CS474/674 Image Processing and Interpretation

Homework 4

Due Date: N/A

1. We have mentioned in class several times that computing convolution in the time domain is expensive; however, it can be compute more efficiently in the frequency domain using the convolution theorem and Fast Fourier Transforms (FFTs). Let's verify this claim. **(a)** What is the complexity of convolving an N x N image with an M x M mask? Use big-O notation. **(b)** What is the complexity of 2D FFT? (*hint:* use the separability property of the FT) **(c)** How could we compute the convolution using FFTs? **(d)** What is the complexity of computing the convolution in the frequency domain? Use big-O notation.

2. Problem 10.12 (page 788)

3. Problem 10.18 (page 790)

4. **(Graduate Students Only)** Problem 10.17 (page 789)