**EEL 4930/5934**

**Introduction to Biomedical Image Analysis**

**Assignment – 9**

**Due: 04/11/2024, Noon**

**Edge detection in the presence of noise**

As discussed in lecture, detecting edges involves approximating the derivative of pixel values in a 2-D setting. In 1-D signals, a square signal has easily detected edges because there is a sudden ascent and descent in signal intensity. However, when there is noise in the signal these sudden changes are not as easily perceived.

**Question 1:**

1. Load the ‘*ButterflyWing.PNG’* image. Generate a noisy output by applying Gaussian noise to the grayscale image using a mean of 0.2 and a variance of 0.1. Include output below. **(2+2 = 4 pts)**
2. Apply an edge filter to both the binarized original and binarized noisy image. (*Hint: Look at edge() command.)* Include output below. How successful was the edge detection in the presence of Gaussian noise? **(2+2+2 = 6 pts)**
3. Apply a low-pass filter to the noisy image and then use the same edge filter as in part (b) to detect the edges. Experiment with at least 5 different filter sizes. How does the output compare to the edges detected on the original noisy image? What is the effect of applying a low-pass filter to a noisy image and how does it impact edge detectability? **(5 + 2.5 + 2.5 = 10 pts)**