

DISCRETE DISTRIBUTIONS						
	RANGE $\mathbb{X}$	PARAMETERS	MASS FUNCTION f_X	CDF F_X	$E_{f_X} [X]$	$\text{Var}_{f_X} [X]$ PGF $\Pi_X(s)$
$Bernoulli(\theta)$	$\{0, 1\}$	$\theta \in (0, 1)$	$\theta^x(1 - \theta)^{1-x}$		θ	$1 - \theta + \theta s$
$Binomial(n, \theta)$	$\{0, 1, ..., n\}$	$n \in \mathbb{Z}^+, \theta \in (0, 1)$	$\binom{n}{x} \theta^x(1 - \theta)^{n-x}$		$n\theta$	$(1 - \theta + \theta s)^n$
$Poisson(\lambda)$	$\{0, 1, 2, ... \}$	$\lambda \in \mathbb{R}^+$	$\frac{e^{-\lambda} \lambda^x}{x!}$		λ	$\exp \{ \lambda (s - 1) \}$
$Geometric(\theta)$	$\{1, 2, ... \}$	$\theta \in (0, 1)$	$(1 - \theta)^{x-1} \theta$	$1 - (1 - \theta)^x$	$\frac{1}{\theta}$	$\frac{\theta s}{1 - s(1 - \theta)}$
$NegBinomial(n, \theta)$	$\{n, n + 1, ... \}$	$n \in \mathbb{Z}^+, \theta \in (0, 1)$	$\binom{x-1}{n-1} \theta^n (1 - \theta)^{x-n}$		$\frac{n}{\theta}$	$\left(\frac{\theta s}{1 - s(1 - \theta)} \right)^n$
or	$\{0, 1, 2, ... \}$	$n \in \mathbb{Z}^+, \theta \in (0, 1)$	$\binom{n+x-1}{x} \theta^n (1 - \theta)^x$		$\frac{n(1 - \theta)}{\theta}$	$\left(\frac{\theta}{1 - s(1 - \theta)} \right)^n$

For **CONTINUOUS** distributions (see over), define the **GAMMA FUNCTION**

$$\Gamma(\alpha) = \int_0^\infty x^{\alpha-1} e^{-x} \, dx$$

and the **LOCATION/SCALE** transformation $Y = \mu + \sigma X$ gives

$$f_Y(y) = f_X\left(\frac{y - \mu}{\sigma}\right) \frac{1}{\sigma} \qquad F_Y(y) = F_X\left(\frac{y - \mu}{\sigma}\right) \qquad M_Y(t) = e^{t\mu} M_X(\sigma t) \qquad E_{f_Y} [Y] = \mu + \sigma E_{f_X} [X] \qquad \text{Var}_{f_Y} [Y] = \sigma^2 \text{Var}_{f_X} [X]$$

CONTINUOUS DISTRIBUTIONS							
	PARAMS.	PDF	CDF	$E_{f_X} [X]$	$\text{Var}_{f_X} [X]$	MGF	
	$\mathbb{X}$	f_X	F_X			M_X	
$Uniform(\alpha, \beta)$ (standard model $\alpha = 0, \beta = 1$)	(α, β) $\alpha < \beta \in \mathbb{R}$	$\frac{1}{\beta - \alpha}$	$\frac{x - \alpha}{\beta - \alpha}$	$\frac{(\alpha + \beta)}{2}$	$\frac{(\beta - \alpha)^2}{12}$	$\frac{e^{\beta t} - e^{\alpha t}}{t(\beta - \alpha)}$	
$Exponential(\lambda)$ (standard model $\lambda = 1$)	$\mathbb{R}^+$ $\lambda \in \mathbb{R}^+$	$\lambda e^{-\lambda x}$	$1 - e^{-\lambda x}$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$	$\left(\frac{\lambda}{\lambda - t}\right)$	
$Gamma(\alpha, \beta)$ (standard model $\beta = 1$)	$\mathbb{R}^+$ $\alpha, \beta \in \mathbb{R}^+$	$\frac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x}$		$\frac{\alpha}{\beta}$	$\frac{\alpha}{\beta^2}$	$\left(\frac{\beta}{\beta - t}\right)^\alpha$	
$Weibull(\alpha, \beta)$ (standard model $\beta = 1$)	$\mathbb{R}^+$ $\alpha, \beta \in \mathbb{R}^+$	$\alpha \beta x^{\alpha-1} e^{-\beta x^\alpha}$	$1 - e^{-\beta x^\alpha}$	$\frac{\Gamma(1 + 1/\alpha)}{\beta^{1/\alpha}}$	$\frac{\Gamma(1 + \frac{2}{\alpha}) - \Gamma(1 + \frac{1}{\alpha})^2}{\beta^{2/\alpha}}$		
$Normal(\mu, \sigma^2)$ (standard model $\mu = 0, \sigma = 1$)	$\mathbb{R}$ $\mu \in \mathbb{R}, \sigma \in \mathbb{R}^+$	$\frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\frac{(x - \mu)^2}{2\sigma^2}\right\}$		μ	σ^2	$e^{\{\mu t + \sigma^2 t^2/2\}}$	
$Student(\nu)$	$\mathbb{R}$ $\nu \in \mathbb{R}^+$	$\frac{(\pi\nu)^{-\frac{1}{2}} \Gamma\left(\frac{\nu+1}{2}\right)}{\Gamma\left(\frac{\nu}{2}\right) \left\{1 + \frac{x^2}{\nu}\right\}^{(\nu+1)/2}}$		0 (if $\nu > 1$) $\frac{\nu}{\nu - 2}$ (if $\nu > 2$)			
$Pareto(\theta, \alpha)$	$\mathbb{R}^+$ $\theta, \alpha \in \mathbb{R}^+$	$\frac{\alpha \theta^\alpha}{(\theta + x)^{\alpha+1}}$	$1 - \left(\frac{\theta}{\theta + x}\right)^\alpha$	$\frac{\theta}{\alpha - 1}$ (if $\alpha > 1$)	$\frac{\alpha \theta^2}{(\alpha - 1)(\alpha - 2)}$ (if $\alpha > 2$)		
$Beta(\alpha, \beta)$	$(0, 1)$ $\alpha, \beta \in \mathbb{R}^+$	$\frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1} (1 - x)^{\beta-1}$		$\frac{\alpha}{\alpha + \beta}$	$\frac{\alpha \beta}{(\alpha + \beta)^2(\alpha + \beta + 1)}$		