**Exponential Distribution**

**(PDF) and (CDF) for Exponential Distribution:**

exponential\_pdf(x, scale)

Function Purpose:

* Defines the Probability Density Function (PDF) for the exponential distribution.

Parameters:

* x: Values at which to evaluate the PDF.
* scale: The scale parameter of the exponential distribution.

Explanation:

* Utilizes the pdf function from the scipy.stats.expon module to calculate the PDF values for given x and scale.

exponential\_cdf(x, scale)

Function Purpose:

* Defines the Cumulative Distribution Function (CDF) for the exponential distribution.

Parameters:

* x: Values at which to evaluate the CDF.
* scale: The scale parameter of the exponential distribution.

Explanation:

* Uses the cdf function from the scipy.stats.expon module to compute the CDF values for given x and scale.

**Variance of Exponential Distribution:**

Function Purpose:

* Calculates the variance of the exponential distribution.

Parameters:

* scale: The scale parameter of the exponential distribution.

Explanation:

* Variance formula: scale^2.

**Expectation (Mean) of Exponential Distribution**

Function Purpose:

* Calculates the expectation (mean) of the exponential distribution.

Parameters:

* lambd: The rate parameter of the exponential distribution (1/scale).

Explanation:

* Expectation formula: 1 / lambd. It ensures that lambd is positive to avoid division by zero.

**Plotting PDF and CDF for Exponential Distribution**

plot\_exponential\_pdf

Function Purpose:

* + - Generates a random sample from an exponential distribution, computes the PDF, and plots the PDF curve.

Parameters:

* + - scale\_param: The scale parameter of the exponential distribution.
    - size: Number of samples in the random sample.

Explanation:

* + - Uses NumPy to generate a random sample from the exponential distribution.
    - Computes the PDF values using the previously defined exponential\_pdf function.
    - Plots the PDF curve.

plot\_exponential\_cdf

Function Purpose:

* + - Generates a random sample from an exponential distribution, computes the empirical CDF, and plots the CDF.

Parameters:

* + - scale\_param: The scale parameter of the exponential distribution.
    - size: Number of samples in the random sample.

Explanation:

* Uses NumPy to generate a random sample from the exponential distribution.
* Sorts the sample for plotting the empirical CDF.
* Computes the CDF values using the previously defined exponential\_cdf function.
* Plots the step chart of the CDF.