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**You**

What is the difference between gaussian random variable and standard normal random variable?

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A Gaussian random variable and a standard normal random variable are related concepts, but they have some key differences.

1. Gaussian Random Variable:

- A Gaussian random variable, also known as a normal random variable, follows a Gaussian distribution, which is a continuous probability distribution. It is characterized by a probability density function (PDF) that has the familiar bell-shaped curve.
- A Gaussian random variable is fully described by two parameters: the mean (μ) and the standard deviation (σ).
- The probability density function (PDF) of a Gaussian random variable X is given by:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

2. Standard Normal Random Variable:

- A standard normal random variable is a specific case of a Gaussian random variable with a mean (μ) of 0 and a standard deviation (σ) of 1.
- The standard normal random variable is often denoted by the letter Z .
- The probability density function (PDF) of a standard normal random variable Z is given by:

$$\phi(z) = \frac{1}{\sqrt{2\pi}} e^{-\frac{z^2}{2}}$$

In summary, every standard normal random variable is a Gaussian random variable, but not every Gaussian random variable is a standard normal random variable. The standard normal random variable serves as a standardized version of the Gaussian distribution, making it easier to compare and analyze different normal distributions. The process of converting a Gaussian random variable to a standard normal random variable is called standardization and involves subtracting the mean and dividing by the standard deviation.



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