Discrete Distributions

Distribution	**Parameters**	**Description**	**Range** Ω_X	$\mathbb{E}[X]$	$\mathrm{Var}(X)$	**PMF** $p_X(k)$ for $k \in \Omega_X$
Uniform (disc)	$X \sim \mathrm{Unif}(a,b)$ for $a,b \in \mathbb{Z}$ and $a \leqslant b$	Equally likely to be any integer in $[a,b]$	$\{a,\ldots,b\}$	$\frac{a+b}{2}$	$\frac{(b-a)(b-a+2)}{12}$	$\frac{1}{b-a+1}$
Bernoulli	$X \sim \mathrm{Ber}(p)$ for $p \in [0,1]$	Takes value 1 with prob p and 0 with prob $1-p$	$\{0,1\}$	p	$p(1-p)$	$p^k(1-p)^{1-k}$
Binomial	$X \sim \mathrm{Bin}(n,p)$ for $n \in \mathbb{N}$, $p \in [0,1]$	Sum of n iid $\mathrm{Ber}(p)$ rvs. # of heads in n independent coin flips with $\mathbb{P}(\text{head}) = p$	$\{0,1,\ldots,n\}$	np	$np(1-p)$	$\binom{n}{k}p^k(1-p)^{n-k}$
Poisson	$X \sim \mathrm{Poi}(\lambda)$ for $\lambda > 0$	# of events that occur in one unit of time independently with rate λ per unit time	$\{0,1,\ldots\}$	λ	λ	$e^{-\lambda}\frac{\lambda^k}{k!}$
Geometric	$X \sim \mathrm{Geo}(p)$ for $p \in [0,1]$	# of independent Bernoulli trials with parameter p up to and including first success	$\{1,2,\ldots\}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$	$(1-p)^{k-1}p$

Continuous Distributions

Distribution	**Parameters**	**Description**	**Range** Ω_X	$\mathbb{E}[X]$	$\mathrm{Var}(X)$	**PDF** $f_X(x)$ for $x \in \Omega_X$	**CDF** $F_X(x) = \mathbb{P}(X \leqslant x)$
Uniform	$X \sim \mathrm{Unif}(a,b)$ for $a < b$	Equally likely to be any real number in $[a,b]$	$[a,b]$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$	$\frac{1}{b-a}$	$\begin{cases} 0 & \text{if } x < a \\ \frac{x-a}{b-a} & \text{if } a \leqslant x < b \\ 1 & \text{if } x \geqslant b \end{cases}$
Exponential	$X \sim \mathrm{Exp}(\lambda)$ for $\lambda > 0$	Time until first event in Poisson process	$[0,\infty)$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$	$\lambda e^{-\lambda x}$	$\begin{cases} 0 & \text{if } x < 0 \\ 1-e^{-\lambda x} & \text{if } x \geqslant 0 \end{cases}$
Normal	$X \sim N(\mu,\sigma^2)$ for $\mu \in \mathbb{R}$, $\sigma^2 > 0$	Standard bell curve	$(-\infty,\infty)$	μ	σ^2	$\frac{1}{\sigma\sqrt{2\pi}}\exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$	$\Phi\left(\frac{x-\mu}{\sigma}\right)$