STAT 525 Homework 1
Spring 2020 Jan 23

Homework 1

Due in class on Thursday, Jan 30.

1. Use the naive Monte Carlo method to estimate $E(e^{X^2})$, where X has a Uniform$[0, 1]$ distribution. Describe and implement your algorithm. Give your estimate of $E(e^{X^2})$ based on 1000 samples, and estimate the standard error of your estimate. Attach your code and results.

2. Suppose $U \sim$ Uniform(0,1). Describe how to use the inversion method to generate a sample from the Pareto distribution with the following pdf:

$$f(x) = 160x^{-6}, \qquad 2 \leq x < \infty.$$

Use the inversion method to generate 1000 samples from the above Pareto distribution. Based on this sample, estimate the mean and variance of this distribution. Attach your code and results.

3. Suppose $U \sim$ Uniform(0,1). Describe how to use the inversion method to generate a sample from a distribution with the following probability density function:

$$f(x) = \begin{cases} x, & 0 \leq x \leq 1, \\ 2 - x, & 1 < x \leq 2. \end{cases}$$

Use the inversion method to generate 10 samples from the above distribution. Attach your code and results.