

# VARIANZA DE UNA VARIABLE ALEATORIA

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Se define varianza de una variable aleatoria:

$$\text{Var}(X) = \mathbb{E}[(X - \mathbb{E}[X])^2] = \mathbb{E}[(X - \mu)^2] \quad \text{donde } \mathbb{E}[X] = \mu$$

También podemos escribir:

$$\begin{aligned} \text{Var}(X) &= \mathbb{E}[(X^2 - 2\mu X + \mu^2)] = \mathbb{E}[X^2] - 2\mu \mathbb{E}[X] + \mu^2 \\ &= \mathbb{E}[X^2] - 2\mu^2 + \mu^2 = \mathbb{E}[X^2] - \mu^2 = \mathbb{E}[X^2] - (\mathbb{E}[X])^2 \end{aligned}$$

Para una variable aleatoria discreta:

$$\text{Var}(X) = \sum_{i=1}^n (x_i - \mathbb{E}[X])^2 \cdot P(X=x_i)$$

Para una variable continua:

$$\text{Var}(X) = \int_{-\infty}^{\infty} (x - \mathbb{E}[X])^2 f(x) dx$$

PROPIEDADES:

$$\text{Var}(X) \geq 0$$

$$\text{Var}(a) = 0$$

$$\text{Var}(aX) = a^2 \text{Var}(X)$$

$$\text{Var}(X+Y) = \text{Var}(X) + \text{Var}(Y) + 2 \text{Cov}(X,Y)$$

$$\text{Cov}(X,Y) = \text{covarianza}$$

$$\text{COVARIANZA: } \text{Cov}(X,Y) = \mathbb{E}[(X - \mathbb{E}[X])(Y - \mathbb{E}[Y])]$$

$$\text{Cov}(X,X) = \text{Var}(X)$$