Topics Covered in Lecture 7

12-August, 2002

- Negative binomial pmf: Number of trials upto and including the r^{th} success. (r $\geq$ 1)
- Poisson pmf:

$$p_X(k) = \frac{e^{-\alpha}\alpha^k}{k!}, \qquad k = 0, 1, 2, \ldots$$

  - It can be used as an approximation to binomial
  - It is related to the continuous, exponential distribution
  - Computing poisson probability for large α (or small α) and for all k is an interesting/important problem.
- Hypergeometric distribution pmf, *h(k;m,d,n)*, defined as the probability of choosing k defective components in a random sample of m components, chosen without replacement, from a total of n components, d of which are defective.

$$h(k; m, d, n) = \frac{\begin{pmatrix} d \\ k \end{pmatrix} \cdot \begin{pmatrix} n-d \\ m-k \end{pmatrix}}{\begin{pmatrix} n \\ m \end{pmatrix}}, k = 0, 1, 2, \ldots, min\left\{d, m\right\}.$$

- Descrete uniform pmf
- Chapter 2 is over.
- Distribution function grows only continuously(no jumps)

$$F_X(x) = P(X \leq x) = P(\{s \in S | X(s) \leq x\})$$

$$\text{probability density function} = f_X(x) = \frac{dF}{dX}$$

$$F(x) = \int_{-\infty}^{x} f_X(y)dy$$

$$P(a \leq X \leq b) = \int_{a}^{b} f_X(y)dy$$

$$f(x) \geq 0$$

$$\int_{-\infty}^{\infty} f(x)dx = 1$$

$$0 \leq F(x) \leq 1$$

$$F(x)\text{is monotonic}$$

$$\lim_{x \to -\infty} F(x) = 0$$

$$\lim_{x \to \infty} F(x) = 1$$

- Mixed Random variables have jumps as well as continuous growth.

$$F_X(x) = \begin{cases} 0 & \text{if } \; x < 0; \\ p_0 & \text{if } \; x = 0; \\ p_0 + (1 - p_0)(1 - e^{-\lambda x}) & \text{if } \; x > 0. \end{cases}$$

  It is mass at origin in the example above. But can have mass at a descrete number of points.

- The Exponential distribution