

Formulário de Estatística

Probabilidades

$$\begin{aligned}\mu_X &= E[X] = \sum_i x_i P(X = x_i) & \sigma_X^2 &= Var[X] = \sum_i (x_i - \mu_x)^2 P(X = x_i) \\ \mu_X &= E[X] = \int x f_X(x) dx & \sigma_X^2 &= Var[X] = \int (x - \mu_x)^2 f_X(x) dx \\ Y &= g(X) & \Rightarrow f_Y(y) &= f_X(g^{-1}(y)) \left| \frac{d}{dy} g^{-1}(y) \right|\end{aligned}$$

Distribuições de Probabilidade

Distribuição	Probab./Densidade	Domínio	E[X]	Var[X]
$X \sim U(k)$	$\frac{1}{k}$	$x = 1, 2, \dots, k$	$\frac{\min(X)+\max(x)}{2}$	$\sqrt{\frac{(\max(X)-\min(X)+1)^2-1}{12}}$
$X \sim B(n, p)$	$\binom{n}{x} p^x (1-p)^{n-x}$	$x = 0, 1, 2, \dots, n$	np	$np(1-p)$
$X \sim HG(N, K, n)$	$\frac{\binom{K}{x} \binom{N-K}{n-x}}{\binom{N}{n}}$	$x = 0, 1, \dots, \min(K, n)$	np	$np(1-p) \frac{N-n}{N-1}$
$X \sim P(\lambda)$	$\frac{e^{-\lambda} \lambda^x}{x!}$	$x = 0, 1, 2, \dots$	λ	λ
$X \sim G(p)$	$(1-p)^x p$	$x = 0, 1, 2, \dots$	$\frac{1-p}{p}$	$\frac{(1-p)}{p^2}$
$X \sim BN(r, p)$	$\binom{x+r-1}{r-1} (1-p)^x p^r$	$x = 0, 1, 2, \dots$	$\frac{r(1-p)}{p}$	$\frac{r(1-p)}{p^2}$
$X \sim U[a, b]$	$\frac{1}{b-a}$	$a \leq x \leq b$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
$X \sim N(\mu, \sigma^2)$	$\frac{1}{\sqrt{2\pi\sigma^2}} \exp\{-\frac{1}{2\sigma^2}(x-\mu)^2\}$	$x \in (-\infty, \infty)$	μ	σ^2
$X \sim HalfN(0, \sigma^2)$	$\frac{\sqrt{2}}{\sigma\sqrt{\pi}} \exp\{-\frac{x^2}{2\sigma^2}\}$	$x \in (0, \infty)$	0	σ^2
$X \sim LN(\mu, \sigma^2)$	$\frac{1}{x\sqrt{2\pi\sigma^2}} \exp\{-\frac{1}{2\sigma^2}(\ln(x)-\mu)^2\}$	$x \in (-\infty, \infty)$	$\exp\{\mu + \sigma^2/2\}$	$\exp\{2\mu + \sigma^2\}(\exp\{\sigma^2\} - 1)$
$X \sim Exp(\lambda)$	$\lambda \exp(-\lambda x)$	$x \geq 0$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$
$X \sim Exp(\phi)$	$\frac{1}{\phi} \exp(-x/\phi)$	$x \geq 0$	$\frac{1}{\phi}$	$\frac{1}{\phi^2}$
$X \sim Erlang(\lambda, r)$	$\lambda^r x^{r-1} \exp(-\lambda x)/(r-1)!$	$x \geq 0 ; r = 1, 2, \dots$	$\frac{r}{\lambda}$	$\frac{r}{\lambda^2}$
$X \sim \chi^2(\nu)$	$\frac{1}{2^{\nu/2} \Gamma(\nu/2) \beta^\alpha} x^{\nu/2-1} \exp\{-x/2\}$	$x \geq 0$	ν	2ν
$X \sim I\chi^2(\nu)$	$\frac{2^{\nu/2}}{\Gamma(\nu/2) \beta^\alpha} x^{-\nu/2-1} \exp\{-1/2x\}$	$x \geq 0$	$\frac{1}{\nu-2}$	$\frac{2}{(\nu-1)^2(\nu-4)}$
$X \sim Ga(\alpha, \beta)$	$\frac{1}{\beta^\alpha \Gamma(\alpha)} x^{\alpha-1} \exp\{-x/\beta\}$	$x \geq 0$	$\alpha\beta$	$\alpha\beta^2$
$X \sim Ga(p, q)$	$\frac{q^p}{\Gamma(p)} x^{p-1} \exp\{-qx\}$	$x \geq 0$	$\frac{p}{q}$	$\frac{p}{q^2}$
$X \sim IGa(\alpha, \beta)$	$\frac{1}{\beta^\alpha \Gamma(\alpha)} x^{-\alpha-1} \exp\{-1/(\beta x)\}$	$x \geq 0$	$\beta(\alpha-1)(\alpha > 1)$	$\frac{1}{\beta^2(\alpha-1)^2(\alpha-2)}$
$X \sim IGa(p, q)$	$\frac{q^p}{\Gamma(p)} x^{-p-1} \exp\{-q/x\}$	$x \geq 0$	$\frac{q}{p-1}(p > 1)$	$\frac{q^2}{(p-1)^2(p-2)}(p > 2)$
$X \sim Weibull(\alpha, \beta)$	$\frac{\alpha}{\beta} (x/\beta)^{\alpha-1} \exp\{-(x/\beta)^\alpha\}$	$x \geq 0$	$\beta \Gamma(1 + \frac{1}{\alpha})$	$\beta^2 [\Gamma(1 + \frac{2}{\alpha}) - \Gamma^2(1 + \frac{1}{\alpha})]$
$X \sim Beta(\alpha, \beta)$	$\frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1} (1-x)^{\beta-1}$	$0 \leq x \leq 1$	$\frac{\alpha}{\alpha+\beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

$$Z = (X - \mu)/\sigma \quad \Gamma(\alpha) = \int_0^\infty x^{\alpha-1} \exp\{-x\} dx \quad \Gamma(\alpha) = (\alpha-1)! \quad \Gamma(\alpha+1) = \alpha \Gamma(\alpha)$$