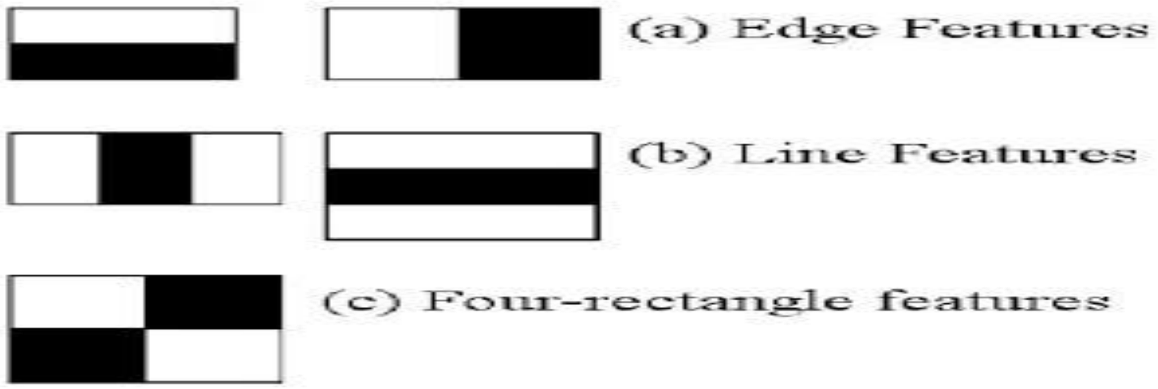
FACE AND EYE DETECTION USING HAAR CASCADES

The key aspect in face recognition is detecting relevant features in human face like eyes, eyebrows, nose, lips. So how do we detect these features in real time/in an image ? The answer is **Haar Wavelets or Haar Features**. And the algorithm used is called as Viola-Jones Algorithm.Haar features are sequence of rescaled square shape functions proposed by Alfred Haar in 1909. They are similar to convolution kernels in the Convolution Neural Networks. We will apply these haar features to all relevant parts of face so as to detect human face.

It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, haar features shown in below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle

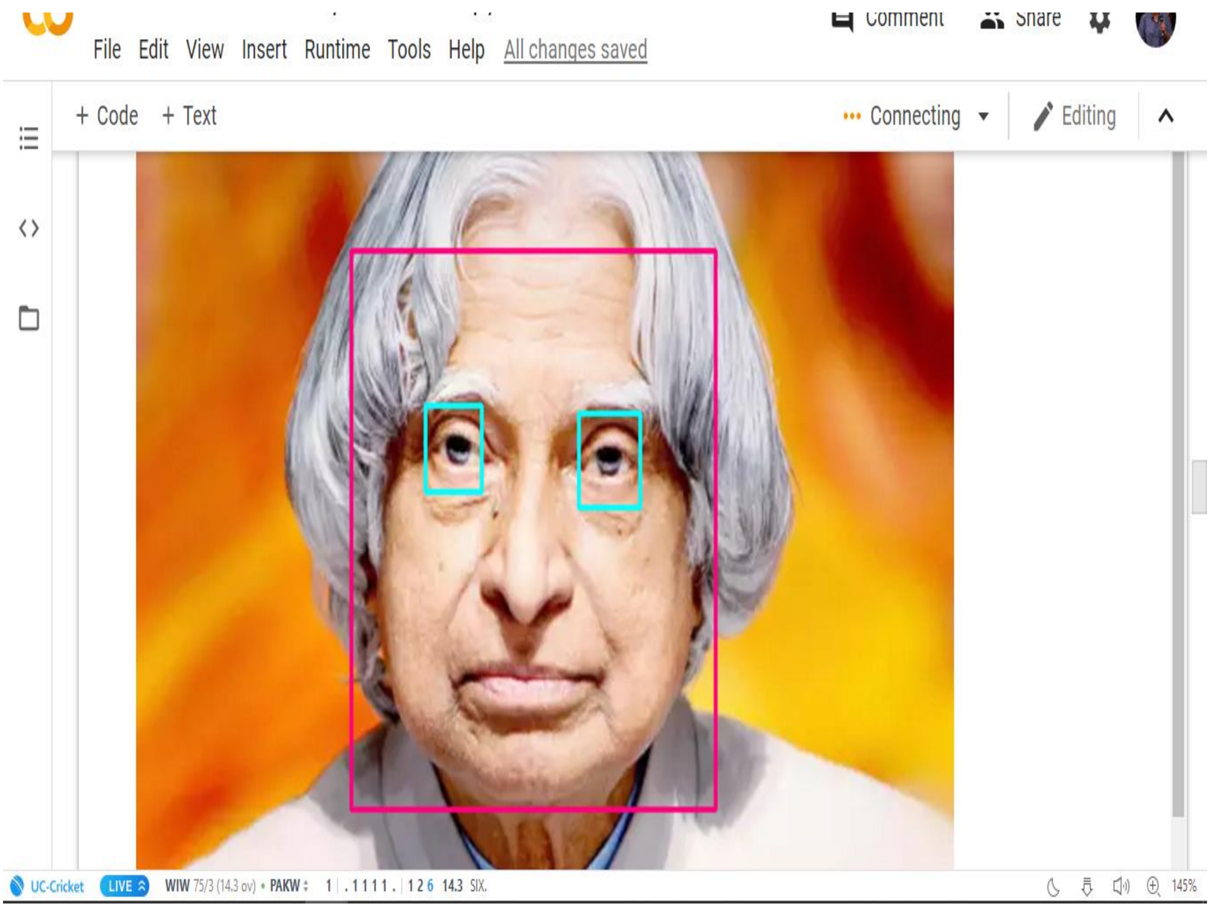


These features are stored in a .xml file which we will be using for face and eye detection.

CODE:

```
import numpy as np
import cv2

face_classifier = cv2.CascadeClassifier('/content/drive/My Drive/HAAR/Haarcascades/haarcascade_frontalface_default.xml')
eye_classifier = cv2.CascadeClassifier('/content/drive/My Drive/HAAR/Haarcascades/haarcascade_eye.xml')

img = cv2.imread('/content/drive/My Drive/HAAR/APJ1.jpg')
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

faces = face_classifier.detectMultiScale(gray, 1.3, 6)

# When no faces detected, face_classifier returns and empty tuple
if faces is ():
    print("No Face Found")

for (x,y,w,h) in faces:
    cv2.rectangle(img,(x,y),(x+w,y+h),(127,0,255),2)
    cv2_imshow(img)
    cv2.waitKey(0)
    roi_gray = gray[y:y+h, x:x+w]
    roi_color = img[y:y+h, x:x+w]
    eyes = eye_classifier.detectMultiScale(roi_gray,1.3,6)
    for (ex,ey,ew,eh) in eyes:
        cv2.rectangle(roi_color,(ex,ey),(ex+ew,ey+eh),(255,255,0),2)
        cv2_imshow(img)
```

OUTPUT:


File Edit View Insert Runtime Tools Help All changes saved
Comment
Share
+ Code + Text
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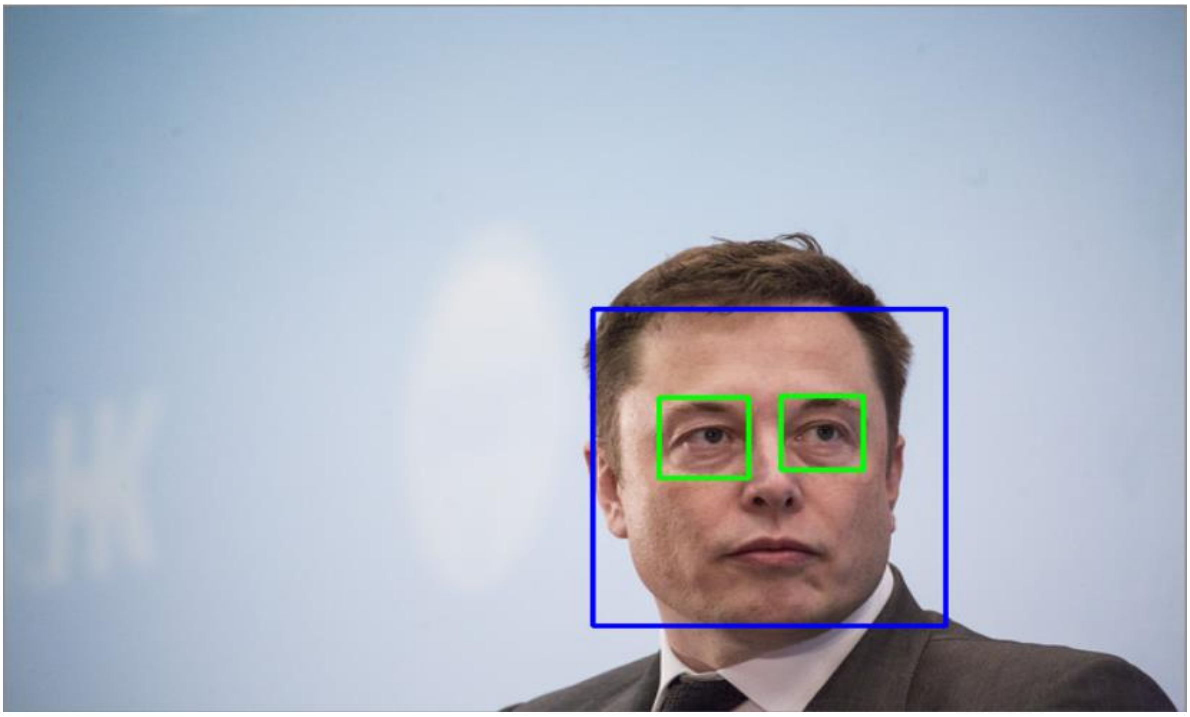
145%



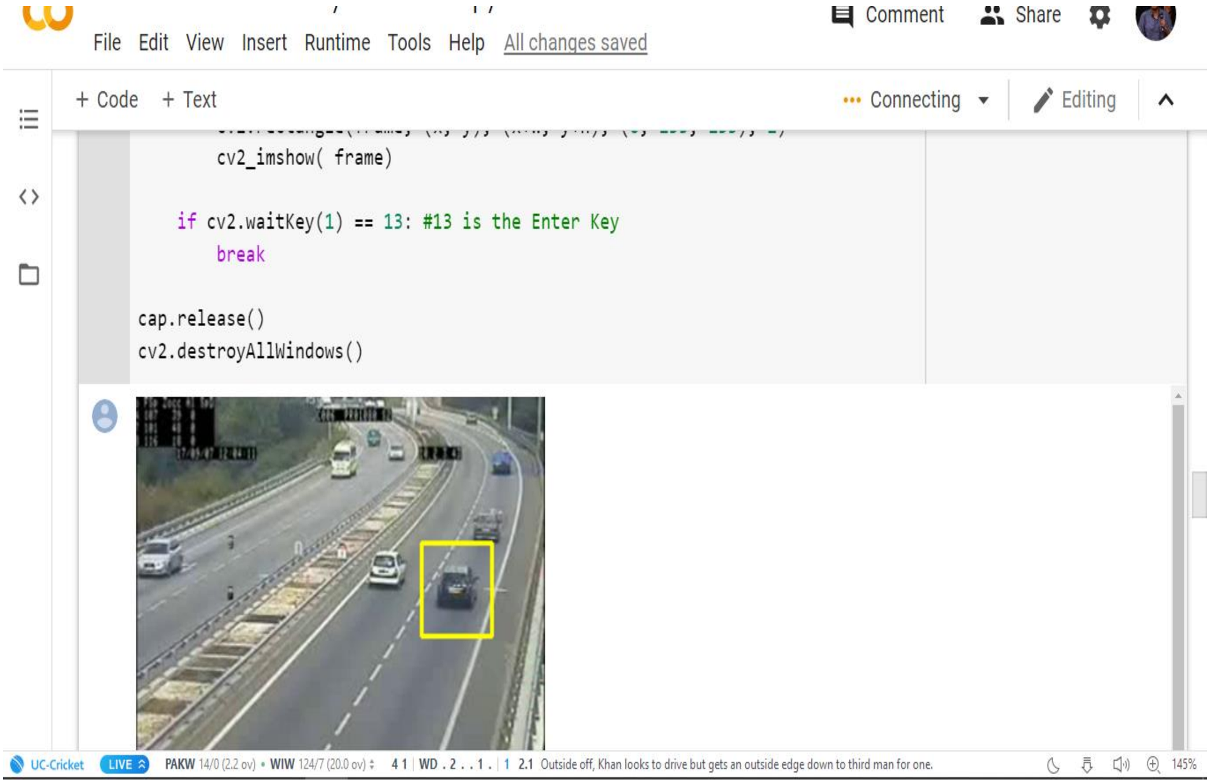
CAR AND PEDESTRIAN DETECTION USING HAAR CASCADES

1.CAR DETECTION IN VIDEO

```
import cv2
import time
import numpy as np

# Create our body classifier
car_classifier = cv2.CascadeClassifier('/content/drive/My Drive/HAAR/Haarcascades/haarcascade_car.xml')

# Initiate video capture for video file
cap = cv2.VideoCapture('/content/drive/My Drive/HAAR/image_examples/cars.avi')


# Loop once video is successfully loaded
while cap.isOpened():
    time.sleep(.05)
    # Read first frame
    ret, frame = cap.read()
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

    # Pass frame to our car classifier
    cars = car_classifier.detectMultiScale(gray, 1.4, 2)

    # Extract bounding boxes for any bodies identified
    for (x,y,w,h) in cars:
        cv2.rectangle(frame, (x, y), (x+w, y+h), (0, 255, 0), 2)
        cv2_imshow( frame)
    if cv2.waitKey(1) == 13: #13 is the Enter Key
        break

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

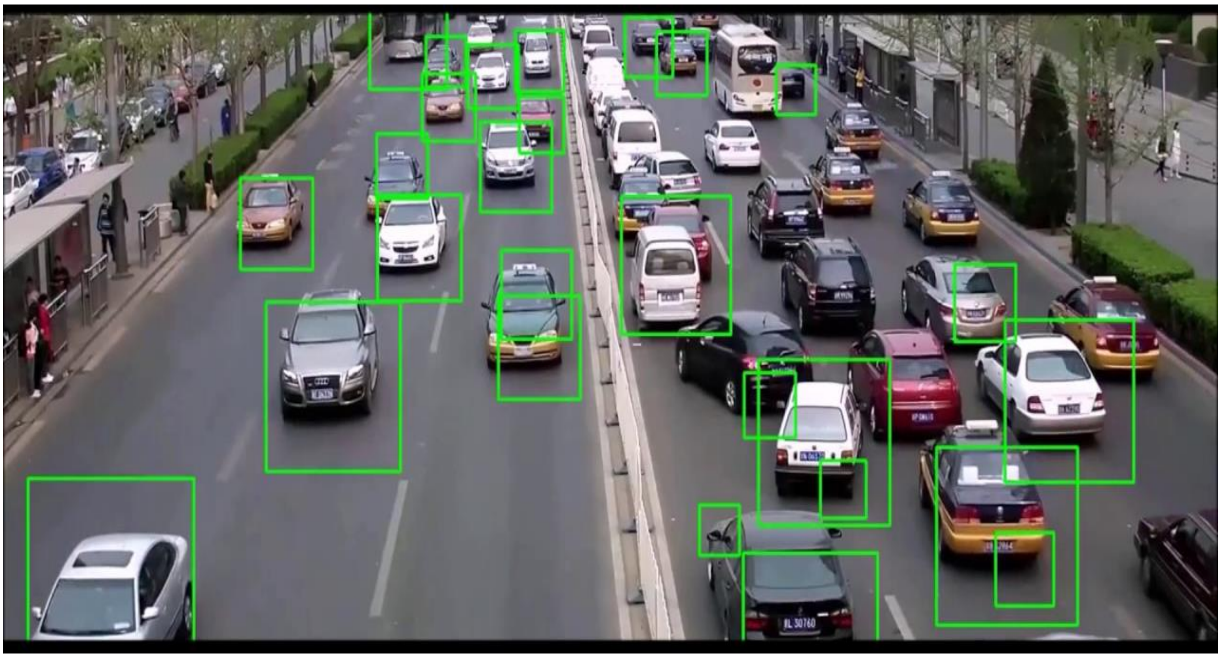
OUTPUT:

Car detection on video



```
        cv2_imshow( frame)

    if cv2.waitKey(1) == 13: #13 is the Enter Key
        break

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

Car detection on image:



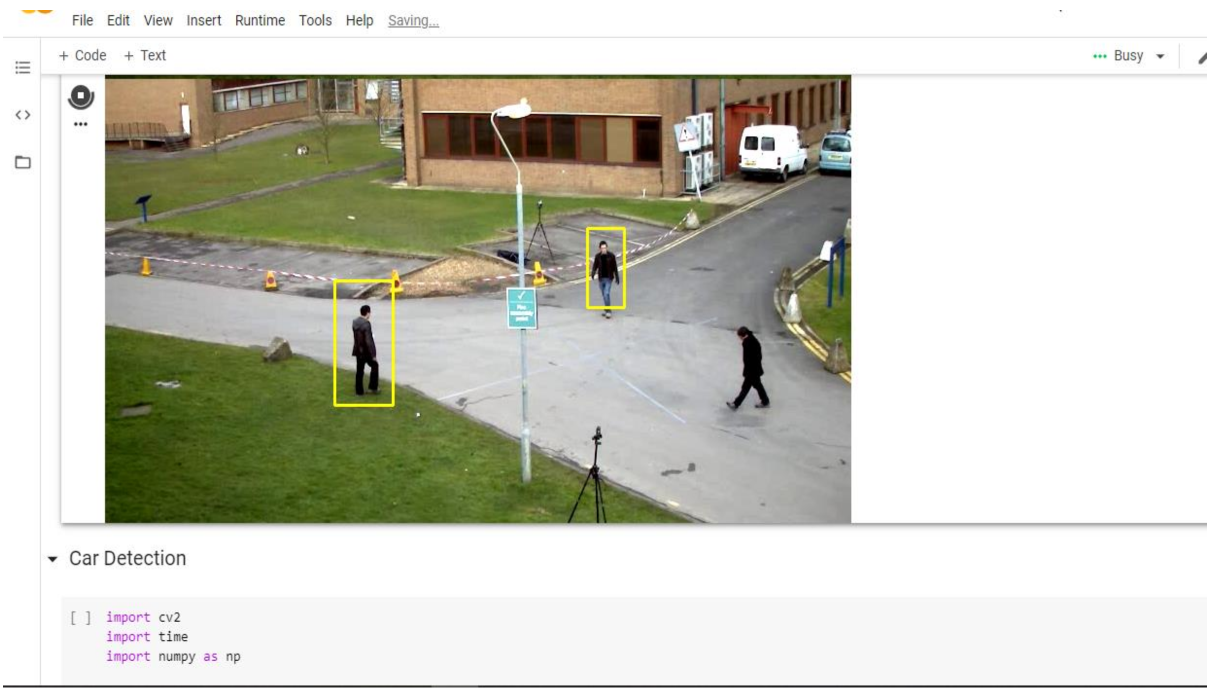
PEDESTRIAN DETECTION

CODE:

```
import cv2
import numpy as np

# Create our body classifier
body_classifier = cv2.CascadeClassifier('/content/drive/My Drive/HAAR/Haarcascades/haarcascade_fullbody.xml')

# Initiate video capture for video file
cap = cv2.VideoCapture('/content/drive/My Drive/HAAR/image_examples/walking.avi')

# Loop once video is successfully loaded
while cap.isOpened():

    # Read first frame
    ret, frame = cap.read()
    #frame = cv2.resize(frame, None,fx=0.5, fy=0.5, interpolation = cv2.INTER_LINEAR)
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    # Pass frame to our body classifier
    bodies = body_classifier.detectMultiScale(gray, 1.2, 3)

# Extract bounding boxes for any bodies identified
    for (x,y,w,h) in bodies:
        cv2.rectangle(frame, (x, y), (x+w, y+h), (0, 255, 255), 2)
        cv2_imshow( frame)

    if cv2.waitKey(1) == 13: #13 is the Enter Key
        break

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

OUTPUT

Pedestrian detection in video



Car Detection

```
[ ] import cv2
    import time
    import numpy as np
```

Below pedestrian detection applied on image