

# Object Detection Project

In this project you are asked to write two programs to detect “winking”. In writing your programs you may use all of the high level functionality of OpenCV, but you are **not allowed to convert images into arrays of pixel values**. The only cascade classifiers that can be used are those provided by OpenCV, as well as those available in the following link:

<http://alereimondo.no-ip.org/OpenCV/34>.

The **cascade classifiers** provided by OpenCV can be found in:

<https://github.com/opencv/opencv/tree/master/data/haarcascades>.

They are also available as part of the OpenCV distribution. If you have a mac, they are most likely in the following folder:

```
/Library/Frameworks/Python.framework/Versions/3.6/lib/python3.6/
site-packages/cv2/data/
```

On windows they may be in following folders:

```
C:/opencv/build/etc/haarcascades
```

```
C:/opencv/sources/data/haarcascades
```

```
C:/Users/name/AppData/Local/Programs/Python/Python35/Lib/site-packages/cv2/data
```

The input to each program is a folder containing images or a live video feed. The program displays each image, and marks each detected face with a distinct color. It also computes and prints the **total number of detections**.

## First program: DetectWink1.py

Write an OpenCV program that can detect a winking face. You may want to build your program by changing the example program DetectWink.py.

## Second program: DetectWink2.py

The requirements for the second program are the same as the requirements for the first program, except that it must start by applying a filter to the image. The filter can be **histogram equalization**, **smoothing**, or anything else that you may consider to be useful.

## What you need to submit

1. Python source code of your programs. Please name them DetectWink1.py and DetectWink2.py.
2. Documentation that explains your approach.

## Evaluation

- The live video performance of your programs will be tested on your own face, or, if you want, on someone else available during the demo. The grade for this part is pass/fail.
- We will run your programs on test data and count:
  - A.** Total number of correct faces detected.
  - B.** Total number of incorrect faces detected.

The results of both programs are the numbers  $A_1, B_1, A_2, B_2$ .

If you submit everything as required, and on time, and your programs work correctly on live video, these numbers are the only thing that will determine the grade. You should try to obtain a detector that maximizes A and minimizes B. Your grade will be given based on the following formula:

$$\max\{2A_1 - B_1, 2A_2 - B_2\}$$