Formula sheet / Formuleblad

PMFs / WMF's and PDFs / WDF's

Type/Tipe	$P_X(x)$ / $f_X(x)$	μ_X	σ_X^2	Limit/Beperk.
Binomial (n,p)	$\binom{n}{x}p^x(1-p)^{n-x}$	np	$np(1-p)$	$0 \le x \le n$
Geometric (p)	$p(1-p)^{x-1}$	$1/p$	$(1-p)/p^2$	$x = 1,2,3,\ldots$
Pascal (k,p)	$\binom{x-1}{k-1}p^k(1-p)^{x-k}$	k/p	$k(1-p)/p^2$	$x = k,k+1,\ldots$ and $k \ge 1$
Discrete Unif. (k,l)	$1/(l-k+1)$	$(k+l)/2$	$(l-k)(l-k+2)/12$	$x = k,k+1,\ldots,l$ and $k < l$
Poisson (α)	$\alpha^x e^{-\alpha}/x!$	α	α	$x = 0,1,2,\ldots$ and $\alpha > 0$
Continuous Unif. (a,b)	$1/(b-a)$	$(b+a)/2$	$(b-a)^2/12$	$a \le x < b$
Exponential (λ)	$\lambda e^{-\lambda x}$	$1/\lambda$	$1/\lambda^2$	$x \ge 0$ and $\lambda > 0$
Erlang (n,λ)	$\lambda^n x^{n-1}e^{-\lambda x}/(n-1)!$	n/λ	n/λ^2	$n = 1,2,\ldots$ and $\lambda > 0$
Gaussian (μ,σ)	$\frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$	μ	σ^2	$\sigma > 0$
Beta(i,j)	$\frac{(i+j-1)!}{(i-1)!(j-1)!}x^{i-1}(1-x)^{j-1}$	$\frac{i}{i+j}$	$\frac{ij}{(i+j)^2(i+j+1)}$	$0 < x < 1$

Standard Gaussian Distribution / Standaard Gaussiese Verdeling

z	0.25	0.5	0.6	0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.33	2.5	2.6	2.75	3.0
$\Phi(z)$	0.599	0.692	0.726	0.773	0.841	0.894	0.933	0.96	0.977	0.988	0.990	0.994	0.995	0.997	0.999

Statistiese formules / *Statistical formulas*

$P(B) = \sum_{i=1}^{n} P(B \cap A_i)$

$f_X(x|y_a < Y \le y_b) = \frac{\int_{y_a}^{y_b} f_{X,Y}(x,y)\,dy}{\int_{y_a}^{y_b} f_Y(y)\,dy}$

$f_{X,Y|B}(x,y) = \frac{f_{X,Y}(x,y)}{P(B)}$

$\mathrm{Cov}[X,Y] = r_{X,Y} - \mu_X\mu_Y$

$\rho_{X,Y} = \frac{\mathrm{Cov}[X,Y]}{\sigma_X\sigma_Y}$

$\mu_2 = m_2 - m_1^2$

$\mathrm{E}[X] = \sum_{x \in S_X} xP_X(x)$

$\mathrm{Var}[X+Y] = \mathrm{Var}[X] + \mathrm{Var}[Y] + 2\mathrm{Cov}[X,Y]$

$\boldsymbol{\mu_Y} = \mathbf{A}\boldsymbol{\mu_X} + \mathbf{b}$

$\mathbf{R_Y} = \mathbf{A}\mathbf{R_X}\mathbf{A}' + (\mathbf{A}\boldsymbol{\mu_X})\mathbf{b}' + \mathbf{b}(\mathbf{A}\boldsymbol{\mu_X})' + \mathbf{b}\mathbf{b}'$

$P(A|B,C) = \frac{P(B|A,C)P(A|C)}{P(B|C)}$

$f_{Y|X}(y|X=x) = \frac{f_{X,Y}(x,y)}{f_X(x)}$

$f_Y(y) = \int_{-\infty}^{\infty} f_{X,Y}(x,y)\,dx$

$E[X^k] = \frac{d^k\phi_X(s)}{ds^k}|_{s=0}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\mu_3 = m_3 - 3m_1\mu_2 - m_1^3$

$\mathrm{E}[X] = \int_{-\infty}^{\infty} xf_X(x)\,dx$

$f_W(w) = f_X(x)\left(\left|\frac{\partial g(X)}{\partial x}\right|\right)^{-1}$

$\mathbf{C_Y} = \mathbf{A}\mathbf{C_X}\mathbf{A}'$

$\mathbf{C_X} = \mathbf{R_X} - \boldsymbol{\mu_X}\boldsymbol{\mu_X}'$

$P(|X-\mu_X| \ge c) \le \frac{\mathrm{Var}[X]}{c^2}$

$P(X \ge c) \le \frac{\mathrm{E}[X]}{c}$

$P(X \ge c) \le \min_{s \ge 0} e^{-sc}\phi_X(s)$

$P(|M_n(X) - \mu_X| \ge c) \le \frac{\mathrm{Var}[X]}{nc^2}$

$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$

$P(B) = P(B|A).P(A) + P(B|\overline{A})P(\overline{A})$

$\hat{x}_B = \mathrm{E}[X]$

$\hat{x}_{\mathrm{ML}}(y) = \arg\max_x f_{Y|X}(y|x)$

$\mathrm{Var}[M_n(X)] = \frac{\mathrm{Var[X]}}{n}$

$e_n = \mathrm{E}[(M_n(X) - \mathrm{E}[X])^2]$

Other Formulas / Ander Formules

$P_k^n = \frac{n!}{(n-k)!}$

$\binom{n}{k} = \frac{P_k^n}{P_k^k} = \frac{n!}{(n-k)!\,k!}$

$\frac{d}{dx}[f(g(x))] = f'(g(x)) \cdot g'(x)$

$f_{\mathbf{X}}(\mathbf{x}) = \frac{1}{\sqrt{(2\pi)^n\,det(\mathbf{C_X})}}\exp\left(-\frac{1}{2}(\mathbf{x}-\boldsymbol{\mu_X})'\mathbf{C_X}^{-1}(\mathbf{x}-\boldsymbol{\mu_X})\right)$

$\frac{d}{dx}[u(x)\cdot v(x)] = u(x)\cdot\frac{d}{dx}[v(x)] + v(x)\cdot\frac{d}{dx}[u(x)]$

Acronyms:

- CDF: cumulative distribution function
- PMF: probability mass function;
- PDF: probability density function;
- iid: independent and identically distributed

Akronieme:

- KVF: kumulatiewe verdelings funksie
- WMF: waarskynlikheidsmassfunksie
- WDF: waarskynlikheidsdigtheidfunksie
- oiv: onafhanklik en identies verdeel