



InClass Exercise 6

Due by 2/27/2018, Tuesday Midnight through Canvas

Requirements: Please ensure that all source code is tested properly and follows general code readability guidelines (i.e., includes proper variable names, adequate comments as well as brief description of your logic or pseudocode or algorithm used). Submit all files including any images.

Part 1: Fourier Transform

Perform Fast Fourier Transformation on a 1-D and 2-D signal using MATLAB's built-in functions.

- a) Construct a 1-D signal and use `fft` to obtain the corresponding Fourier transform. Shift the frequency domain signal and plot the absolute, real and imaginary parts of the output of `fft`.
- b) Repeat part a using a 2D signal. You will need to use `fft2` now.

Submit a file named `fourier_transform.m` which contains your code for part a and b. Remember to also include the part where you generate your 1-D and 2-D signals.

Part 2: Spatial v/s Frequency domain.

Discover the fact that convolution of two signals in spatial domain is multiplication in frequency domain of the same signals using MATLAB's built-in functions.

- a) Take an image and perform convolution using a low pass filter.
- b) Take Fourier transforms of the image and the kernel used in part a, and multiply the two transformations in frequency domain. Take inverse Fourier transform of the resulting signal from multiplication and compare this result to the result obtained in part a.
- c) Repeat part a and b with a high pass filter.
- d) Repeat part a, b, c after adding noise to the images

Submit a file named `convolve_multiply.m` which contains your code for part a-d. Submission should contain any image used in this part.