$f_X(x)$ ... verjetnostna gostota $\quad f_X = \frac{dF_X}{dx}$

$F_X(x)$ ... kumulativna funkcija $\quad F_X(x) = \int_{-\infty}^{x} f_X(x)\,dx$

Nove spremenljivke

1D $\quad Y = h(X) \quad f_Y(y) = f_X(h^{-1}(y)) \left| \frac{d}{dy} h^{-1}(y) \right|$

bijekcija

2D $\quad X = \Psi_1(u,v) \quad Y = \Psi_2(u,v) \quad f_{u,v} = f_{X,Y}(\Psi_1, \Psi_2) \left| \det \begin{pmatrix} \frac{\partial \Psi_1}{\partial u} & \frac{\partial \Psi_1}{\partial v} \\ \frac{\partial \Psi_2}{\partial u} & \frac{\partial \Psi_2}{\partial v} \end{pmatrix} \right|$

Pogojna verjetnost $\quad P(A \cap B) = P(B|A)P(A) = P(A|B)P(B)$

$$P(B|A) = \frac{P(A \cap B)}{P(A)} \qquad f_{Y|X} = \frac{f_{X,Y}}{f_X}$$

Neodvisni dogodki $\quad P(A \cap B) = P(A)P(B) \quad P(B|A) = P(B) \quad P(A|B) = P(A)$

$$\mathrm{erf}(x) = \frac{2}{\sqrt{\pi}} \int_0^{z} e^{-t^2} dt$$

Normalna porazdelitev $\quad f_X(x) = \frac{1}{\sqrt{2\pi}\,\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$

Pričakovane vrednosti

$$\bar{X} = E[X] = \sum_{i=1}^{N} x_i\, P(X = x_i) \qquad E[X] = \int_{-\infty}^{\infty} x\, f_X(x)\,dx$$

$$\mathrm{var}[X] = E[(X - E(X))^2] = \overline{(X - \bar{X})^2} \qquad \sigma = \sqrt{\mathrm{var}}$$

$$\mathrm{var}[X] = \sum_{i=1}^{N} (x_i - \bar{x})^2 f_X(x_i) \qquad \mathrm{var}[X] = \int_{-\infty}^{\infty} (x - \bar{x})^2 f_X(x)\,dx$$

Višji momenti $\quad M_n = \overline{(X - \bar{X})^n} = \int_{-\infty}^{\infty} (x - \bar{x})^n f_X(x)\,dx \qquad \varphi = \frac{M_3}{\sigma^3}$ poševnost $\qquad \varepsilon = \frac{M_4}{\sigma^4}$ eksces

Mediana - uredimo po vrsti in vzamemo srednjo vrednost

Modus - najpogostejša vrednost $\quad df/dx = 0$

$$\bar{X} = \mu_x = E[X] = \iint_{-\infty}^{\infty} x\, f_{X,Y}(x,y)\,dx\,dy \qquad \sigma_x^2 = \mathrm{var}[X] = \iint_{-\infty}^{\infty} (x - \mu_x)^2 f_{X,Y}(x,y)\,dx\,dy$$

Kovarianca $\quad \sigma_{x,y} = \mathrm{cov}[X,Y] = \iint_{-\infty}^{\infty} (x - \mu_x)(y - \mu_y) f_{X,Y}\,dx\,dy = E[XY] - E[X]E[Y]$

$$\mathrm{var}[X \pm Y] = \sigma_{x \pm y}^2 = \sigma_x^2 + \sigma_y^2 \pm 2\sigma_{xy}$$

Linearni korelacijski koeficient $\quad \varphi = \frac{\sigma_{xy}}{\sigma_x \sigma_y}$

Binomska porazdelitev - Verjetnost da v N poskusih dosimo n uspodnih in $N-n$ neuspodnih. p je verjetnost uspodnih.

$$P(X = n; N, p) = \binom{N}{n} p^n (1-p)^{N-n}$$

$$\bar{X} = Np \qquad \mathrm{Var}[X] = Np(1-p)$$

Poissonova porazdelitev - Ugodni izidi malo verjetni $p \to 0$, veliko vzorcev $N \to \infty$

$$P(X = n, \overset{\bar{x}}{\lambda}) = \frac{\lambda^n e^{-\lambda}}{n!} \qquad \bar{x} = \lambda = Np \qquad \mathrm{var}[x] = \sigma^2 = Np = \lambda$$

Konvolucija $z = x + y$ neodvisni $h(z) = \int f_x(x)\, g_y(z-x)\, dx = f * g$

$$\bar{z} = \bar{x} + \bar{y} \qquad \text{var}[X + Y] = \text{var}(X) + \text{var}[Y]$$

Realne meritve - Statistika

$$\bar{X} \ldots \mu \qquad S_x^2 \ldots \sigma_x^2$$

$$E[\bar{X}] = \mu \qquad \text{var}[\bar{X}] = \sigma_{\bar{x}}^2 = \frac{\sigma_x^2}{n} \overset{<}{\neq} S_x^2$$

razpršenost variance $S_x^2 = \sigma^2 \left(1 \pm \sqrt{\frac{2}{n}}\right)$

$$E[S_x^2] = \frac{n-1}{n}\sigma^2$$

Vzorčenje brez nadomeščanja $E[\bar{x}] = \mu$ $\text{var}[\bar{x}] = \frac{N-n}{N-1}\,\frac{\sigma_x^2}{n}$

Stirlingova formula

$$n! = n\ln n - n \qquad n! \doteq \left(\frac{n}{e}\right)^n \sqrt{2\pi n}$$