Summary of Discrete Distributions

Notation and Parameters	**Probability Function** $f(x)$	**Mean** $E(X)$	**Variance** $Var(X)$
Discrete Uniform(a,b) $b \geq a$ a,b integers	$\frac{1}{b-a+1}$ $x = a, a+1, \dots, b$	$\frac{a+b}{2}$	$\frac{(b-a+1)^2-1}{12}$
Hypergeometric(N,r,n) $N = 1,2,\dots$ $n = 0,1,\dots,N$ $r = 0,1,\dots,N$	$\frac{\binom{r}{x}\binom{N-r}{n-x}}{\binom{N}{n}}$ $x = max(0, n-N+r),$ $\dots, min(r,n)$	$\frac{nr}{N}$	$\frac{nr}{N}\left(1-\frac{r}{N}\right)\frac{N-n}{N-1}$
Binomial(n,p) $0 \leq p \leq 1, q = 1-p$ $n = 1,2,\dots$	$\binom{n}{x} p^x q^{n-x}$ $x = 0,1,\dots,n$	np	npq
Bernoulli(p) $0 \leq p \leq 1, q = 1-p$	$p^x q^{1-x}$ $x = 0,1$	p	pq
Negative Binomial(k,p) $0 < p \leq 1, q = 1-p$ $k = 1,2,\dots$	$\binom{x+k-1}{x} p^k q^x$ $= \binom{-k}{x} p^k (-q)^x$ $x = 0,1,\dots$	$\frac{kq}{p}$	$\frac{kq}{p^2}$
Geometric(p) $0 < p \leq 1, q = 1-p$	pq^x $x = 0,1,\dots$	$\frac{q}{p}$	$\frac{q}{p^2}$
Poisson(λ) $\lambda \geq 0$	$\frac{e^{-\lambda}\lambda^x}{x!}$ $x = 0,1,\dots$	λ	λ
Multinomial$(n; p_1, p_2, \dots, p_k)$ $0 \leq p_i \leq 1$ $i = 1,2,\dots,k$ and $\sum_{i=1}^{k} p_i = 1$	$f(x_1, x_2, \dots, x_k) =$ $\frac{n!}{x_1!\, x_2! \dots x_k!} p_1^{x_1} p_2^{x_2} \dots p_k^{x_k}$ $x_i = 0,1,\dots,n$ $i = 1,2,\dots,k$ and $\sum_{i=1}^{n} x_i = n$	$E(X_i)$ $= np_i$ $i = 1,\dots,k$	$Var(X_i)$ $= np_i(1-p_i)$ $i = 1,2,\dots,k$

Summary of Continuous Distributions

Notation and Parameters	**Probability Density Function** $f(x)$	**Mean** $E(X)$	**Variance** $Var(X)$
$\text{Uniform}(a, b)$ $b > a$	$\frac{1}{b-a}$ $a \leq x \leq b$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
$\text{Exponential}(\theta)$ $\theta > 0$	$\frac{1}{\theta} e^{-x/\theta}$ $x \geq 0$	θ	θ^2
$N(\mu, \sigma^2) = G(\mu, \sigma)$ $\mu \in \mathbb{R}, \sigma > 0$	$\frac{1}{\sqrt{2\pi}\sigma} e^{-(x-\mu)^2/(2\sigma^2)}$ $x \in \mathbb{R}$	μ	σ^2