# EE 511 Simulation Methods for Stochastic Systems

## Project #1: Coins and Bootstraps

**Question 1 [Coins, Coins, everywhere…]**
Pick a coin, any coin. Toss it thirteen times. How many Heads occur? Repeat the experiment (thirteen coin tosses) n=50 times. Record the number of Heads you observe in each experiment. Plot:
- A scatter plot of the outcomes of these experiments
- a histogram of the same outcomes
- a running tally of (*total* # of Heads)/(*total* # of coin flips). The $k^{th}$ index on the x-axis corresponds to $k^{th}$ experiment.

Based on a visual inspection, do you believe your coin is *fair*?

**Question 2 [So Unfair]**
Pick another coin identical to the first coin. *Modify the coin to make it unfair.* Use any means you can think of to accomplish this. Repeat the steps in Question 1. Examine the plots. Do the plots support your claim that the coin is now *unfair*?

**Question 3 [Gas Bootstrap Confidence Intervals]**
Download the NJGAS data set from Blackboard and find the 95% bootstrap confidence interval for the mean of the data set.

**Question 4 [Unfair Confidence…]**
Use your data set from Question 2 to generate a 95% bootstrap confidence interval for the probability of heads for your supposedly unfair coin. How does this modify your confidence in the claim that the coin is now unfair?

Turn in:
- A summary of your experiments including plots and statistics
- a brief discussion of the results (max 1 page per problem)
- a print out of your code.