʜᴏᴅᴏʟᴏɢY -

```python
import cv2
from deepface import DeepFace

faceCascade = cv2.CascadeClassifier(cv2.data.haarcascades +
    'haarcascade_frontalface_default.xml')

cap = cv2.VideoCapture(-1)
if not cap.isOpened():
    cap = cv2.VideoCapture(0)
if not cap.isOpened():
    cap = cv2.VideoCapture(1)
if not cap.isOpened():
    raise IOError("Cannot open webcam")

while True:
    ret,frame = cap.read()

    result = DeepFace.analyze(frame, actions = ['age', 'emotion', 'gender'])

    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

    faces = faceCascade.detectMultiScale(gray,1.1,4)

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

- Hᴇʀᴇ I ʜᴀᴠᴇ ɪᴍᴘᴏʀᴛᴇᴅ ʟɪʙʀᴀʀɪᴇꜱ ʀᴇQᴜɪʀᴇᴅ ꜰᴏʀ ᴘʀᴏɢʀᴀᴍ.
- Tʜɪꜱ ɪꜱ ᴛʜᴇ ᴄᴏᴅᴇ ᴏꜰ ᴘʀᴏɢʀᴀᴍ ꜰᴏʀ ɢᴇᴛᴛɪɴɢ ᴀᴄᴄᴇꜱꜱ ᴛᴏ ᴛʜᴇ ᴡᴇʙᴄᴀᴍ ᴏꜰ ᴛʜᴇ ᴅᴇᴠɪᴄᴇ.
- Iꜰ ᴛʜᴇ ᴘʀᴏɢʀᴀᴍ ᴅᴏᴇꜱɴ'ᴛ ɢᴇᴛ ᴀᴄᴄᴇꜱꜱ ᴛᴏ ᴛʜᴇ ᴡᴇʙᴄᴀᴍ ᴛʜᴇ ᴘʀᴏɢʀᴀᴍ ᴡɪʟʟ ᴇɴᴅ ʜᴇʀᴇ ᴘʀɪɴᴛɪɴɢ ᴛʜᴇ ᴇʀʀᴏʀ ᴀꜱ ᴏᴜᴛᴘᴜᴛ "ᴄᴀɴɴᴏᴛ ᴏᴘᴇɴ ᴡᴇʙᴄᴀᴍ".

- Here the captured image is located using the green coloured rectangular box and then is converted to grayscale image.
- Also the command for the font to be used to print output is defined here.
- Here facecascade algorithm is used to draw rectangular box around the detected image.

```python
while True:
    ret,frame = cap.read()

    result = DeepFace.analyze(frame, actions = ['age', 'emotion', 'gender'])

    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

    faces = faceCascade.detectMultiScale(gray,1.1,4)

    for(x, y, w, h) in faces:
        cv2.rectangle(frame, (x, y), (x+w,y+h), (0, 255, 0), 2)
```

```
29      cv2.putText(frame,
30                  result['dominant_emotion'],
31                  (340, 60),
32                  font, 3,
33                  (0, 0, 255),
34                  2,
35                  cv2.LINE_4)
36
37      cv2.putText(frame,
38                  result['gender'],
39                  (10, 60),
40                  font, 3,
41                  (0, 0, 255),
42                  2,
43                  cv2.LINE_4)
44
45      cv2.putText(frame,
46                  str(result['age']),
47                  (210, 430),
48                  font, 3,
49                  (0, 0, 255),
50                  2,
51                  cv2.LINE_4)
52  cv2.imshow('Original video',frame)
```
Python ▾   Tab Width: 8 ▾   Ln 11, Col 23   ▾   INS

- **Here the output generated is located where to print the age, gender and emotion on the video screen.**
- **Here the command used is used to quit the program using the key 'q'.**

```
    if cv2.waitKey(2) & 0xFF == ord('q'):
        break

cap.release()
cv2.destroyAllWindows()
```

❖ RESULTS —

THESE ARE THE OUTPUT GIVEN BY THE PROGRAM DETECTING THE AGE, GENDER AND EMOTIONS.

THE ACCURACY MENTIONED BY FACEBOOK IS AROUND 97% DUE TO ACCESS TO THE LARGE NUMBER OF IMAGES AND USER DATA.
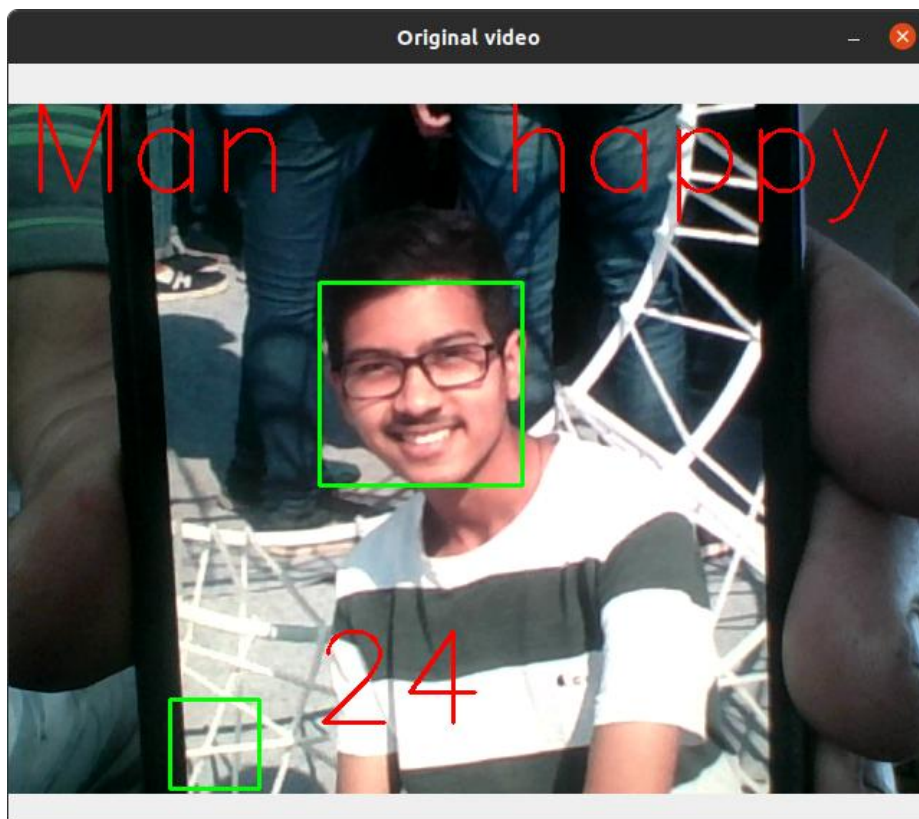
THE ACCURACY MEASURED HERE IN THIS PROJECT IS AROUND 87-90% WHICH CAN BE SEEN IN THE GIVEN RESULT OUTPUT
I.E.
1]WOMAN, HAPPY, AGE 30 - IS 100% ACCURATE.
2]MAN, HAPPY, AGE 32 - HERE THE GIVEN OUTPUT IS 100% ACCURATE.
3]MAN, HAPPY, AGE 24 - HERE GENDER AND EMOTION IS CORRECT BUT AGE IS WRONG IT MUST BE AROUND 19-20.

❖ CONCLUSIONS -

Recognizing age and gender, on the other hand, is an inherently difficult process, more so than many other PC vision tasks. The knowledge required to prepare these kinds of frameworks is the basic justification for this difficulty hole. While normal article finding missions can frequently approach tens of thousands or even hundreds of thousands of images for preparation, datasets with age and gender names are typically in the thousands or, in the best case scenario, hundreds of thousands. Python collected photos, and the model did not perform well in terms of accuracy; the model technique needs to be improved further. Automatic age, emotion, and gender classification has become more useful as the number of apps has grown, especially as the number of users has grown.

To do this, a variety of deep Learning approaches may be used. A suitable dataset is used to train the model, and its performance is measured using a range of performance indicators. The best model, i.e. the model with the highest accuracy, is used to classify facial features. We believe that 75% of the time, when a user uploads an image into our programme, it will be compared and analysed approximately.

❖ Future prospects –

As in today's world the power of internet, social media is incomparable to any other medium and the new trends which are thriving these days also include the topic given 'automatic age, gender and emotion detector' so in future aspect I think of upgrading this project to the next level adding some unique gui user experience detecting more accurate and different attributes through facial recognition.

This project can also be taken to the light in terms of security and safety purposes adding different data to the program as per the requirement or demand of the industry.

❖ References -

- HTTPS://WWW.YOUTUBE.COM/WATCH?V=F KGPVKQCOJC

- HTTPS://DOCS.MICROSOFT.COM/EN-US/AZURE/COGNITIVE-SERVICES/FACE/CONCEPTS/FACE-DETECTION

- FER-2013 | Kaggle

- OpenCV Python Tutorial - GeeksforGeeks

❖ Acknowledgements -

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Secondly, I'd like to express my gratitude to my parents and friends for their assistance in completing this project within the time constraints.