**ECE 8527: Introduction to  
Machine Learning and Pattern Recognition**

# HW No. 5: ML vs. Bayesian Estimation

The tasks to be accomplished in this homework assignment are:

1. Generate 10 independent sets of random data consisting of 106 points from a 1D GRV with a mean of 1 and a variance of 1.
2. For the first set, estimate the mean value using a maximum likelihood estimate. Plot the error in this estimate as a function of the number of points used in the estimate (e.g., N=1, 10, 100, … 106). Use the square of the Euclidean distance between the true mean and your estimate of the mean as a proxy for the error.
3. Repeat no. 2, but for each value of N, average across the 10 sets. For example, pick the first 100 points of each set. Compute the mean for each set using these 100 points, and then average the means across the 10 sets. Plot the error as a function of the number of points.
4. Next, assume an initial mean guess of 2. Construct the Bayesian estimate of the mean and plot the error as a function of N.

Explain what you observe in each step of this assignment and comment on the significance. What does this suggest about algorithms to build high performance machine learning systems?