Standard Normal Distribution

The standard normal distribution, also known as the z-distribution, is a special case of the normal distribution. A normal distribution is a continuous probability distribution that is symmetric around its mean, forming a bell-shaped curve. The standard normal distribution has a mean (μ) of 0 and a standard deviation (σ) of 1.

The probability density function (PDF) of the standard normal distribution is given by the formula:

$f(z)=2\pi 1e_{-2z2}$

where z is a standard score, often denoted as z-score. The z-score represents how many standard deviations a data point is from the mean.

In the standard normal distribution:

The mean (μ) is 0.

The standard deviation (σ) is 1.

To convert a value from a normal distribution to the standard normal distribution, you use the

z-score formula:

$z=\sigma x-\mu$

where x is the raw score, μ is the mean, and σ is the standard deviation. Conversely, to convert a z-score back to a raw score, you can use

$x=\mu+z\cdot\sigma.$

The standard normal distribution is particularly useful in statistics because it allows for comparisons and analysis across different normal distributions. By converting values to z-scores, we can determine the relative position of a data point within its distribution, regardless of the specific mean and standard deviation.

Tables or calculators for the standard normal distribution, known as z-tables, provide the probability that a standard normal random variable is less than or equal to a given z-score. This is crucial in various statistical analyses, hypothesis testing, and confidence interval calculations.