Assignment 2: Background Removal
(Due Sep 18 Wednesday 11:59pm)

Part 1: Histogram Equalization

Please complete the following exercises in your programming environment of choice (Python/NumPy):

1) Open and display the image "input.png".
2) Calculate and display (plot) the histogram of this image.
3) Write a program to implement Histogram Equalization and test it on "input.png". Display the histogram-equalized image side-by-side with the original image.
4) Plot the lookup table used to histogram equalize "mystery.png".
5) Calculate and display the histogram of the equalized image.

**Part 2: Image Filtering**

Apply <u>averaging filter</u>, <u>Sobel filter</u>, <u>Laplacian filter</u> and <u>median filter</u> to one or some of your own images. **Show the original image and filtered images**.

You are NOT required to analyze the different effects of the filters, just observe and show your results in the report. You could choose any kernel for a certain type of filter (kernels with different kernel sizes, negative or positive center etc.).

Part 3: Find the boundary of the pupil.

1) Apply the <u>sobel filter</u> to detect the edge information (both vertical and horizontal edges) of the image "iris.bmp".
2) Try the filtering/correlation techniques to detect the boundary of the pupil, given the radius of the boundary circle is within range 35~45. (You could first detect the center of the pupil and remove noise that is far away from the pupil center.)
3) Show your Sobel filtered result, center result and the final detected pupil boundary result.

   For example:
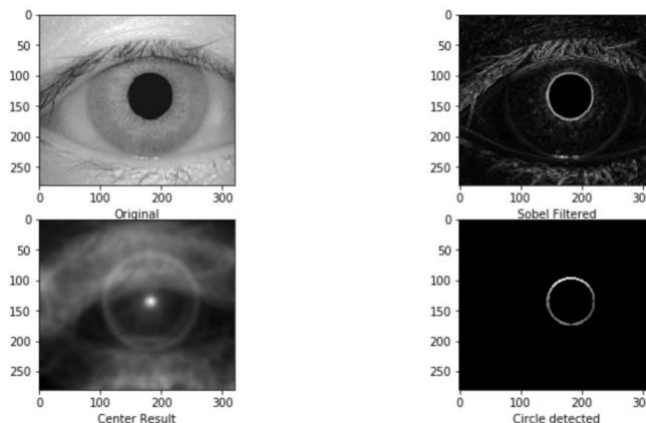
4) OpenCV or any other library function(s) that detects the circle automatically is/are **NOT** allowed!

Submission:
1. Your report (include the figures, discussion of your analysis and conclusion.)
2. A compressed (e.g. "zip or rar") file including all the code files and source images, output images.