Probability Distributions

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Discrete Distributions

Distribution	Support	PMF	Mean	Variance
Bernoulli (p)	$\{0,1\}$	$p^x(1-p)^{1-x}$	p	$p(1-p)$
Binomial (n,p)	$\{0,1,2,\dots,n\}$	$\binom{n}{k}p^k(1-p)^{n-k}$	np	$np(1-p)$
Geometric (p)	$\{1,2,\dots\}$ or $\{0,1,2,\dots\}$	$(1-p)^{k-1}p$ or $(1-p)^k p$	$1/p$ or $(1-p)/p$	$(1-p)/p^2$
Negative Binomial (r,p)	$\{r,r+1,\dots\}$ or $\{0,1,2,\dots\}$	$\binom{k-1}{r-1}p^r(1-p)^{k-r}$ or $\binom{k+r-1}{r-1}p^r(1-p)^k$	r/p or $r(1-p)/p$	$r(1-p)/p^2$
Poisson (λ)	$\{0,1,2,\dots\}$	$\frac{e^{-\lambda}\lambda^k}{k!}$	λ	λ

Continuous Distributions

Distribution	Support	Parameters	PDF	Mean	Variance
Uniform (a,b)	$[a,b]$	a,b	$\frac{1}{b-a}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
Exponential (λ)	$[0,\infty)$	λ	$\lambda e^{-\lambda x}$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$
Normal (μ,σ^2)	$(-\infty,\infty)$	μ,σ	$\frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$	μ	σ^2
Gamma (α,β)	$[0,\infty)$	α,β	$\frac{\beta^\alpha x^{\alpha-1}e^{-\beta x}}{\Gamma(\alpha)}$	$\frac{\alpha}{\beta}$	$\frac{\alpha}{\beta^2}$
Beta (α,β)	$[0,1]$	α,β	$\frac{x^{\alpha-1}(1-x)^{\beta-1}}{B(\alpha,\beta)}$	$\frac{\alpha}{\alpha+\beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$