

Probability Distributions

Discrete Distributions

	PMF: $p(k)$	MGF: $m_X(s)$	Mean	Variance
Binom(n, p)	$\binom{n}{k} p^k (1-p)^{n-k}$	$(pe^s + 1 - p)^n$	np	$np(1-p)$
Pois(λ)	$e^{-\lambda} \lambda^k / k!$	$\exp(\lambda(e^t - 1))$	λ	λ
Geom(p)	$p(1-p)^k$	$\frac{pe^s}{1 - (1-p)e^s}$	$1/p$	$(1-p)/p^2$
Negbinom(r, p)	$\binom{k-1}{r-1} p^r (1-p)^{k-r}$	$\left(\frac{pe^s}{1 - (1-p)e^s}\right)^r$	r/p	$r(1-p)/p^2$

Continuous Distributions

	PDF: $f(x)$	MGF: $m_X(s)$	Mean	Variance
Uniform(a, b)	$\frac{1}{b-a}$ on $[a, b]$	$\frac{e^{sb} - e^{sa}}{s(b-a)}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
Exp(λ)	$\lambda e^{-\lambda x}$ on $[0, \infty)$	$\frac{\lambda}{\lambda - s}$ on $(-\infty, \lambda)$	$1/\lambda$	$1/\lambda^2$
Norm(μ, σ^2)	$\frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/(2\sigma^2)}$	$\exp\left(\mu s + \frac{\sigma^2 s^2}{2}\right)$	μ	σ^2
Gamma(α, λ)	$\frac{\lambda^\alpha x^{\alpha-1}}{\Gamma(\alpha)} e^{-\lambda x}$ on $[0, \infty)$	$\left(\frac{\lambda}{\lambda - s}\right)^\alpha$ on $(-\infty, \lambda)$	α/λ	α/λ^2
$\chi^2(n)$	$\frac{x^{n/2-1}}{2^{n/2}\Gamma(n/2)} e^{-x/2}$ on $[0, \infty)$	$\left(\frac{1}{1-2s}\right)^{n/2}$ on $(-\infty, \lambda)$	n	$2n$