

# State University of New York at Buffalo

## CSE 473/573      Fall 2016 Homework Set #2

Assignment Date: Monday October 10, 2016; Due: Wednesday October 19, 2016 at 3:00PM

**Programming languages:** Python or MATLAB programming for the following problems is preferred. However, solutions obtained via another programming language is also acceptable. Submit your code and report via UBLearn.

**Warning:** You are NOT allowed to use library functions for applying convolution or Fourier/inverse Fourier transform. You shall NOT receive credit if you use these library functions directly.

### Problem (1)    (Fourier Transform) 50%

Pick an  $M \times N$  image of your choice and convert it to 8-bit grayscale representation if needed

- (a) Apply Fourier Transform on the image  $I_O$  and display the Fourier Transform image
- (b) Apply Inverse Fourier Transform to the output from (a) to obtain recovered image  $I_R$
- (c) Compute the Mean Square Error (MSE) between the original and the recovered image based on the following:

$$MSE = \sum_{i=0}^{M-1} \sum_{j=0}^{N-1} [I_O(i,j) - I_R(i,j)]^2$$

- (d) Discuss why or why not the MSE may be non-zero

**NOTE:** You need to write your own code for this implementation. External libraries on Fourier Transform can only be used for verification. Include all the images and results in your report.

### Problem (2)    (Laplacian Pyramid) 50%

Pick an  $M \times N$  image of your choice and convert it to 8-bit grayscale representation if needed

- (a) Generate 5-Level Laplacian Pyramid and display the images at each level
- (b) Reconstruct the original image from its Laplacian Pyramid
- (c) Compute the MSE between the original and the reconstructed image
- (d) Discuss why or why not the MSE may be non-zero

**NOTE:** You need to write your own code for this implementation. Report all the images of 5-Level Laplacian Pyramid of your image and the reconstructed image.