

RANDOM VARIABLES JOINT LAW

Why

We name the image measure of a collection of real-valued random variables.

Definition

The *joint law* of a sequence of n real-valued random variables is the image measure of the tuple-valued function whose components are the individual random variables.

Notation

Let (X, \mathcal{A}, μ) be a probability space and (Y, \mathcal{B}) be a measurable space. Let $f_1, \ldots, f_n : X \to Y$ be random variables. Define $f : X \to Y^n$ by $(f(x))_i = f_i(x)$. The joint law is the image measure of f.

We denote the joint law of $\{f_i\}$ by $\mu_{f_1,...,f_n}: \mathcal{A} \to [0,\infty]$. We defined it by

$$\mu_{f_1,\dots,f_n}(A) = \mu(\{x \in X \mid f(x) \in A\}).$$

for all A in the product sigma algebra on Y^n .

