Probability Density Functions and Cummulative Distribution Functions

Study Development Quick Guide

Probability density functions

A probaility density function (pdf) of a continuous random variable is a function that describes relative likelihood. We use pdfs to find the probability that a random variable will lie between two values.

The important points for pdfs are as follows:

- For a pdf $f_X(x)$, $P(a \leq x \leq b) = \int_a^b f_X(x)\, dx$.
- $f_X(x) > 0$ for all $x \in R$.
- $\int_{-\infty}^{\infty} f_X(x)\, dx = 1$.
- Since $P(x = a) = \int_a^a f_X(x)dx = 0$, we have that $P(a < x < b) = P(a < x \leq b) = P(a \leq x < b) = P(a \leq x \leq b) = \int_a^b f_X(x)dx$.

Cummulative distribution functions

The cummulative distribution function (cdf) is a function that gives the probability that a random variable will take a value less than x when the cdf is evaluated at x.

We find a cdf ($F_X(x)$) by calculating:

$$F_X(x) = \int_{-\infty}^{x} f_X(t)\, dt$$

Thus, we can also find the pdf from the cdf by calculating

$$f_X(x) = \frac{dF_X(x)}{dx}$$

The cdf gives us

$$P(X < x) = F_X(x)$$

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