Distribution	Notation	Parameters	Density funct
Uniform	$egin{aligned} \theta &\sim \mathrm{U}(lpha, eta) \\ p(heta) &= \mathrm{U}(heta lpha, eta) \end{aligned}$	boundaries α, β with $\beta > \alpha$	$p(\theta) = \frac{1}{\beta - \alpha},$
Normal	$ \begin{aligned} \theta &\sim \mathcal{N}(\mu, \sigma^2) \\ p(\theta) &= \mathcal{N}(\theta \mu, \sigma^2) \end{aligned} $	location μ scale $\sigma > 0$	$p(\theta) = \frac{1}{\sqrt{2\pi}\sigma} \epsilon$
Lognormal	$\theta \sim \text{lognormal}(\mu, \sigma^2)$ $p(\theta) = \text{lognormal}(\theta \mu, \sigma^2)$	location μ log-scale $\sigma > 0$	$p(\theta) = (\sqrt{2\pi}c)$
Multivariate normal	$\theta \sim \mathcal{N}(\mu, \Sigma)$ $p(\theta) = \mathcal{N}(\theta \mu, \Sigma)$ (implicit dimension d)	symmetric, pos. definite, $d\times d \text{ variance matrix } \Sigma$	$p(\theta) = (2\pi)^{-\epsilon} \times \exp\left(-\frac{1}{2}(-\epsilon)^{-\epsilon}\right)$
Gamma	$\begin{aligned} \theta &\sim \operatorname{Gamma}(\alpha, \beta) \\ p(\theta) &= \operatorname{Gamma}(\theta \alpha, \beta) \end{aligned}$	shape $\alpha > 0$ inverse scale $\beta > 0$	$p(\theta) = \frac{\beta^{\alpha}}{\Gamma(\alpha)} \theta^{\alpha}$
Inverse-gamma	$\begin{aligned} \theta &\sim \text{Inv-gamma}(\alpha, \beta) \\ p(\theta) &= \text{Inv-gamma}(\theta \alpha, \beta) \end{aligned}$	shape $\alpha > 0$ scale $\beta > 0$	$p(\theta) = \frac{\beta^{\alpha}}{\Gamma(\alpha)}\theta^{-1}$
Chi-square	$\theta \sim \chi_{\nu}^2 \\ p(\theta) = \chi_{\nu}^2(\theta)$	degrees of freedom $\nu > 0$	$p(\theta) = \frac{2^{-\nu/2}}{\Gamma(\nu/2)}$ same as Ga
Inverse-chi-square	$\theta \sim \text{Inv-}\chi_{\nu}^2$ $p(\theta) = \text{Inv-}\chi_{\nu}^2(\theta)$	degrees of freedom $\nu > 0$	$p(\theta) = \frac{2^{-\nu/2}}{\Gamma(\nu/2)}$ same as In
Scaled inverse-chi-square	$\begin{aligned} \theta &\sim \text{Inv-}\chi^2(\nu, s^2) \\ p(\theta) &= \text{Inv-}\chi^2(\theta \nu, s^2) \end{aligned}$	degrees of freedom $\nu > 0$ scale $s > 0$	$p(\theta) = \frac{(\nu/2)^{\nu/2}}{\Gamma(\nu/2)}$ same as In
Exponential	$\theta \sim \text{Expon}(\beta)$ $p(\theta) = \text{Expon}(\theta \beta)$	inverse scale $\beta > 0$	$p(\theta) = \beta e^{-\beta \theta}$ same as Ga
Laplace (double-exponential)	$\begin{aligned} \theta &\sim \text{Laplace}(\mu, \sigma) \\ p(\theta) &= \text{Laplace}(\theta \mu, \sigma) \end{aligned}$	location μ scale $\sigma > 0$	$p(\theta) = \frac{1}{2\sigma} \exp$
t	$\theta \sim t_{\nu}(\mu, \sigma^{2})$ $p(\theta) = t_{\nu}(\theta \mu, \sigma^{2})$ $t_{\nu} \text{ is short for } t_{\nu}(0, 1)$	degrees of freedom $\nu > 0$ location μ scale $\sigma > 0$	$p(\theta) = \frac{\Gamma((\nu+1))}{\Gamma(\nu/2)}$
Multivariate t	$\begin{split} \theta &\sim t_{\nu}(\mu, \Sigma) \\ p(\theta) &= t_{\nu}(\theta \mu, \Sigma) \\ \text{(implicit dimension } d) \end{split}$	degrees of freedom $\nu > 0$ location $\mu = (\mu_1,, \mu_d)$ symmetric, pos. definite $d \times d$ scale matrix Σ	$p(\theta) = \frac{\Gamma((\nu + \frac{1}{\Gamma(\nu/2)\nu})}{\times (1 + \frac{1}{\nu}(\theta - \frac{1}{\nu}))}$
Beta	$\theta \sim \text{Beta}(\alpha, \beta)$ $p(\theta) = \text{Beta}(\theta \alpha, \beta)$	'prior sample sizes' $\alpha>0, \beta>0$	$p(\theta) = \frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)}$ $\theta \in [0, 1]$
Dirichlet	$\begin{aligned} \theta &\sim \text{Dirichlet}(\alpha_1, \dots, \alpha_k) \\ p(\theta) &= \text{Dirichlet}(\theta \alpha_1, \dots, \alpha_k) \end{aligned}$	'prior sample sizes' $\alpha_j > 0; \; \alpha_0 \equiv \sum_{j=1}^k \alpha_j$	$p(\theta) = \frac{\Gamma(\alpha_1 + \cdots + \alpha_k)}{\Gamma(\alpha_1) \cdots \Gamma(\alpha_k)}$ $\theta_1, \dots, \theta_k \ge 1$
Poisson	$\theta \sim \text{Poisson}(\lambda)$ $p(\theta) = \text{Poisson}(\theta \lambda)$	'rate' $\lambda > 0$	$p(\theta) = \frac{1}{\theta!} \lambda^{\theta} \text{ ex}$ $\theta = 0, 1, 2,$
Binomial	$\theta \sim \text{Bin}(n, p)$ $p(\theta) = \text{Bin}(\theta n, p)$	'sample size' $n \text{ (positive integer)}$ 'probability' $p \in [0, 1]$ 'sample size'	$p(\theta) = \binom{n}{\theta} p^{\theta} (1)$ $\theta = 0, 1, 2, \dots$
Multinomial	$\theta \sim \text{Multin}(n; p_1, \dots, p_k)$ $p(\theta) = \text{Multin}(\theta n; p_1, \dots, p_k)$	'sample size' $n \text{ (positive integer)}$ 'probabilities' $p_j \in [0, 1];$ $\sum_{j=1}^k p_j = 1$	$p(\theta) = \binom{n}{\theta_1 \theta_2 \dots}$ $\theta_j = 0, 1, 2,$
Negative binomial	$\theta \sim \text{Neg-bin}(\alpha, \beta)$ $p(\theta) = \text{Neg-bin}(\theta \alpha, \beta)$	shape $\alpha > 0$ inverse scale $\beta > 0$	$p(\theta) = \begin{pmatrix} \theta + \alpha - 1 \\ \alpha - 1 \end{pmatrix}$ $\theta = 0, 1, 2, .$
Beta- binomial	$\theta \sim \text{Beta-bin}(n, \alpha, \beta)$ $p(\theta) = \text{Beta-bin}(\theta n, \alpha, \beta)$	'sample size' n (positive integer) 'prior sample sizes'	$p(\theta) = \frac{\Gamma(1)}{\Gamma(\theta+1)I} \times \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)},$

Density function	Mean, variance, and mode
(a) 1 a.e.(a)	$E(\theta) = \frac{\alpha + \beta}{2}$ $(\beta - \alpha)^2$
$p(\theta) = \frac{1}{\beta - \alpha}, \ \theta \in [\alpha, \beta]$	$\operatorname{var}(\theta) = \frac{\frac{2}{(\beta - \alpha)^2}}{12}$ no mode
	$E(\theta) = \mu$
$p(\theta) = \frac{1}{\sqrt{2\pi}\sigma} \exp \left(-\frac{1}{2\sigma^2}(\theta - \mu)^2\right)$	$var(\theta) = \sigma^2$
	$\operatorname{mode}(\theta) = \mu$
$p(\theta) = (\sqrt{2\pi}\sigma\theta)^{-1} \exp(-\frac{1}{2\sigma^2}(\log\theta - \mu)^2)$	$E(\theta) = \exp(\mu + \frac{1}{2}\sigma^2),$ $var(\theta) = \exp(2\mu + \sigma^2)(\exp(\sigma^2) - 1)$
γ(-) (ν=)γ(2σ²($mode(\theta) = exp(\mu - \sigma^2)$
$p(\theta) = (2\pi)^{-d/2} \Sigma ^{-1/2}$	$E(\theta) = \mu$
$\times \exp\left(-\frac{1}{2}(\theta-\mu)^T\Sigma^{-1}(\theta-\mu)\right)$	$var(\theta) = \Sigma$ $mode(\theta) = \mu$
	$E(\theta) = \frac{\alpha}{\beta}$
$p(\theta) = \frac{\beta^{\alpha}}{\Gamma(\alpha)} \theta^{\alpha - 1} e^{-\beta \theta}, \ \theta > 0$	$var(\theta) = \frac{\alpha}{\beta^2}$
	$mode(\theta) = \frac{\alpha-1}{\beta}$, for $\alpha \ge 1$
(a) $\beta^{\alpha} = \alpha - (\alpha + 1) = \beta/\beta = \alpha$, α	$E(\theta) = \frac{\beta}{\alpha - 1}$, for $\alpha > 1$
$p(\theta) = \frac{\beta^{\alpha}}{\Gamma(\alpha)} \theta^{-(\alpha+1)} e^{-\beta/\theta}, \ \theta > 0$	$\operatorname{var}(\theta) = \frac{\beta^2}{(\alpha-1)^2(\alpha-2)}, \alpha > 2$
	$mode(\theta) = \frac{\beta}{\alpha + 1}$ $E(\theta) = \nu$
$p(\theta) = \frac{2^{-\nu/2}}{\Gamma(\nu/2)} \theta^{\nu/2-1} e^{-\theta/2}, \ \theta > 0$	$var(\theta) = \nu$ $var(\theta) = 2\nu$
same as $Gamma(\alpha = \frac{\nu}{2}, \beta = \frac{1}{2})$	$mode(\theta) = \nu - 2$, for $\nu \ge 2$
$p(\theta) = \frac{2^{-\nu/2}}{\Gamma(\nu/2)} \theta^{-(\nu/2+1)} e^{-1/(2\theta)}, \ \theta > 0$	$E(\theta) = \frac{1}{\nu - 2}$, for $\nu > 2$
same as Inv-gamma($\alpha = \frac{\nu}{2}, \beta = \frac{1}{2}$)	$var(\theta) = \frac{2}{(\nu-2)^2(\nu-4)}, \nu > 4$
$p(\theta) = \frac{(\nu/2)^{\nu/2}}{\Gamma(\nu/2)} s^{\nu} \theta^{-(\nu/2+1)} e^{-\nu s^2/(2\theta)}, \theta > 0$	$var(\theta) = \frac{2\nu^2}{(\nu-2)^2(\nu-4)}s^4$
same as Inv-gamma($\alpha = \frac{\nu}{2}, \beta = \frac{\nu}{2}s^2$)	$mode(\theta) = \frac{\nu}{\nu+2}s^2$
$p(\theta) = \beta e^{-\beta \theta}, \ \theta > 0$	$E(\theta) = \frac{1}{\beta}$
same as $Gamma(\alpha = 1, \beta)$	$\operatorname{var}(\theta) = \frac{1}{\beta^2}$
	$mode(\theta) = 0$ $E(\theta) = \mu$
$p(\theta) = \frac{1}{2\sigma} \exp\left(-\frac{ x-\mu }{\sigma}\right)$	$var(\theta) = 2\sigma^2$
20 - (0)	$mode(\theta) = \mu$
	$E(\theta) = \beta \Gamma(1 + \frac{1}{\alpha})$
$p(\theta) = \frac{\Gamma((\nu+1)/2)}{\Gamma(\nu/2)\sqrt{\nu\pi}\sigma}(1+\frac{1}{\nu}(\frac{\theta-\mu}{\sigma})^2)^{-(\nu+1)/2}$	$E(\theta) = \mu$, for $\nu > 1$ $var(\theta) = \frac{\nu}{\nu - 2}\sigma^2$, for $\nu > 2$
$p(v) = \frac{\Gamma(v/2)\sqrt{\nu\pi}\sigma}{\Gamma(v/2)\sqrt{\nu\pi}\sigma} \left(1 + \frac{1}{\nu}\left(\frac{\sigma}{\sigma}\right)\right)$	$\operatorname{mode}(\theta) = \mu$
F((n+d)/2) - 1/2	$E(\theta) = \mu$, for $\nu > 1$
$\begin{split} p(\theta) &= \frac{\Gamma((\nu+d)/2)}{\Gamma(\nu/2)\nu^{d/2}\pi^{d/2}} \Sigma ^{-1/2} \\ &\times \left(1 + \frac{1}{\nu}(\theta - \mu)^T \Sigma^{-1}(\theta - \mu)\right)^{-(\nu+d)/2} \end{split}$	$var(\theta) = \frac{\nu}{\nu-2}\Sigma$, for $\nu > 2$
$\times (1 + \frac{\pi}{\nu}(\theta - \mu)^2 \Sigma^{-1}(\theta - \mu))^{-(\theta + \mu)/2}$	$mode(\theta) = \mu$
$p(\theta) = \frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} \theta^{\alpha-1} (1-\theta)^{\beta-1}$	$E(\theta) = \frac{\alpha}{\alpha + \beta}$
$ \rho(b) = \frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha)\Gamma(\beta)}b \qquad (1 - b)^{\alpha} $ $ \theta \in [0, 1] $	$var(\theta) = \frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$ $mode(\theta) = \frac{\alpha-1}{\alpha+\beta-2}$
	$\operatorname{mode}(\theta) = \frac{\alpha - 1}{\alpha + \beta - 2}$ $\operatorname{F}(\theta) = \frac{\alpha_1}{\alpha + \beta - 2}$
$p(\theta) = \Gamma(\alpha_1 + \cdots + \alpha_k) \rho \alpha_1 - 1 \qquad \rho \alpha_k - 1$	$\operatorname{mode}(\theta) = \frac{\alpha - 1}{\alpha + \beta - 2}$ $E(\theta_j) = \frac{\alpha_j}{\alpha_0} \frac{\alpha_0}{\alpha_0} \frac{\alpha_0}{\alpha$
$\begin{array}{l} p(\theta) = \frac{\Gamma(\alpha_1 + \dots + \alpha_k)}{\Gamma(\alpha_1) \cdots \Gamma(\alpha_k)} \theta_1^{\alpha_1 - 1} \cdots \theta_k^{\alpha_k - 1} \\ \theta_1, \dots, \theta_k \geq 0; \sum_{j=1}^k \theta_j = 1 \end{array}$	$cov(\theta_i, \theta_j) = \frac{\alpha_0^2(\alpha_0 + 1)}{\alpha_0^2(\alpha_0 + 1)}$
$01, \dots, 0k \subseteq 0, \sum_{j=1}^{n} 0j = 1$	$\operatorname{mode}(\theta_j) = \frac{\alpha_0^2(\alpha_0+1)}{\alpha_0-k}$
$p(\theta) = \frac{1}{\theta!} \lambda^{\theta} \exp(-\lambda)$	$E(\theta) = \lambda, var(\theta) = \lambda$
$\theta = 0, 1, 2, \dots$	$\operatorname{mode}(\theta) = \lambda $
$p(\theta) = \binom{n}{\theta} p^{\theta} (1-p)^{n-\theta}$	$E(\theta) = np$
$\theta = 0, 1, 2, \dots, n$	$\operatorname{var}(\theta) = np(1 - p)$ $\operatorname{mode}(\theta) = \lfloor (n + 1)p \rfloor$
$p(\theta) = \binom{n}{\theta_1 \ \theta_2 \cdots \theta_k} p_1^{\theta_1} \cdots p_k^{\theta_k}$	$E(\theta_j) = np_j$ $var(\theta_j) = np_j(1 - p_j)$
$\theta_j = 0, 1, 2, \dots, n; \sum_{j=1}^k \theta_j = n$	$cov(\theta_i, \theta_j) = -np_i p_j$
$p(\theta) = \binom{\theta + \alpha - 1}{\alpha - 1} \left(\frac{\beta}{\beta + 1} \right)^{\alpha} \left(\frac{1}{\beta + 1} \right)^{\theta}$	$E(\theta) = \frac{\alpha}{\beta}$
$p(\theta) = \begin{pmatrix} 1 & 1 & 1 \\ \alpha - 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} \frac{1}{\beta+1} \\ \frac{1}{\beta+1} \end{pmatrix}$ $\theta = 0, 1, 2, \dots$	$\operatorname{var}(\theta) = \frac{\alpha}{\beta} (\beta + 1)$
$p(\theta) = \frac{\Gamma(n+1)}{\Gamma(\theta+1)\Gamma(n-\theta+1)} \frac{\Gamma(\alpha+\theta)\Gamma(n+\beta-\theta)}{\Gamma(\alpha+\beta+n)}$	$E(\theta) = n \frac{\alpha}{\alpha + \beta}$
$\times \frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)}, \theta = 0, 1, 2, \dots, n$	$E(\theta) = n \frac{\alpha}{\alpha + \beta}$ $var(\theta) = n \frac{\alpha\beta(\alpha + \beta + n)}{(\alpha + \beta)^2(\alpha + \beta + 1)}$