Probability distributions - summary

Discrete Distributions				
Distribution	Probability Mass Function	Mean	Variance	Moment-generating Function
Binomial	$P(X=x)=\binom{n}{x}p^x(1-p)^{n-x}$ $x=0,1,\cdots,n$	np	$np(1-p)$	$[pe^t+(1-p)]^n$
Geometric	$P(X=x)=(1-p)^{x-1}p$ $x=1,2,\cdots$	$\frac{1}{p}$	$\frac{1-p}{p^2}$	$\frac{pe^t}{1-(1-p)e^t}$
Negative Binomial	$P(X=x)=\binom{x-1}{r-1}p^r(1-p)^{x-r}$ $x=r,r+1,\cdots$	$\frac{r}{p}$	$\frac{r(1-p)}{p^2}$	$[\frac{pe^t}{1-(1-p)e^t}]^r$
Hypergeometric	$P(X=x)=\frac{\binom{r}{x}\binom{N-r}{n-x}}{\binom{N}{n}}$ $x=0,1,\cdots,n$ if $n\leq r$, $x=0,1,\cdots,r$ if $n>r$	$\frac{nr}{N}$	$n\frac{r}{N}\frac{N-r}{N}\frac{N-n}{N-1}$	Fairly complicated!
Poisson	$P(X=x)=\frac{\lambda^x e^{-\lambda}}{x!}$ $x=0,1,\cdots$	λ	λ	$exp[\lambda(e^t-1)]$
Continuous Distributions				
Distribution	Probability Density Function	Mean	Variance	Moment-generating Function
Uniform	$f(x)=\frac{1}{b-a}$ $a\leq x\leq b$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$	$\frac{e^{tb}-e^{ta}}{t(b-a)}$
Gamma	$f(x)=\frac{x^{\alpha-1}e^{-\frac{x}{\beta}}}{\beta^\alpha\Gamma(\alpha)}$, $\alpha,\beta>0$, $x\geq 0$	$\alpha\beta$	$\alpha\beta^2$	$(1-\beta t)^{-\alpha}$
Exponential	$f(x)=\lambda e^{-\lambda x}$, $\lambda>0$, $x\geq 0$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$	$(1-\frac{1}{\lambda}t)^{-1}$
Normal	$f(x)=\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}$ $-\infty<x<+\infty$	μ	σ^2	$e^{\mu t+\frac{t^2\sigma^2}{2}}$

Remarks:

Binomial:	X represents the number of successes among n trials.
Geometric:	X represents the number of trials needed until the first success.
Negative Binomial:	X represents the number of trials needed until r successes occur.
Hypergeometric:	X represents the number of items among the n selected that comes from the r group.
Poisson:	X represents the number of events that occur in time, area, etc.