Normal Distribution

The normal distribution, also known as the Gaussian distribution, is a bell-shaped curve that describes the probability of finding a certain value in a continuous random variable. It's incredibly common across statistics and many other fields.

There are two main things that define a normal distribution:

- Mean (μ): This represents the center of the distribution, where the peak of the bell curve is. It indicates the average value you'd expect to find.
- Standard deviation (σ): This controls how spread out the data is. A larger standard deviation means the data points are further from the mean and the curve is flatter, while a smaller standard deviation indicates the data points are clustered closer to the mean and the curve is steeper.

The normal distribution is useful because it applies to many real-world phenomena where data tends to cluster around an average value with some variation. Examples include:

- Heights of people
- IQ scores
- · Test grades
- Errors in measurements

Probability Density Function (PDF):

The PDF describes the probability density of a specific value (x) occurring in the normal distribution. The general form for a normal distribution with mean (μ) and standard deviation (σ) is:

$$f(x) = (1/(\sigma * sqrt(2*pi))) * exp(-((x-\mu)^2)/(2*\sigma^2))$$

Where:

- f(x) is the probability density at value x
- μ (mu) is the mean of the distribution
- σ (sigma) is the standard deviation of the distribution
- pi (pi) is the mathematical constant pi

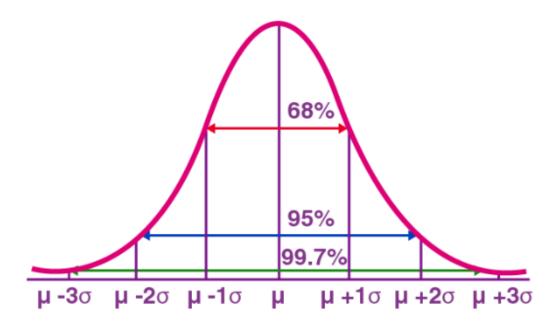
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• exp() is the exponential function

Cumulative Distribution Function (CDF):

For a normal distribution with any mean (μ) and standard deviation (σ), the CDF can be calculated using the CDF of the standard normal distribution (Φ) and the following relationship:

$$\Phi((x-\mu)/\sigma)$$



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