Statistical Simulation

Homework 3

Due data: 00:00, November 06, 2019

1. Use the rejection method to generate a random variable having density function

$$f(x) = ke^x, \ 0 \le x \le 1 \text{ and } k > 0.$$

   (a) What is the function $g(x)$ in the rejection method?

   (b) What is the value of c in the rejection method?

   (c) Can you conclude what value of k is by comparing the average of iteration time and the value of c? What is the approximated value of k?

   (d) Draw the histogram of your samples and add its density function on the histogram with k from (c).

   (e) Add the density function on the histogram in (d) with $k = \frac{1}{e-1}$. What result can you conclude on the value of k? (Use two different colors to identify the two curves.)

2. Use the rejection method to generate a random variable X following a beta distribution $Beta(2, 4)$ and $0.8 < x < 1$ with the pdf as

$$f(x) = kx(1 - x)^3, \ 0.8 < x < 1 \text{ and } k > 0.$$

   (a) Evaluate the value of k by the conditional probability (the exact value of k).

   (b) What is the function $g(x)$ in the rejection method?

   (c) What is the exact value of c in the rejection method? (You can show the answer by either an exact value or a numerically computed one.)

   (d) Draw the histogram of your samples and add its true density function on the histogram.