

Table of probability distributions

Discrete random variables

Name	Abbrev.	Parameters	p.m.f.: $\mathbb{P}[X = k], k \in \mathbb{N}_0$	$\mathbb{E}[X]$	$\text{Var}(X)$	m.g.f.: $\mathbb{E}[e^{tX}], t \in \mathbb{R}$
Bernoulli	Bern(p)	$p \in [0, 1]$	$\binom{1}{k} p^k (1-p)^{1-k}$	p	$p(1-p)$	$(1-p) + pe^t$
Binomial	Bin(n, p)	$n \in \mathbb{N}, p \in [0, 1]$	$\binom{n}{k} p^k (1-p)^{n-k}$	np	$np(1-p)$	$[(1-p) + pe^t]^n$
Poisson	Pois(λ)	$\lambda > 0$	$e^{-\lambda} \frac{\lambda^k}{k!}$	λ	λ	$\exp(\lambda(e^t - 1))$
Geometric	Geo(p)	$p \in (0, 1)$	$\begin{cases} (1-p)^{k-1}p, & k \geq 1, \\ 0, & \text{else.} \end{cases}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$	$\frac{pe^t}{1 - (1-p)e^t}, t < -\log(1-p)$
Negative binomial	NB(r, p)	$r \in \mathbb{N}, p \in (0, 1)$	$\begin{cases} \binom{k-1}{r-1} p^r (1-p)^{k-r}, & k \geq r, \\ 0, & \text{else.} \end{cases}$	$\frac{r}{p}$	$\frac{r(1-p)}{p^2}$	$\left(\frac{pe^t}{1 - (1-p)e^t} \right)^r, t < -\log(1-p)$
Hypergeometric		$n, m, N \in \mathbb{N}_0$	$\frac{\binom{m}{k} \binom{N-m}{n-k}}{\binom{N}{n}}$	$\frac{nm}{N}$	(not tested)	(not tested)

Continuous random variables

Name	Abbrev.	Parameters	p.d.f.: $f(x), x \in \mathbb{R}$	$\mathbb{E}[X]$	$\text{Var}(X)$	m.g.f.: $\mathbb{E}[e^{tX}], t \in \mathbb{R}$
Uniform	$\mathcal{U}(a, b)$	$a, b \in \mathbb{R}, a < b$	$\begin{cases} \frac{1}{b-a}, & \text{if } x \in [a, b], \\ 0, & \text{if } x \notin [a, b]. \end{cases}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$	$\frac{e^{tb} - e^{ta}}{t(b-a)}$
Normal	$\mathcal{N}(\mu, \sigma^2)$	$\mu, \sigma \in \mathbb{R}$	$\frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$	μ	σ^2	$e^{\mu t} e^{\sigma^2 t^2 / 2}$
Exponential	Exp(λ)	$\lambda > 0$	$\begin{cases} \lambda e^{-\lambda x}, & \text{if } x \geq 0, \\ 0, & \text{if } x < 0. \end{cases}$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$	$\frac{\lambda}{\lambda - t}, \text{ for } t < \lambda$