

Generating Bernoulli Random Variable from uniform Random variable

Let $u \sim U[0, 1]$

Step 1: Set a threshold s such that:

$$X = \begin{cases} 1, & \text{if } u < s \\ 0, & \text{if } u > s \end{cases} \quad (1)$$

where X is a Bernoulli random variable $X \sim \beta(p)$.
 s should be defined such that $P(X = 1) = p$

$$P(X = 1) = P(u \leq s) = s \quad (2)$$

Generating Binomial Random Variable from Bernoulli

Let Y be binomial random variable $y \sim \beta(n, p)$

$$Y = X_1 + X_2 + \dots + X_n \quad (3)$$

where X_i is a bernoulli $X_i \sim \beta(p)$

Generating Geometric Random Variable from Bernoulli

We repeat bernoulli simulation until first success. The number of simulation is an observation of the geometric distribution.