STATISTICAL DISTRIBUTIONS

Name	Formula	Type	Parameters	Mean	Variance
Beta distribution	$\frac{x^{p-1}(1-x)^{q-1}}{B(p,q)}$	pdf	$0 \le x \le 1$ $0 < p$ $0 < q$	$\frac{p}{p+q}$	$\frac{p \cdot q}{(p+q)^2(p+q+1)}$
Binomial distribution	$nCx \cdot p^x (1-p)^{n-x}$	pf	$x = 0,1,2,3,....,\ n(n \neq 0)$ $0 < p < 1$	np	np(1-p)
Chi-squared distribution	$\frac{\exp(-x/2) \cdot x^{\nu/2-1}}{2^{\nu/2} \cdot \Gamma(\nu/2)}$	pdf	$0 \le x < \infty$ $\nu = 1,2,3,....$	ν	2ν
Noncentral Chi-squard distribution	$\frac{\exp(-x/2-d/2)}{2^{\nu/2}} \sum_{j=0}^{\infty} \frac{x^{\nu/2-1+j} \cdot (d/2)^j}{\Gamma(\nu/2+j) \cdot 2^j \cdot j!}$	pdf	$0 \le x < \infty$ $\nu = 1,2,3,....$ $0 \le d$	$\nu + d$	$2(\nu + 2d)$
Error distribution	$\frac{\exp[-(\lvert x-a \rvert / b)^{2/c}/2]}{b \cdot 2^{1+c/2} \cdot \Gamma(1+c/2)}$	pdf	$-\infty < x, a < \infty$ $0<b,\ 0<c$	a	$\frac{2^c \cdot b^2 \cdot \Gamma(3c/2)}{\Gamma(c/2)}$
Exponential distribution	$(1/b) \cdot \exp(-x/b)$	pf	$0 \le x < \infty$ $0 < b$	b	b^2
F-distribution	$\frac{\Gamma((p+q)/2) \cdot (p/q)^{p/2} \cdot x^{p/2-1}}{\Gamma(p/2) \cdot \Gamma(q/2) \cdot (1+px/q)^{p/2+q/2}}$	pdf	$0 \le x < \infty$ $p, q = 1,2,3,....$	$\frac{q}{q-2}\ (2<q)$	$\frac{2 \cdot q^2 \cdot (p+q-2)}{p \cdot (q-2)^2 \cdot (q-4)}\ (4<q)$
Noncentral F-distribution	$\frac{\exp(-d/2) \cdot p^{p/2} \cdot q^{q/2} \cdot x^{p/2-1}}{B(p/2,q/2) \cdot (q+px)^{p/2+q/2}} \cdot K$ $K = 1 + \sum_{j=1}^{\infty} \left(\frac{pdx/2}{q+px}\right)^j \cdot \frac{(p+q) \cdot (p+q+2) \cdot (p+q+2j-2)}{p \cdot (p+2) \cdot \cdots \cdot (p+2j-2) \cdot j!}$	pdf	$0 \le x < \infty$ $p, q = 1,2,3,....$ $0 \le d$	$\frac{q \cdot (p+d)}{p \cdot (q-2)}\ (2<q)$	$2 \cdot \left(\frac{q}{p}\right)^2 \cdot \frac{(p+d)^2 + (p+2d) \cdot (q-2)}{(q-2)^2 \cdot (q-4)}\ (4<q)$
Gamma distribution	$(x/b)^{c-1} \cdot \frac{\exp(-x/b)}{b \cdot \Gamma(c)}$	pdf	$0 \le x < \infty$ $0 < b$ $0 < c$	bc	$b^2 c$
Hypergeometric distribution	$yCx \cdot N-yCn-x / NCn$	pf	$\max(0, n-N+y) \le x \le \min(y, n)$ $N, n, x, y = 1,2,3,....$ $n \le N$	ny/N	$\frac{(ny/N) \cdot (1-y/N) \cdot (N-n)}{N-1}\ (1<N)$
Logistic distribution	$\frac{\exp[-(x-a)/b)]}{b \cdot (1+\exp[-(x-a)/b])^2}$	pdf	$-\infty < x, a < \infty$ $0<b$	a	$\pi^2 b^2 / 3$
Lognormal distribution	$\frac{1}{x \cdot \sigma \cdot \sqrt{2\pi}} \cdot \exp\left(\frac{-[\log(x/m)]^2}{2 \cdot \sigma^2}\right)$	pdf	$0 \le x < \infty$ $0 < m$ $0 < \sigma$	$m \cdot \exp(\sigma^2/2)$	$m^2 \cdot \exp(\sigma^2) \cdot (\exp(\sigma^2)-1)$
Normal distribution	$\frac{1}{s \cdot \sqrt{2\pi}} \cdot \exp\left(-\frac{(x-m)^2}{2 \cdot s^2}\right)$	pdf	$-\infty < x, m < \infty$ $0<s$	m	s^2

Poisson distribution	$\frac{\lambda^x \cdot \exp(-\lambda)}{x!}$	pf	$x = 0,1,2,3,....$ $0 < \lambda$	λ	λ
Uniform (continuous) distribution	1/(b-a)	pdf	$a \le x \le b$	(a+b)/2	$(b-a)^2/12$
Uniform (discrete) distribution	1/(n+1)	pf	x=0,1,2,…,n	n/2	n(n+2)/12
t-distribution	$\frac{\Gamma((p+1)/2)}{(p\pi)^{1/2} \cdot \Gamma(p/2) \cdot (1+x^2/p)^{p/2+1/2}}$	pdf	$-\infty < x < \infty$ p=1,2,3,…..	0 (1<p)	p/(p-2) (2<p)
Noncentral t-distribution	$\frac{p^{p/2} \cdot \exp(-d^2/2)}{(\pi)^{1/2} \cdot \Gamma(p/2) \cdot (p+x^2)^{p/2+1/2}} \cdot K$ $K = \sum_{i=0}^{\infty} \Gamma(\frac{p+i+1}{2}) \cdot \frac{(xd)^i}{i!} \cdot (\frac{2}{p+x^2})^{i/2}$	pdf	$-\infty < x < \infty$ $p = 1,2,3,.....$ $0 \le d$	$\frac{d \cdot (p/2)^{1/2} \cdot \Gamma((p-1)/2)}{\Gamma(p/2)}$ $(1 < p)$	$\frac{p \cdot (1+d^2)}{p-2} - \frac{p \cdot d^2}{2} \cdot (\frac{\Gamma((p-1)/2)}{\Gamma(p/2)})^2$ $(2 < p)$
Weibull distribution	$\frac{q \cdot x^{q-1}}{p^q} \cdot \exp[-(x/p)^q]$	pdf	$0 \le x < \infty$ $0 < p$ $0 < q$	$p \cdot \Gamma((q+1)/q)$	$p^2 \cdot \{\Gamma((q+2)/q) - \Gamma((q+1)/q) \cdot \Gamma((q+1)/q)\}$

NOTE:
pdf=probability density function,
pf=probability function.
(Edited by Kimio Kanda)