DTSA 5001 - Final Exam - Formula Sheet
Some Common Random Variables

Bernoulli(p): A Bernoulli random variable is also known as a binary random variable.

$$P\{X=1\}=p \quad \text{and} \quad P\{X=0\}=1-p$$
$$\begin{aligned} E[X] &= p \\ V[X] &= p(1-p) \end{aligned}$$

Discrete Uniform(n):

$$P\{X=i\}=\frac{1}{n} \quad \text{for} \quad i=0,1,2,\ldots,n$$
$$\begin{aligned} E[X] &= n/2 \\ V[X] &= n(n+2)/12 \end{aligned}$$

Geometric(p):

$$\begin{aligned} P(X=i) &= p(1-p)^{i-1} \text{ for } i=1,2,3,... \\ E[X] &= \frac{1}{p} \\ V[X] &= \frac{1-p}{p^2} \end{aligned}$$

Binomial(n,p)**:**

$$\begin{aligned} P(X=i) &= \binom{n}{i} p^i (1-p)^{n-i} \text{ for } i=0,1,2,...,n \\ E[X] &= np \\ V[X] &= np(1-p) \end{aligned}$$

Negative Binomial(r,p)**:**

$$\begin{aligned} P(X=i) &= \binom{i+r-1}{r-1} p^r (1-p)^i \text{ for } i=0,1,2,... \\ E[X] &= r(1-p)/p \\ V[X] &= r(1-p)/p^2 \end{aligned}$$

Poisson(λ):

$$\begin{aligned} P(X=i) &= \frac{e^{-\lambda}\lambda^i}{i!} \text{ for } i=0,1,2,... \\ E[X] &= \lambda \\ V[X] &= \lambda \end{aligned}$$

Uniform(a,b)**:**

$$f(x) = \begin{cases} \frac{1}{b-a} & \text{for } a<x<b \\ 0 & \text{else} \end{cases}$$

$$\begin{aligned} E[X] &= \frac{a+b}{2} \\ V[X] &= \frac{(b-a)^2}{12} \end{aligned}$$

Exponential(λ)**:**

$$\begin{aligned} f(x) &= \begin{cases} \lambda e^{-\lambda x} & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases} \\ E[X] &= 1/\lambda \\ V[X] &= 1/\lambda^2 \end{aligned}$$

Normal(μ, σ^2)**:** A normal random variable is also known as a Gaussian random variable.

$$\begin{aligned} f(x) &= \frac{1}{\sqrt{2\pi}\sigma} e^{-(x-\mu)^2/2\sigma^2} \text{ for } -\infty < x < \infty \\ E[X] &= \mu \\ V[X] &= \sigma^2 \end{aligned}$$