

Assigned: 29 January 2020

Project #2 – Samples and statistics

EE 511: Spring 2020

Due: Wednesday, 05 February 2020 at 14:00. Late penalty: 15% per day before 07 February at 14:00.

1. Simulate sampling uniformly (how many?) on the interval $[-3, 2]$.
 - a. Generate a histogram of the outcomes.
 - b. Compute the sample mean and sample variance for your samples. How do these values compare to the theoretical values? If you repeat the experiment will you compute a different sample mean or sample variance?
 - c. Compute the bootstrap confidence interval (what width?) for the sample mean and sample standard deviation.
2. Produce a sequence X by drawing samples from a standard uniform random variable.
 - a. Compute $Cov[X_k, X_{k+1}]$. Are X_k and X_{k+1} uncorrelated? What can you conclude about the independence of X_k and X_{k+1} ?
 - b. Compute a new sequence Y where: $Y[k] = X[k] - 2 \cdot X[k-1] + 0.5 \cdot X[k-2] - X[k-3]$. Assume $X[k] = 0$ for $k \leq 0$. Compute $Cov[X_k, Y_k]$. Are X_k and Y_k uncorrelated?
3. Let $M = 10$. Simulate (uniform) sampling with replacement from the outcomes $0, 1, 2, 3, \dots, M-1$.
 - a. Generate a histogram of the outcomes.
 - b. Perform a statistical goodness-of-fit test to conclude at the 95% confidence level if your data fits samples from a discrete uniform distribution $0, 1, 2, \dots, 9$.
 - c. Repeat (b) to see if your data (the same data from b) instead fit an alternate uniform distribution $1, 2, 3, \dots, 10$.