Distributions

If $X \sim \text{Binom}(n, \theta)$, then

$$p_X(x; n, \theta) = \binom{n}{x} \theta^x (1-\theta)^{n-x} I_{\{0,1,\ldots,n\}}(x) \text{ where } \theta \in (0,1), n \in \{1, 2, ...\}$$

If $X \sim \text{Poiss}(\lambda)$, then

$$p_X(x; \lambda) = \frac{\lambda^x}{x!} e^{-\lambda} I_{\{0,1,2,\ldots\}}(x) \text{ where } \lambda > 0$$

If $X \sim \text{Geom}(\theta)$, then

$$p_X(x; \theta) = (1-\theta)^x \theta I_{\{0,1,2,\ldots\}}(x) \text{ where } \theta \in (0,1)$$

If $X \sim \text{NegBinom}(r, \theta)$, then

$$p_X(x; \theta, r) = \binom{r-1+x}{x} \theta^r (1-\theta)^x I_{\{0,1,2,\ldots\}}(x) \text{ where } \theta \in (0,1), r \in \{1, 2, ...\}$$

If $X \sim \text{HyperGeom}(N, K, n)$, then

$$p_X(x; N, K, n) = \frac{\binom{K}{x}\binom{N-K}{n-x}}{\binom{N}{n}} I_{[\max(0, n+K-N), min(n,K)]}(x)$$
$$\text{where } N \in \{0, 1, 2, ...\}, K \in \{0, 1, 2, ..., N\}, b \in \{0, 1, 2, ..., N\}$$

If $X \sim \text{Unif}(L, R)$, then

$$f_X(x; L, R) = \frac{1}{R-L} I_{[L,R]}(x) \text{ where } L < R \in \mathbb{R}$$

If $X \sim \text{Exp}(\lambda)$, then

$$f_X(x; \lambda) = \lambda e^{-\lambda x} I_{[0,\infty)}(x) \text{ where } \lambda > 0$$

If $X \sim \text{Gam}(\alpha, \lambda)$, then

$$f_Z(z; \alpha, \lambda) = \frac{\lambda^\alpha}{\Gamma(\alpha)} z^{\alpha-1} e^{-\lambda z} I_{[0,\infty)}(z) \text{ where } \alpha, \lambda > 0$$

If $X \sim \mathcal{N}(\mu, \sigma)$, then

$$f_Z(z; \mu, \sigma^2) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\frac{(z-\mu)^2}{2\sigma^2}\right\} \text{ where } \mu \in \mathbb{R}, \sigma > 0$$