Question-1 Report

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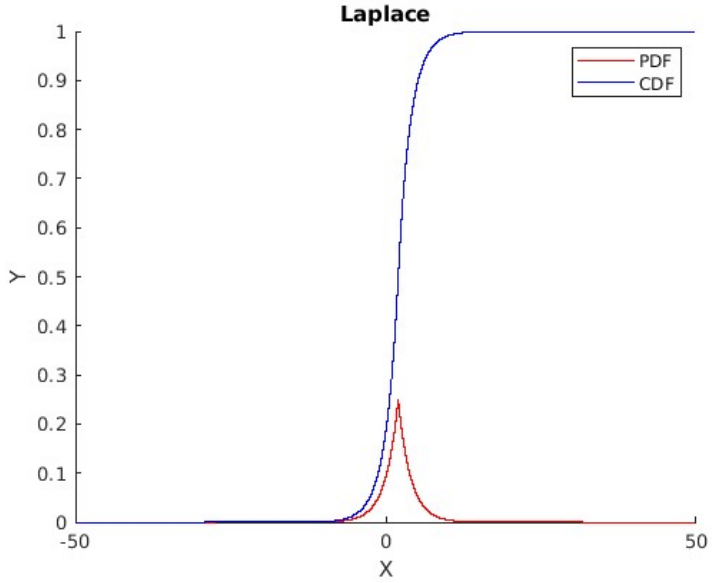
1 Laplace Distribution



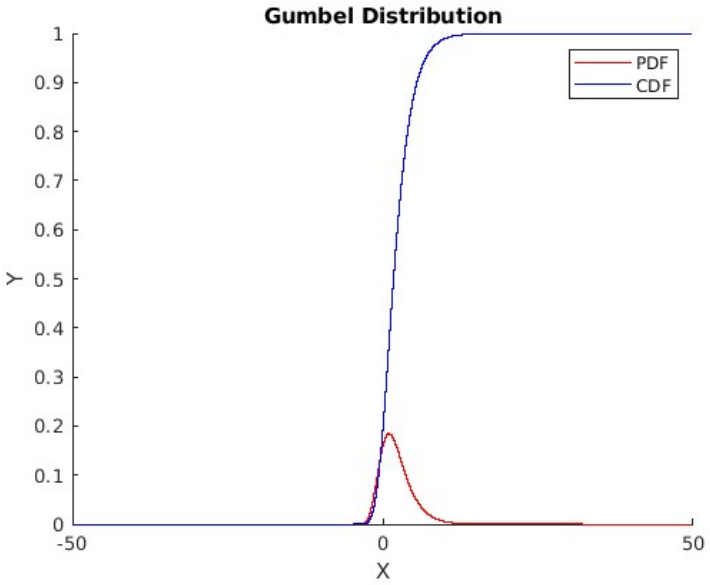
Probability Density Function for Laplace Distribution is given by,

$$\frac{1}{2b} exp\left(-\frac{|x-\mu|}{b}\right)$$

Above figure is a plot of PDF and CDF for Laplace distribution with $\mu = 2$ and $b = 2$.

Variance of Laplace distribution is given theoretically by $2b^2$.
So, Theoretical Variance = 8 and Experimental Variance = 7.9999

2 Gumbel Distribution



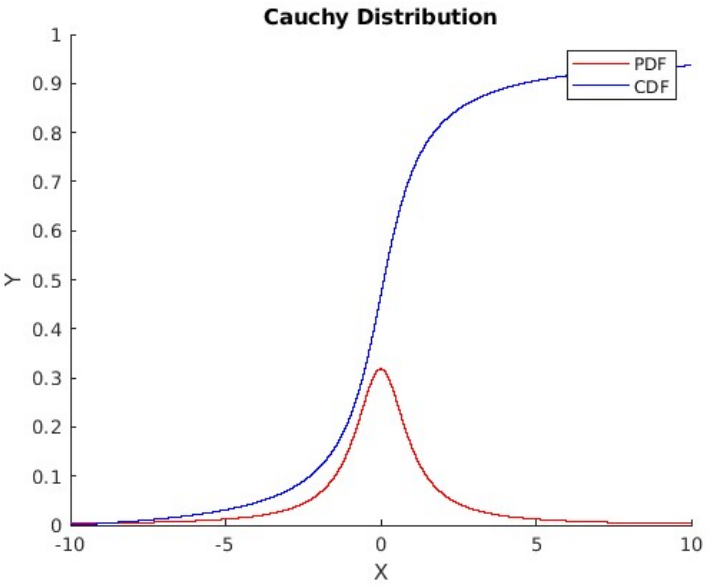
Probability Density Function for Gumbel Distribution is given by,

$$\frac{1}{\beta} exp\left(-\left(\frac{x-\mu}{\beta} + e^{-(\frac{x-\mu}{\beta})}\right)\right)$$

Above figure is a plot of PDF and CDF for Gumbel distribution with $\mu = 1$ and $\beta = 2$.

Variance of Gumbel distribution is given theoretically by $\frac{\beta^2\pi^2}{6}$.
So, Theoretical Variance = 6.5797 and Experimental Variance = 6.5797

3 Cauchy Distribution



Probability Density Function for Cauchy Distribution is given by,

$$\frac{1}{\pi\gamma}\left[\frac{\gamma^2}{(x-x_0)^2+\gamma^2}\right]$$

Above figure is a plot of PDF and CDF for Cauchy distribution with $x_0 = 0$ and $\gamma = 1$.

Variance of Cauchy distribution is undefined.

Idea::
Probability Density Function is plotted by calculating value at some finite points and then joining them. Ideally to plot Cumulative Distribution Function we will have to integrate the PDF from $-\infty$ to x, but as that is not possible we have done the Riemann sum from some large enough negative number to x.