**Gaussian Distribution**

**Probability Density Function (PDF) for Gaussian Distribution**

gaussian\_pdf(x, mean, std\_dev):

Function Purpose:

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

Parameters:

* x: Values at which to evaluate the PDF.
* mean: Mean (expected value) of the Gaussian distribution.
* std\_dev: Standard deviation of the Gaussian distribution.

Explanation:

* Utilizes the pdf function from the scipy.stats.norm module to calculate the PDF values for given x, mean, and std\_dev.

gaussian\_cdf(x, mean, std\_dev):

Function Purpose:

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

Parameters:

* x: Values at which to evaluate the CDF.
* mean: Mean (expected value) of the Gaussian distribution.
* std\_dev: Standard deviation of the Gaussian distribution.

Explanation:

* Uses the cdf function from the scipy.stats.norm module to compute the CDF values for given x, mean, and std\_dev.

**Variance and Expectation of Gaussian Distribution**

gaussian\_variance(std\_dev):

Function Purpose:

* + Calculates the variance of the Gaussian distribution.

Parameters:

* + std\_dev: Standard deviation of the Gaussian distribution.

Explanation:

* + Variance formula: std\_dev^2.

gaussian\_expectation(mu):

Function Purpose:

* + Returns the mean of the Gaussian distribution.

Parameters:

* + mu: Mean (expected value) of the Gaussian distribution.

Explanation:

* + Simply returns the input mu.

**Plotting PDF and CDF for Gaussian Distribution**

plot\_gaussian\_pdf(mean, std\_dev, size=10000):

Function Purpose:

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

Parameters:

* + mean: Mean (expected value) of the Gaussian distribution.
  + std\_dev: Standard deviation of the Gaussian distribution.
  + size: Number of samples in the random sample.

Explanation:

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

plot\_gaussian\_cdf(mean, std\_dev, size=10000):

Function Purpose:

* Generates a random sample from a Gaussian distribution, computes the empirical CDF, and plots the CDF.

Parameters:

* mean: Mean (expected value) of the Gaussian distribution.
* std\_dev: Standard deviation of the Gaussian distribution.
* size: Number of samples in the random sample.

Explanation:

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