Dr. Tim Brereton
Matthias Neumann

ulm university universität

Methods of Monte Carlo Simulation II
Exercise about reading material 2

Exercise 1

Let X be a random variable with density function

$$f_X(x) = \frac{\exp(-4x^2)}{\int_0^1 \exp(-4t^2)\mathrm{d}t}\, \mathbb{I}\left\{x \in [0,1]\right\}.$$

Estimate $\mathbb{P}(X > 3/4)$ by weighted importance sampling with sampling density $g(x) = \mathbb{I}\left\{x \in [0,1]\right\}.$ Use a sample size of 10000.

Exercise 2

Modify the Matlab code given in Listing 4 of the reading material in order to simulate a self-avoiding random walk with $X_0 = (0,0)$ of length $n = 200$ on $\mathbb{Z}^2_{\geq 0}$. This means that all states of the random walk are tuples of non-negative integers. Plot one realization.

Exercise 3

Modify the Matlab code given in Listing 4 of the reading material in order to simulate a self-avoiding random walk with $X_0 = (0,0)$ of length $n = 100$ on $\mathbb{Z}^2$, where it is possible to move to diagonal neighbors. This means that from state $(0,0)$ you can reach states $(1,1),(1,0),(1,-1),(0,1),(0,-1),(-1,1),(-1,0)$ and $(-1,-1)$. Plot one realization.