

Modeling and Simulation, CS302

Lab-5

Due Date: March 1, 2017

Modeling with randomness

1. In this problem you are supposed to use Monte carlo method for your calculation. You can use the inbuilt random number generator. You are supposed to do the problem in two ways (i) through a single run and increasing values of the number of random numbers (ii) run the simulation many times and then calculate the average. In each of the cases you should show through a single figure how the estimate improves/converges as the length of the runs is increased or the number of runs increases.

Using Monte Carlo Method calculate

- (a) Area between the curve for $f(x) = x^2$ and the x-axis from $x = 0$ to $x = 2$.
 - (b) An estimate of π .
 - (c) Volume of a Sphere.
2. Starting from uniformly distributed random numbers between 0 and 1, generate random numbers which are distributed as
 - (a) Normal ($\mathcal{N}(\mu, \sigma^2)$) (Use Box-Muller Algorithm)
 - (b) Exponential $F_X(x) = 1 - e^{-\lambda x}$ (Use Inverse Transform Method)
 - (c) Weibull $F_X(x) = 1 - e^{-(x/\lambda)^k}$, for $x > 0$. (Use Inverse Transform Method)

In each of these cases plot a histogram for PDF and CDF (take representative values of the parameters).

3. Using Acceptance-Rejection Method obtain random numbers whose probability density function is given by $f(x) = 2\pi \sin(4\pi x)$ in the range 0 to 0.25. Generating sufficient number of values plot the histogram.