Cheat Sheet for CS/STAT 6313

Discrete Distributions

Expected value	$\mu = E(X) = \sum_x x f(x)$
Expected value of a function	$Eg(X) = \sum_x g(x) f(x)$
Variance	$\sigma^2 = Var(X) = \sum_x (x-\mu)^2 f(x)$
Binomial probability mass function	$f(x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$ for $x = 0, 1, ..., n,$
Geometric probability mass function	$f(x) = (1-p)^{x-1} p$ for $x = 1, 2, ...$
Poisson probability mass function	$f(x) = \frac{e^{-\lambda}\lambda^x}{x!}$ for $x = 0, 1, ...$

Continuous Distributions

Expected value	$\mu = E(X) = \int x f(x) dx$
Expected value of a function	$Eg(X) = \int g(x) f(x) dx$
Variance	$\sigma^2 = Var(X) = \int (x-\mu)^2 f(x) dx$
Exponential density	$f(x) = \lambda e^{-\lambda x}$ for $0 < x < \infty$
Uniform density	$f(x) = \frac{1}{b-a}$ for $a < x < b$
Gamma density	$f(x) = \frac{\lambda^r}{\Gamma(r)} x^{r-1} e^{-\lambda x}$ for $0 < x < \infty$
Normal density	$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/2\sigma^2}$ for $-\infty < x < \infty$
Normal approximation	Binomial$(n, p) \approx$ Normal$(\mu = np, \sigma^2 = np(1-p))$ for $n \geq 30$, $0.05 \leq p \leq 0.95$
Central Limit Theorem	$\frac{(X_1 + \ldots + X_n) - n\mu}{\sigma\sqrt{n}}$ or $\frac{\overline{X} - \mu}{\sigma/\sqrt{n}} \to$ Normal(0,1) as $n \to \infty$

Expected values and variances of some distributions

Distribution	Bernoulli (p)	Binomial (n,p)	Geometric (p)	Poisson (λ)	Exponential (λ)	Gamma (r,λ)	Uniform (a,b)	Normal (μ,σ^2)
$E(X)$	p	np	$\frac{1}{p}$	λ	$\frac{1}{\lambda}$	$\frac{r}{\lambda}$	$\frac{a+b}{2}$	μ
Var(X)	$p(1-p)$	$np(1-p)$	$\frac{1-p}{p^2}$	λ	$\frac{1}{\lambda^2}$	$\frac{r}{\lambda^2}$	$\frac{(b-a)^2}{12}$	σ^2