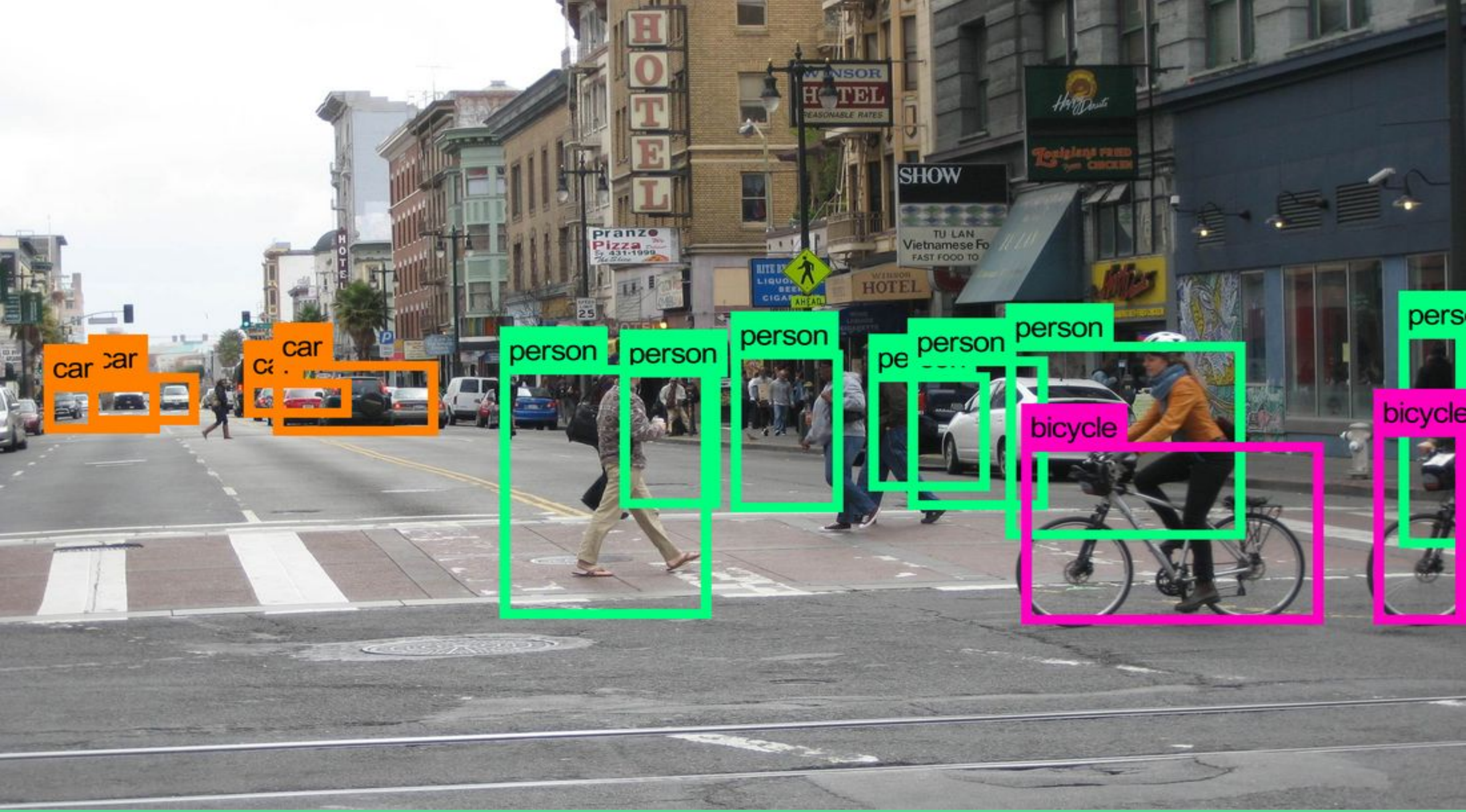
# COMPUTER VISION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25

## Definition

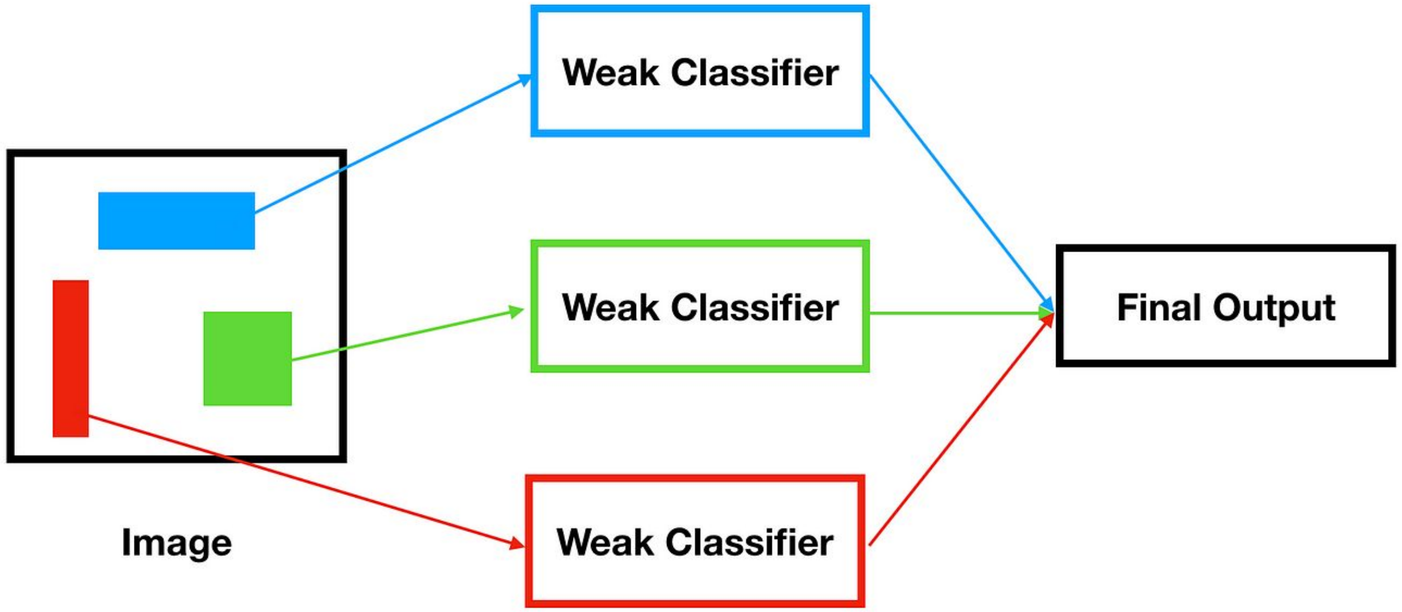
- acquiring, processing, understanding and analyzing digital images
- scientific discipline concerned with the theory behind artificial systems that extract information from images

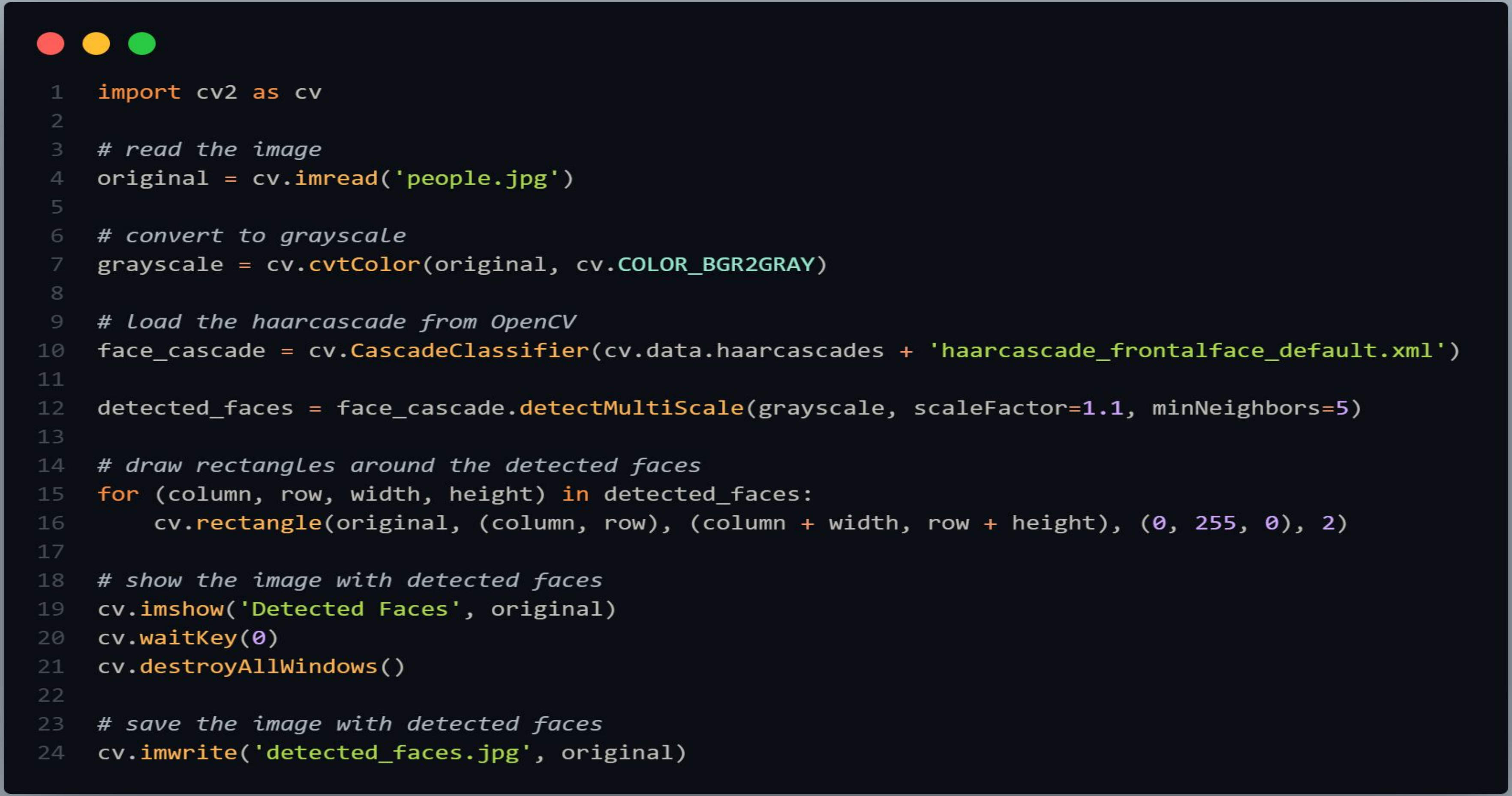
## Goals and real-world implementation

- solid-state physics
- neurobiology
- signal processing
- robotic navigation
- visual computing
- generally doing anything the human visual system can do

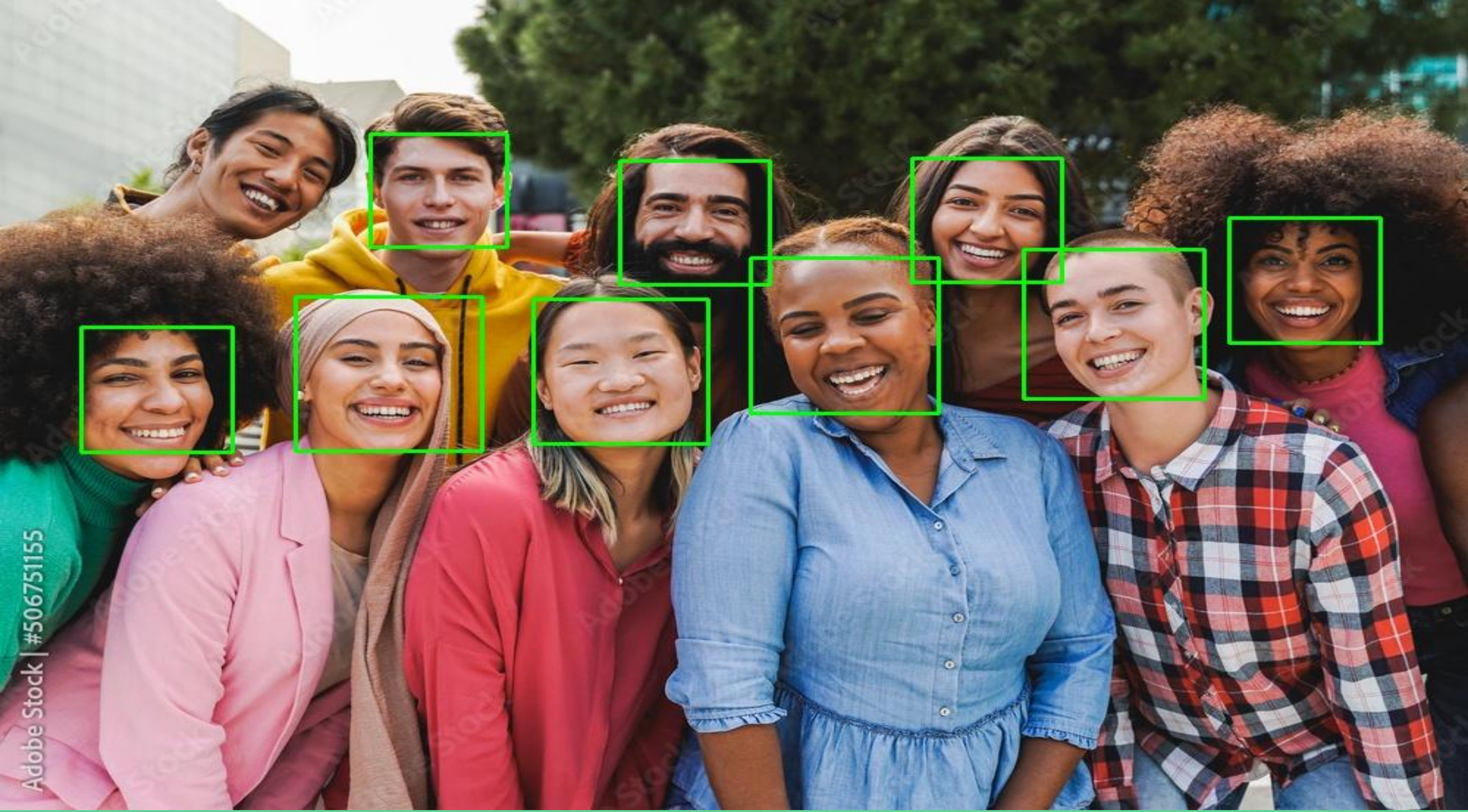
## Python implementation

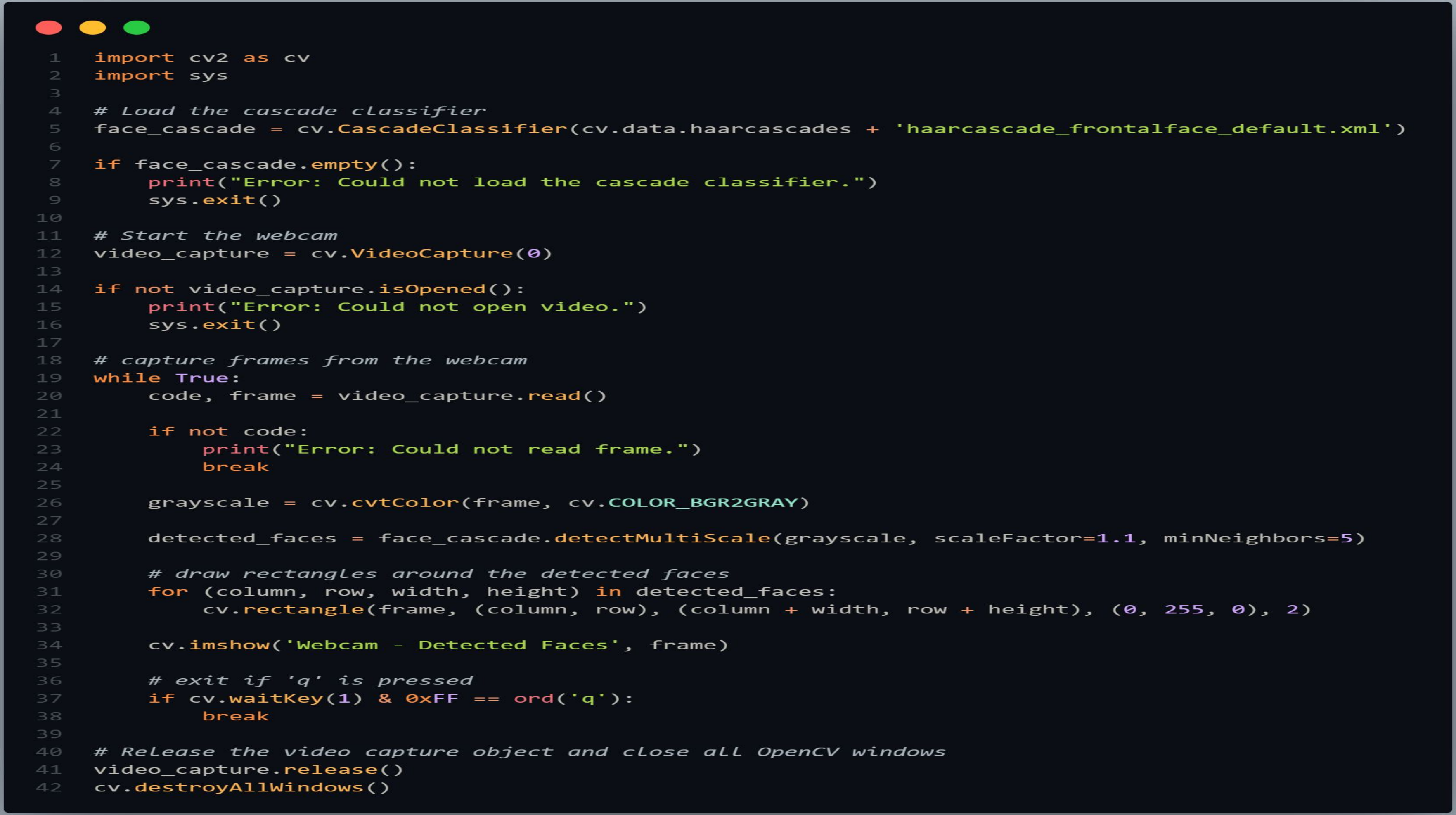
## Viola-Jones object-detection framework





```python
import cv2 as cv

# read the image
original = cv.imread('people.jpg')

# convert to grayscale
grayscale = cv.cvtColor(original, cv.COLOR_BGR2GRAY)

# Load the haarcascade from OpenCV
face_cascade = cv.CascadeClassifier(cv.data.haarcascades + 'haarcascade_frontalface_default.xml')

detected_faces = face_cascade.detectMultiScale(grayscale, scaleFactor=1.1, minNeighbors=5)

# draw rectangles around the detected faces
for (column, row, width, height) in detected_faces:
    cv.rectangle(original, (column, row), (column + width, row + height), (0, 255, 0), 2)

# show the image with detected faces
cv.imshow('Detected Faces', original)
cv.waitKey(0)
cv.destroyAllWindows()

# save the image with detected faces
cv.imwrite('detected_faces.jpg', original)
```


Adobe Stock | #506751155



```python
import cv2 as cv
import sys

# Load the cascade classifier
face_cascade = cv.CascadeClassifier(cv.data.haarcascades + 'haarcascade_frontalface_default.xml')

if face_cascade.empty():
    print("Error: Could not load the cascade classifier.")
    sys.exit()

# Start the webcam
video_capture = cv.VideoCapture(0)

if not video_capture.isOpened():
    print("Error: Could not open video.")
    sys.exit()

# capture frames from the webcam
while True:
    code, frame = video_capture.read()

    if not code:
        print("Error: Could not read frame.")
        break

    grayscale = cv.cvtColor(frame, cv.COLOR_BGR2GRAY)

    detected_faces = face_cascade.detectMultiScale(grayscale, scaleFactor=1.1, minNeighbors=5)

    # draw rectangles around the detected faces
    for (column, row, width, height) in detected_faces:
        cv.rectangle(frame, (column, row), (column + width, row + height), (0, 255, 0), 2)

    cv.imshow('Webcam - Detected Faces', frame)

    # exit if 'q' is pressed
    if cv.waitKey(1) & 0xFF == ord('q'):
        break

# Release the video capture object and close all OpenCV windows
video_capture.release()
cv.destroyAllWindows()
```

## Thanks for your attention!

Github repository of the project:

https://github.com/vect000r/computervision