Table of probability distributions

Discrete random variables

Name	Abbrev.	Parameters	p.m.f.: $\mathbb{P}[X=k],\ k\in\mathbb{N}_0$	$\mathbb{E}[X]$	$\mathrm{Var}(X)$	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)	$p\in(0,1)$	$\begin{cases}(1-p)^{k-1}p, & \text{for } k\geq 1,\\ 0, & \text{else.}\end{cases}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$	$\frac{pe^t}{1-(1-p)e^t}$, for $t<-\log(1-p)$
Negative binomial	NB(r,p)	$r\in\mathbb{N}, p\in(0,1)$	$\begin{cases}\binom{k-1}{r-1}p^r(1-p)^{k-r}, & \text{if } k\geq r,\\ 0, & \text{else.}\end{cases}$	$\frac{r}{p}$	$\frac{r(1-p)}{p^2}$	$\left(\frac{pe^t}{1-(1-p)e^t}\right)^r$, for $t<-\log(1-p)$
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.: $f(x),\ x\in\mathbb{R}$	$\mathbb{E}[X]$	$\mathrm{Var}(X)$	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	$e^{\mu t}e^{\sigma^2t^2/2}$
Exponential	Exp(λ)	$\lambda>0$	$\begin{cases}\lambda e^{-\lambda x}, & \text{if } x\geq 0,\\ 0, & \text{if } x<0.\end{cases}$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$	$\frac{\lambda}{\lambda-t}$, for $t<\lambda$