Emotion Detection Using DeepFace

Introduction

Emotion detection is a pivotal application in the field of computer vision, providing insights into human emotional states based on facial expressions. This technology has diverse applications, ranging from healthcare to marketing and entertainment. One of the leading tools for implementing emotion detection is the DeepFace library, which leverages deep learning models to analyze and interpret facial features.

DeepFace Library Overview

DeepFace is an open-source deep learning library designed for face recognition and facial attribute analysis, including emotion detection. Developed by Serengil and contributors, it integrates several state-of-the-art models, such as VGG-Face, Google FaceNet, OpenFace, Facebook DeepFace, DeepID, Dlib, and ArcFace, allowing users to choose the most suitable model for their specific needs.

Key Features

1. **Multiple Pre-trained Models**: Supports various advanced models for enhanced flexibility and accuracy.
2. **Facial Attribute Analysis**: Detects age, gender, emotion, and race from facial images.
3. **Real-time Analysis**: Capable of performing real-time face recognition and attribute analysis.
4. **User-friendly API**: Simplifies the process of implementing complex face recognition and analysis tasks.

Applications

Emotion detection has numerous applications across various fields:

- **Healthcare**: Monitoring patient emotions to provide better care and detect early signs of mental health issues.
- **Marketing**: Understanding customer emotions to tailor marketing strategies and improve customer experience.
- **Entertainment**: Enhancing user interaction in gaming and media by responding to user emotions.
- **Security**: Using emotion detection to identify potential threats based on facial expressions.

Emotion Detection Process

Emotion detection using DeepFace involves several steps:

1.Install Necessary Libraries

```
!pip install deepface opencv-python
```

2.Import Libraries

```
import cv2

from deepface import DeepFace

import matplotlib.pyplot as plt
```

3. Load Video and Process Frames

```
# Path to the video file

video_path = '''C:\Users\RISHENDRA\OneDrive\Desktop\testt.mp4'  # Replace with your video path



# Open the video file

cap = cv2.VideoCapture(video_path)



# Check if video opened successfully

if not cap.isOpened():

    print("Error: Could not open video.")

    exit()



# Read until video is completed

while cap.isOpened():

    # Capture frame-by-frame
    ret, frame = cap.read()
    if not ret:
        break

    # Analyze the frame for emotions
    try:
        result = DeepFace.analyze(frame, actions=['emotion'], enforce_detection=False)
        dominant_emotion = result[0]['dominant_emotion']
        face_area = result[0]['region']  # get face coordinates

        # Draw rectangle around the face
        x, y, w, h = face_area['x'], face_area['y'], face_area['w'], face_area['h']
        cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0), 2)

        # Display the resulting frame with emotion
        font = cv2.FONT_HERSHEY_SIMPLEX
        cv2.putText(frame, dominant_emotion, (x, y - 10), font, 0.9, (0, 255, 0), 2,
cv2.LINE_AA)
        cv2.imshow('Video', frame)
    except Exception as e:
        print("Error in analyzing frame: ", e)

    # Press Q on keyboard to exit
    if cv2.waitKey(25) & 0xFF == ord('q'):
        break
```

```
# When everything done, release the video capture object

cap.release()

cv2.destroyAllWindows()
```

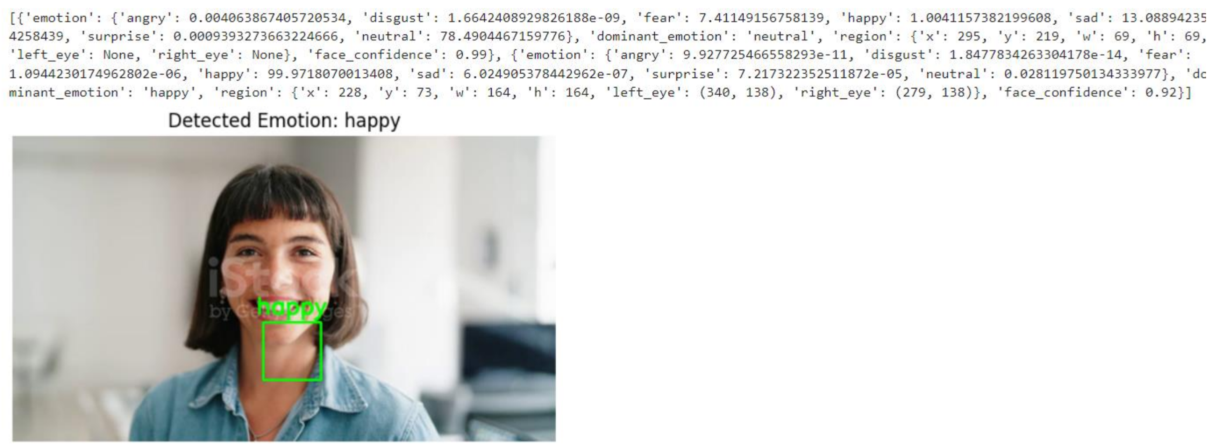
4. Save the Processed Video

```
# Path to the video file

video_path = r'C:\Users\RISHENDRA\OneDrive\Desktop\testt.mp4'

output_path = r'C:\Users\RISHENDRA\OneDrive\Desktop\out.mp4'  # Replace with your desired output path



# Open the video file

cap = cv2.VideoCapture(video_path)



# Check if video opened successfully

if not cap.isOpened():

    print("Error: Could not open video.")

    exit()



# Get the video writer initialized to save the output video

fourcc = cv2.VideoWriter_fourcc(*'mp4v')
```

```
out = cv2.VideoWriter(output_path, fourcc, 20.0, (int(cap.get(3)), int(cap.get(4))))


# Read until video is completed
while cap.isOpened():
    # Capture frame-by-frame
    ret, frame = cap.read()
    if not ret:
        break


    # Analyze the frame for emotions
    try:
        result = DeepFace.analyze(frame, actions=['emotion'], enforce_detection=False)
        dominant_emotion = result[0]['dominant_emotion']
        face_area = result[0]['region']  # get face coordinates


        # Draw rectangle around the face
        x, y, w, h = face_area['x'], face_area['y'], face_area['w'], face_area['h']
        cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0), 2)


        # Display the resulting frame with emotion
        font = cv2.FONT_HERSHEY_SIMPLEX
        cv2.putText(frame, dominant_emotion, (x, y - 10), font, 0.9, (0, 255, 0), 2,
cv2.LINE_AA)
        out.write(frame)
    except Exception as e:
        print("Error in analyzing frame: ", e)
    # Press Q on keyboard to exit
    if cv2.waitKey(25) & 0xFF == ord('q'):
        break

# When everything done, release the video capture object and video writer object
cap.release()
out.release()
cv2.destroyAllWindows()
```

5.Display a Frame with Detected Emotions

```
import cv2
from deepface import DeepFace
import matplotlib.pyplot as plt

# Path to the video file
video_path = r'C:\Users\RISHENDRA\OneDrive\Desktop\testt.mp4'  # Replace with your
video path

# Open the video file
cap = cv2.VideoCapture(video_path)

# Capture a single frame
ret, frame = cap.read()
if ret:
    # Analyze the frame for emotions
    try:
        # Analyze the frame using DeepFace
        result = DeepFace.analyze(frame, actions=['emotion'], enforce_detection=False)

        # Print the result structure for debugging
        print(result)

        # Check if there are any detected faces
        if result:

            face_area = result[0]['region']  # get face coordinates

            # Center the rectangle around the face
            x, y, w, h = face_area['x'], face_area['y'], face_area['w'], face_area['h']
            x_center = x + w // 2
            y_center = y + h // 2
            half_w = w // 2
            half_h = h // 2

            cv2.rectangle(frame, (x_center - half_w, y_center - half_h), (x_center + half_w,
y_center + half_h), (0, 255, 0), 2)

            # Display the resulting frame with emotion
            font = cv2.FONT_HERSHEY_SIMPLEX
            text_size = cv2.getTextSize(dominant_emotion, font, 0.9, 2)[0]
            text_x = x_center - text_size[0] // 2
            text_y = y_center - half_h - 10

            cv2.putText(frame, dominant_emotion, (text_x, text_y), font, 0.9, (0, 255, 0), 2,
cv2.LINE_AA)


            # Convert frame to RGB for displaying with matplotlib

            frame_rgb = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)

            plt.imshow(frame_rgb)

            plt.title(f"Detected Emotion: {dominant_emotion}")

            plt.axis('off')

            plt.show()

        else:

            print("No faces detected in the frame.")

    except Exception as e:

        print("Error in analyzing frame: ", e)


# Release the video capture object

cap.release()
```



```
[{'emotion': {'angry': 0.004063867405720534, 'disgust': 1.6642408929826188e-09, 'fear': 7.41149156758139, 'happy': 1.0041157382199608, 'sad': 13.08894235
4258439, 'surprise': 0.0009393273663224666, 'neutral': 78.4904467159776}, 'dominant_emotion': 'neutral', 'region': {'x': 295, 'y': 219, 'w': 69, 'h': 69,
'left_eye': None, 'right_eye': None}, 'face_confidence': 0.99}, {'emotion': {'angry': 9.927725466558293e-11, 'disgust': 1.8477834263304178e-14, 'fear':
1.0944230174962802e-06, 'happy': 99.9718070013408, 'sad': 6.024905378442962e-07, 'surprise': 7.217322352511872e-05, 'neutral': 0.028119750134333977}, 'dc
minant_emotion': 'happy', 'region': {'x': 228, 'y': 73, 'w': 164, 'h': 164, 'left_eye': (340, 138), 'right_eye': (279, 138)}, 'face_confidence': 0.92}]
```

Detected Emotion: happy