

## Discrete Distributions

Distribution	$\theta$	PMF	$E(X)$	$Var(X)$	MGF	Support
Bernoulli	$p$	$p^x(1-p)^{1-x}$	$p$	$p(1-p)$	$1-p+pe^t$	$X = 0, 1$
Binomial	$n, p$	$\binom{n}{x}p^x(1-p)^{n-x}$	$np$	$np(1-p)$	$(1-p+pe^t)^n$	$X = 0, 1, \dots, n$
Poisson	$\lambda$	$\frac{e^{-\lambda}\lambda^x}{x!}$	$\lambda$	$\lambda$	$e^{\lambda(e^t-1)}$	$X = 0, 1, \dots, \infty$
Geometric	$p$	$p(1-p)^{x-1}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$	$\frac{pe^t}{1-(1-p)e^t}$	$X = 1, 2, \dots, \infty$
Negative Binomial	$r, p$	$\binom{x-1}{r-1}p^r(1-p)^{x-r}$	$\frac{pr}{1-p}$	$\frac{(1-p)r}{p^2}$	$\left(\frac{1-p}{1-pe^t}\right)^r$	$X = 0, 1, \dots, \infty$

## Continuous Distributions

Distribution	$\theta$	PDF	$E(X)$	$Var(X)$	MGF	Support
Uniform	$a, b$	$\frac{1}{b-a}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$	$\frac{e^{tb}-e^{ta}}{t(b-a)}$	$a \leq X \leq b$
Normal	$\mu, \sigma^2$	$\frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$	$\mu$	$\sigma^2$	$e^{\mu t + \frac{t^2}{2}\sigma^2}$	$-\infty \leq X \leq \infty$
Exponential	$\lambda$	$\lambda e^{-x\lambda}$	$1/\lambda$	$1/\lambda^2$	$\frac{\lambda}{\lambda-t}$	$0 \leq X$
$\chi^2$	$k$	$\frac{1}{2^{k/2}\Gamma(k/2)} x^{k/2-1} e^{-x/2}$	$k$	$2k$	$(1-2t)^{-k/2}$	$0 \leq X$
Gamma	$\alpha, \beta$	$\frac{1}{\beta^\alpha \Gamma(\alpha)} x^{\alpha-1} e^{-x/\beta}$	$\alpha\beta$	$\alpha\beta^2$	$(1-\beta t)^{-\alpha}$	$0 \leq X$
Beta	$\alpha, \beta$	$\frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha+\beta)} x^{\alpha-1} (1-x)^{\beta-1}$	$\frac{\alpha}{\alpha+\beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$		$0 \leq X \leq 1$
Laplace	$\mu, b$	$\frac{1}{2b} e^{-\frac{ x-\mu }{b}}$	$\mu$	$b^2$	$\frac{e^{\mu t}}{1-b^2 t^2}$	$-\infty \leq X \leq \infty$
Logistic	$\mu, s$	$\frac{e^{-\frac{(x-\mu)}{s}}}{s \left(1 + e^{-\frac{(x-\mu)}{s}}\right)^2}$	$\mu$	$\frac{s^2\pi^2}{3}$	$e^{\mu t} \frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha+\beta)}$	$-\infty \leq X \leq \infty$