Other Distribution and Density Functions

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Based on
Probability, Random Variables and Random Signal Principles,
P.Z. Peebles,Jr. and B. Shi

Outline

Binomial Density Function

Definition

Let $0 < p < 1$ and $N = 1, 2, \ldots$

$$f_X(x) = \sum_{k=0}^{N} \begin{pmatrix} N \\ k \end{pmatrix} p^k (1-p)^{N-k} \delta(x-k)$$

where $\begin{pmatrix} N \\ k \end{pmatrix} = \dfrac{N!}{k!(N-k)!}$

Binomial Distribution Function

Definition

Let $0 < p < 1$ and $N = 1, 2, \ldots$

$$F_X(x) = \sum_{k=0}^{N} \binom{N}{k} p^k (1-p)^{N-k} u(x-k)$$

where $\binom{N}{k} = \frac{N!}{k!(N-k)!}$

Poisson Density Function

Definition

$$f_X(x) = e^{-b} \sum_{k=0}^{\infty} \frac{b^k}{k!} \delta(x-k)$$

where $b > 0$ is a real constant

Poisson Distribution Function

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Exponential Density Function

Definition

Let $-\infty < a < \infty$ and $b > 0$

$$f_X(x) = \begin{cases} \dfrac{1}{b} e^{-(x-a)/b} & (x > a) \\ 0 & (x < a) \end{cases}$$

Exponential Distribution Function

Definition

Let $-\infty < a < \infty$ and $b > 0$

$$f_X(x) = \begin{cases} 1 - e^{-(x-a)/b} & (x > a) \\ 0 & (x < a) \end{cases}$$

Rayleigh Density Function

Definition

Let $-\infty < a < \infty$ and $b > 0$

$$f_X(x) = \begin{cases} \dfrac{2}{b}(x-a)e^{-(x-a)^2/b} & (x \geq a) \\ 0 & (x < a) \end{cases}$$

Rayleigh Distribution Function

Definition

Let $-\infty < a < \infty$ and $b > 0$

$$F_X(x) = \begin{cases} 1 - e^{-(x-a)^2/b} & (x > a) \\ 0 & (x < a) \end{cases}$$