

Facial Emotion Detection using OpenCv and Deepface

ABSTRACT

Facial emotion detection is a model based on facial expressions which can be used in several fields such as criminal investigation, healthcare, human-machine interfaces, academics etc. Facial Emption Recognition (FER) has been recognized for a long time and is a vital topic in the field of computer vision and machine learning. Researchers in this field are interested in developing models that help in better interpretation of facial expressions and extracting these properties to use them later. This model presents the use of deep learning library Deepface which is developed by researchers at Facebook and a very famous computer vision library OpenCv to detect facial emotions. It works on three main steps: Face detection, features extraction and emotion classification. The interest of this model is to provide insights on recent works on automatic facial emotion recognition (FER) via deep learning.

Keywords: Facial emotion detection, Deep learning, Computer vision, Automatic Recognition, Deepface, OpenCv.

1. INTRODUCTION

With deep learning, a lot of new applications of computer vision techniques have been introduced and are now becoming parts of our everyday lives. These include face recognition and indexing, photo stylization or machine vision in self-driving cars.

At its heart, the field of computer vision focuses on designing computer systems that possess the ability to capture, understand, and interpret important visual information contained with image and video data.

Computer vision systems then translate this data, using contextual knowledge provided by human beings, into insights used to drive decision making. Turning raw image data into higher-level concepts so that humans or computers can interpret and act upon them is the principal goal of computer vision technology.

2. RELATED WORK

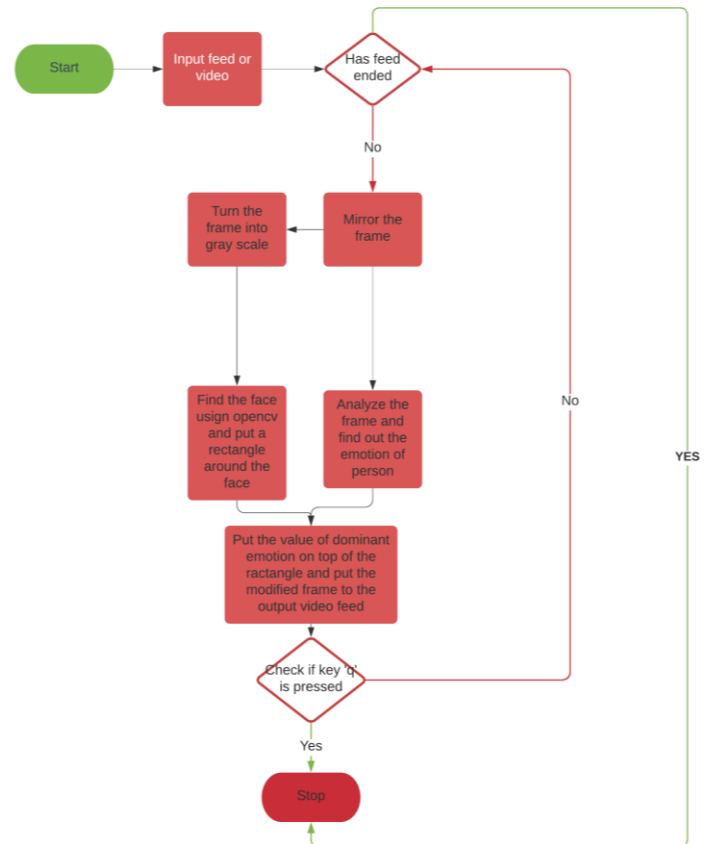
Body language and facial expressions play a very crucial role in human interaction all over the world. Not only humans but also animals, produce specific muscle movements that belong to a certain mental state. Charles Darwin already published on globally common facial expressions in the nineteenth century, which play an important role in nonverbal communication.[1]

In 1971, Ekman Friesen declared facial behaviors to be correlated uniformly with specific emotions.[2]

3. Proposed Model

3.1 Emotion detection using deep learning:

In this model we use the deep learning library “DeepFace” provided by Facebook for emotion detection which employs a nine-layer neural network with over 120 million connection weights and was trained on four million images uploaded by Facebook users. The following flow chart shows the flow of program that’ll be recognizing the expressions.



3.2 Implementation proposed model:

Libraries opencv and deepface need to be preinstalled to use this model. Following algorithm works with web cam of the device and outputs a modified video.

Algorithm

```
#python 3.9.7, CRLF, tab-size = 4
```

```
#importing libraries
```

```
import cv2
```

```
from deepface import DeepFace
```

```
#declaring cascade to be used for face detection
```

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

```

#opening webcam for video input
cap = cv2.VideoCapture(1)
if not cap.isOpened():
    cap = cv2.VideoCapture(0)
if not cap.isOpened():
    raise IOError('Cannot Open Camera')

#code that extracts and updates video frame
while True:
    #read the camera feed
    ret, frame = cap.read()

    #if condition to check input is continuous. If not exit
    if not ret:
        continue

    #mirror the camera feed for user convenience
    frame = cv2.flip(frame, 1)

    #convert frame to gray and extract faces in frame
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    faces = cascade.detectMultiScale(gray, 1.2, 4)

    #font used for displaying emotion
    font = cv2.FONT_HERSHEY_SIMPLEX

    #each iteration puts a rectangle box around the face and
    #emotion on top of rectangle in the frame
    for (x, y, w, h) in faces:
        result = DeepFace.analyze(frame, actions=['emotion'])
        cv2.rectangle(frame, (x, y), (x+w, y+h), (0, 255, 0), 1)

        cv2.putText(frame,
                    result['dominant_emotion'].capitalize(),
                    (x, y-10),
                    font, 1,
                    (0, 0, 255),
                    2
                    )

    #output the modified frame
    cv2.imshow('video', frame)

    #if key 'q' is pressed exit()
    if cv2.waitKey(2) & 0xFF == ord('q'):
        break
    else:
        break

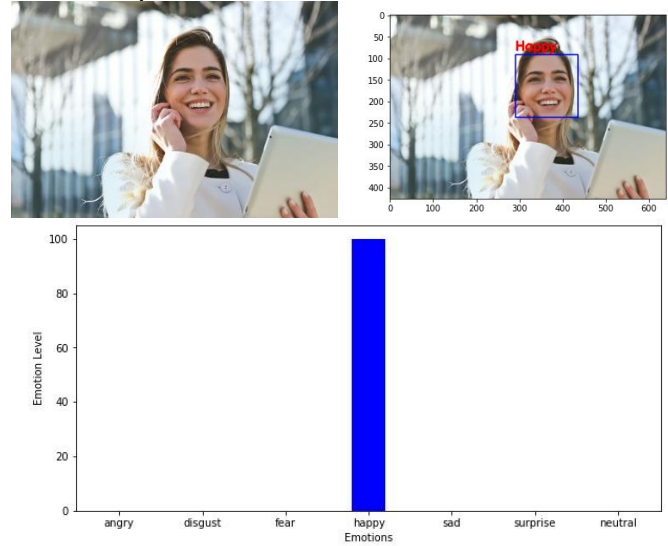
#stop reading webcam feed
cap.release()
#destroy windows used for taking input and showing output
cv2.destroyAllWindows()

```

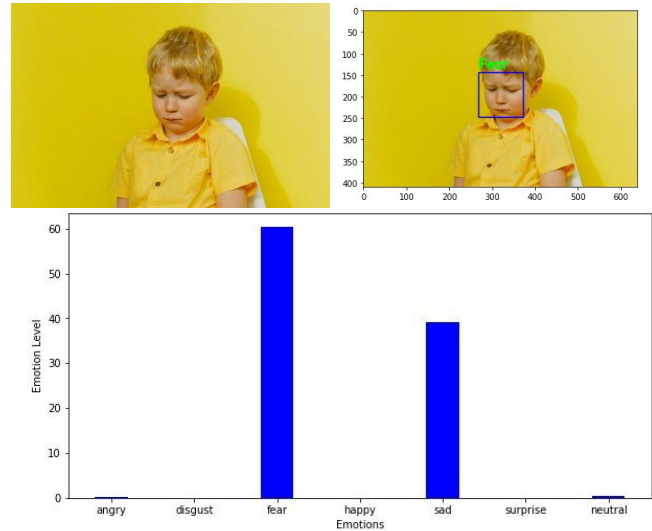
4. EXPERIMENT DETAILS

We conducted several experiments on the concept of FER using the proposed model to assess the model's emotion detection capability. This section describes the results on different datasets used for the experiment.

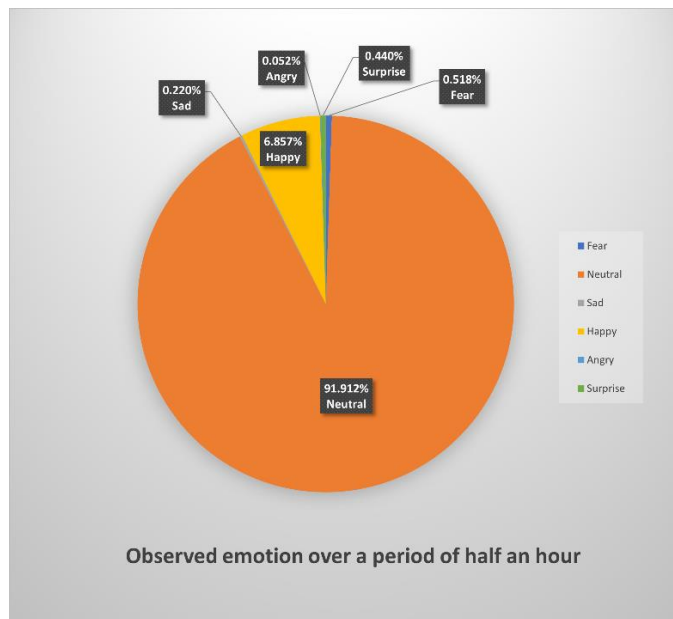
- a. We passed the following image dataset and got the following results:



- b. Another dataset was as follows:



Further we used the model to detect emotions of a person sitting in front of the camera for half an hour and got the following results:



5. CONCLUSION

In this study, we have proposed an algorithm to detect facial expressions of a person in a video or webcam feed and showed how deep-learning and computer vision together be used to create a program that can be helpful in solving different real world problems.

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REFERENCES

1. C. R. Darwin, "The expression of the emotions in man and animals" in , John Murray, London, 1872.
2. P. Ekman and W. V. Friesen, "Constants across cultures in the face and emotion", Journal of personality and social psychology, vol. 17, no. 2, pp. 124, 1971.

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PROJECT LINK

<https://github.com/PriyanshuUpadhyay/FacialEmotionDetection>