# Gaussian Distribution

## Formula

The Gaussian distribution, also known as the normal distribution, is described by the probability density function (PDF):

$$f(x \mid \mu, \sigma^2) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$$

- $\mu$ is the mean
- $\sigma^2$ is the variance
- $x$ is the point at which you're evaluating the function

## Mean

The mean ($\mu$) of a data set $X$ with $N$ elements is calculated as:

$$\mu = \frac{1}{N} \sum_{i=1}^{N} x_i$$

## Variance

The variance ($\sigma^2$) of a data set $X$ with $N$ elements is calculated as:

$$\sigma^2 = \frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2$$

Note that this formula calculates the population variance. For sample variance, you would divide by $N - 1$ instead of $N$.