

CS4442/9542

Assignment 3:

Submission Instructions: Please submit a .zip file named <your name>.zip containing 1) report named report.pdf including your answers to all required questions with images and/or plots showing your results, and 2) the python notebook, with the cells run and the relevant source code (or MATLAB m-files).

Problem 1. Edge Detection (50%)

Please download attached Image 1.

- Implement convolution process of smoothing Image 1 with a 5 x 5 Gaussian Filter with $\sigma = 1$ and 2, plot the corresponding output images (10%).
- Implement convolution process of convolving a 3 x 3 Sobel filters (S_x and S_y) with the output images you obtained in step a. Plot the outputs of each step and the final edge map which combines edges in x and y directions (10%).
- Implement convolution process of convolving Image 1 with $\frac{\partial G}{\partial x}$ and $\frac{\partial G}{\partial y}$ filters (5 x5 filters and for $\sigma = 1$ and 2, and plot the outputs of each step and the final edge map which combines edges in x and y directions (20%)

Please explain what you observe comparing the final output of b and c (10%).

Please note that in this assignment you need to create the Gaussian filter and write the convolution process code, and you are not allowed to use available functions and libraries for this.

Problem 2. Corner Detection (50%)

Implement Harris Corner Detection algorithm step by step as explained in the class. Apply your script to detect corners in image 1. Plot the corner response map, and the non-maximum suppression output. Again, you should write the code for this algorithm, and you are not allowed to use available functions and libraries.