

# Assignment 3

## Due 3/23/2021

The objective of this assignment is for you to become familiar with the basic image operations. Select your choice of image processing environment: MATLAB or OpenCV.

### **1. 1. Convolution (50.0%)**

Implement the convolution operation. Write a function named convolution that takes two matrices. The first matrix is the image and the second matrix is the convolution kernel. For every pixel (double loop) calculate the piece wise products of each kernel value with the pixel/appropriate neighbours. Check that the kernel dimensions are odd. Return with an error message otherwise. Implement zero padding. Use the build-in function to test your results. Use a unit response matrix for debugging. Test your implementation with different kernels. Use two blurring kernels, two edge-detection, one image-enhancement, and one more kernel of your own choice. Produce a write up in the report for each kernel together with examples.

### **2. Image Segmentation (50.0%)**

Select three images (gray scale) where the pixels are grouped around two intensities. Use the histogram to verify your intuition. Then use the algorithm in the segmentation slides to find the right threshold. Threshold the images into binary. Report the threshold and the two images.

### **3. (Grad Credit)**

Choose (at least) two images one with more texture and one with less. Corrupt them with:

1. Salt and pepper
2. Uniform
3. Gaussian

Noise, you can use the code I posted on the dropbox. Then apply basic smoothing techniques:

1. Mean
2. Gaussian blur
3. Median

Report the results.

Important: **Write your own code.**

### **What to Submit**

Please together with your code provide a report discussing your implementation together with some illustrative examples (screen shots). The report will be the primary product of this assignment. Ensure that it is well written and formatted. Document your work in images and use captions to describe what each image displays. Use of LaTeX is encouraged.