## Untitled

## November 20, 2023

```
[48]: import numpy as np
      import cv2
      import matplotlib.pyplot as plt
      import IPython.display as ipd
      from PIL import Image
      from tensorflow.keras.preprocessing import image
      from tensorflow import keras
      import time
      from sklearn.metrics import accuracy_score, confusion_matrix,_
       ⇔classification_report
[31]: model_eye = keras.models.load_model("eye_detection.h5")
      model_yawn = keras.models.load_model("yawn_detection1.h5")
[50]: video_path = "10fps_laura.mp4"
      output_video_path="output.mp4"
      ipd.Video(video_path, width=700)
[50]: <IPython.core.display.Video object>
[51]: #capturing frames
      cap = cv2.VideoCapture(video_path)
      num_frames=cap.get(cv2.CAP_PROP_FRAME_COUNT)
      num frames
[51]: 1891.0
[52]: ret, img = cap.read()
      print(f'Returned {ret} and img of shape {img.shape}')
     Returned True and img of shape (720, 1280, 3)
[53]: #code for detecting eyes region from face
      face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
      eye_cascade = cv2.CascadeClassifier('haarcascade_eye.xml')
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[56]: yawn_count = 0
      head_rotation_count = 0
      closed_eyes_count = 0
      concentration_levels = {0: "Low Concentration", 1: "Medium Concentration", 2: ___
       →"High Concentration"}
[57]: while cap.isOpened():
          ret, img = cap.read()
          #check if the video capture was successful
          if not ret:
              print("Error: Could not read frame")
              break
          #if the frame is not empty
          if img is None:
              print("Error: Empty frame")
              break
          #resize the frame to (256, 256) and convert to grayscale
          resized_frame = cv2.resize(cv2.cvtColor(img, cv2.COLOR_BGR2GRAY), (256,
       →256))
          #recognition of face and eye
          for (x, y, w, h) in faces:
              #draw a rectangle around the face
              cv2.rectangle(img, (x, y), (x+w, y+h), (255, 0, 0), 2)
              #qet the region for eye detection within the detected face
              roi_gray = gray[y:y+h, x:x+w]
              eyes = eye_cascade.detectMultiScale(roi_gray)
              for (ex, ey, ew, eh) in eyes:
                  #draw a rectangle around the eyes
                  cv2.rectangle(img, (x + ex, y + ey), (x + ex + ew, y + ey + eh),
       \hookrightarrow (0, 255, 0), 2)
              #get the region for mouth detection within the detected face
              roi_gray_mouth = gray[y:y+h, x:x+w]
              mouths = mouth_cascade.detectMultiScale(roi_gray_mouth)
              for (mx, my, mw, mh) in mouths:
                  # Draw a rectangle around the mouth (within the face region)
                  cv2.rectangle(img, (x + mx, y + my), (x + mx + mw, y + my + mh),
       (0, 0, 255), 2)
          #eye detection
          if len(eyes) > 0:q
              # Resize the eyes region to (256, 256) and add an additional dimension
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resized_eyes = np.expand_dims(cv2.resize(roi_gray, (256, 256)), axis=-1)
      eye_pred = np.argmax(model_eye.predict(np.expand_dims(resized_eyes,_u
→axis=0)))
  else:
      eye_pred = -1
      cv2.putText(img, "Head rotation: Detected", (10, 90), cv2.
→FONT_HERSHEY_SIMPLEX, 0.7, (255, 255, 255), 2)
  #yawn detection
  →1)))
  #running the models
  if eye_pred == 0:
      cv2.putText(img, "Eyes: Closed", (10, 30), cv2.FONT_HERSHEY_SIMPLEX, 0.
47, (255, 255, 255), 2)
  else:
      cv2.putText(img, "Eyes: Open", (10, 30), cv2.FONT_HERSHEY_SIMPLEX, 0.7, __
\hookrightarrow (255, 255, 255), 2)
  if yawn_pred == 0:
      cv2.putText(img, "Yawn: Detected", (10, 60), cv2.FONT HERSHEY SIMPLEX,
40.7, (255, 255, 255), 2)
      yawn count += 1
  else:
      cv2.putText(img, "Yawn: Not Detected", (10, 60), cv2.
→FONT_HERSHEY_SIMPLEX, 0.7, (255, 255, 255), 2)
   #check concentration level
  if yawn_count > 5 and head_rotation_count > 5 and closed_eyes_count > 10:
      concentration level = 0 # Low Concentration
  elif yawn_count > 3 and head_rotation_count > 3 and closed_eyes_count > 5:
      concentration level = 1 # Medium Concentration
  elif 1 <= yawn_count <= 2 and 1 <= head_rotation_count <= 2 and \square
⇔closed eyes count > 3:
      concentration_level = 2 # High Concentration
  else:
      concentration_level = -1 # Not classified
  #display the concentration level
  cv2.putText(img, f"Concentration: {concentration_levels.
(10, 120), cv2.FONT HERSHEY SIMPLEX, 0.7, (255, 255, 255), 2)
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cv2.imshow('Frame', img)
k = cv2.waitKey(30) & 0xff
if k == 27:
    break

cap.release()
cv2.destroyAllWindows()
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