Variance

1 Why

TODO

2 Definition

The **variance** of a square-integrable real-valued random variable is the expectation of its square less its expectation squared.

2.1 Notation

Let $(X, \mathcal{A}, \mu)$ be a probability space and f be a random variable. We denote the variance of f by $\mathbf{var}\, f$. We defined it by

$$\mathbf{var}\, f = \mathbf{E}(f^2) - (\mathbf{E}(f))^2.$$

3 Results

Proposition 1. *If a random variable on a probability space is square integrable then it is integrable.*

Proof. The L^p spaces are nested for finite measures. $\square$

Proposition 2. *The variance of a square-integrable real-valued random variable is the expectation of the square of the difference between the random variable and its expectation.*

Proof.

$$\mathsf{var}\, f = \mathsf{E}((f - \mathsf{E}(f))^2)$$

$\square$