Diskretne slučajne varijable

Slučajna varijabla s binomnom razdiobom $X \sim \mathcal{B}(n,p)$

$$X(\Omega) = \{0,1,2,\dots,n\} \qquad P(X=x) = \binom{n}{x} p^x q^{n-x}$$
$$E(X) = np, \qquad V(X) = npq, \qquad \sigma = \sqrt{npq}$$

Slučajna varijabla s Poissonovom razdiobom $X \sim \mathcal{P}(\lambda)$

Poissona razdioba aproksimira binomnu: provjeriti uvjet $np \leq 10$ i $n > 50$ i tada $\lambda = np$.

$$X(\Omega) = \{0,1,2,\dots\} \qquad P(X=x) = \frac{\lambda^x}{x!} e^{-\lambda}, \quad x = 0,1,2,\dots$$
$$E(X) = \lambda, \qquad V(X) = \lambda, \qquad \sigma = \sqrt{\lambda}$$

Slučajna varijabla s geometrijskom razdiobom $X \sim \mathcal{G}(p)$

$$X(\Omega) = \{1,2,3,\dots\} \qquad P(X=x) = q^{x-1} \cdot p, \quad q = 1-p$$

Slučajna varijabla s hipergeometrijskom razdiobom $X \sim \mathcal{H}(n,m,d)$

$$X(\Omega) = \{0,1,\dots,m\} \qquad P(X=x) = \frac{\binom{d}{x}\binom{n-d}{m-x}}{\binom{n}{m}}, \quad x \leq m \leq d \leq n$$

Neprekinute slučajne varijable

Slučajna varijabla s eksponencijalnom razdiobom $X \sim \mathcal{E}(\lambda)$

$$f(x) = \begin{cases} 0, & x \leq 0 \\ \lambda e^{-\lambda x}, & x > 0 \end{cases}; \qquad F(x) = \begin{cases} 0, & x \leq 0 \\ 1 - e^{-\lambda x}, & x > 0 \end{cases}$$

$$P(X \leq a) = F(a) = 1 - e^{-\lambda a}$$
$$P(X > a) = 1 - F(a) = e^{-\lambda a}$$
$$P(a \leq X \leq b) = F(b) - F(a) = e^{-\lambda a} - e^{-\lambda b}$$
$$E(X) = \frac{1}{\lambda}$$
$$V(X) = \frac{1}{\lambda^2}$$

Slučajna varijabla s normalnom razdiobom $X \sim \mathcal{N}(\mu, \sigma^2)$

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}, \quad x \in \mathbf{R}; \qquad F(x) = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{(t-\mu)^2}{2\sigma^2}} dt = \Phi(\frac{x-\mu}{\sigma})$$

Nestandardna normalna razdioba $X \sim \mathcal{N}(\mu, \sigma^2)$

$$P(X \leq a) = F(a) = \Phi(\frac{a-\mu}{\sigma})$$
$$P(X > a) = 1 - F(a) = 1 - \Phi(\frac{a-\mu}{\sigma})$$
$$P(a < X < b) = F(b) - F(a) = \Phi(\frac{b-\mu}{\sigma}) - \Phi(\frac{a-\mu}{\sigma})$$
$$E(X) = \mu$$
$$V(X) = \sigma^2$$