Continuous Random Variables: Summary of The Uniform and Exponential Probability Distributions*

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Abstract

This module provides a summary of formulas and definitions related to Continuous Random Variables.

Formula 1: Uniform

X = a real number between a and b (in some instances, X can take on the values a and b). a = smallest X ; b = largest X

$X \sim U$ (a,b)

The mean is $\mu = \frac{a+b}{2}$

The standard deviation is $\sigma = \sqrt{\frac{(b-a)^2}{12}}$

Probability density function: $f(X) = \frac{1}{b-a}$ for $a \leq X \leq b$

Area to the Left of x: $P(X < x) =$ (base)(height)

Area to the Right of x: $P(X > x) =$ (base)(height)

Area Between c and d: $P(c < X < d) =$ (base) (height) $= (d - c)$ (height).

Formula 2: Exponential

$X \sim \text{Exp}(m)$

X = a real number, 0 or larger. m = the parameter that controls the rate of decay or decline

The mean and standard deviation **are the same.**

$\mu = \sigma = \frac{1}{m}$ and $m = \frac{1}{\mu} = \frac{1}{\sigma}$

The probability density function: $f(X) = m \cdot e^{-\text{m}\cdot\text{X}}$, $X \geq 0$

Area to the Left of x: $P(X < x) = 1 - e^{-\text{m}\cdot\text{x}}$

Area to the Right of x: $P(X > x) = e^{-\text{m}\cdot\text{x}}$

Area Between c and d: $P(c < X < d) = P(X < d) - P(X < c) = \left(1 - e^{-\text{m}\cdot\text{d}}\right) - \left(1 - e^{-\text{m}\cdot\text{c}}\right) = e^{-\text{m}\cdot\text{c}} - e^{-\text{m}\cdot\text{d}}$

Percentile, k: $k = \frac{\text{LN(1-AreaToTheLeft)}}{-\text{m}}$

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