Statistical Distributions

Geometric: $X \sim Geo(p)$; X is no. of attempts needed for 1st success

$P(X = k) = ?$

$$P(X = k) = q^{k-1}p$$

$P(X \leq k) =?$

$P(X \leq k) = 1 - q^k$

Negative Binomial: X is number of attempts needed for n successes

Prob. of nth success on kth attempt: p_k =?

Prob. of nth success on kth attempt:

$$p_k = \binom{k-1}{n-1} p^{n-1} q^{(k-1)-(n-1)} p$$

$$= \binom{k-1}{n-1} p^n q^{k-n}$$

If $X \sim Po(\lambda)$, what is the most common value of X?

(a) If $\lambda = 5$ (b) If $\lambda = 5.5$

If $X \sim Po(\lambda)$, what is the most common value of X?

(a) If $\lambda = 5$ (b) If $\lambda = 5.5$

Solution

$$P(X = r) = e^{-\lambda}\frac{\lambda^r}{r!} = P(X = r - 1) \times \frac{\lambda}{r}$$

(a) If $\lambda = 5$, mode (most common value) occurs at $X = 4$ and $X = 5$

(b) If $\lambda = 5.5$, mode occurs at $X = 5$