

LATENT GENERATION PAIRS

Why

1

Definition

Let Z and X be sets, either of which may or may not be finite.

A latent generation pair from latents Z to observations X is an ordered pair $(p_z, p_{x|z})$ whose first coordinate is a distribution (density) on Z and whose second coordinate is a conditional distribution (density) on X from Z.

The joint function $p_{zx}: Z \times X \to \mathbf{R}$ of the pair is defined by $p_{zx}(\zeta, \xi) = p_z(\zeta)p_{x|z}(\xi, \zeta)$ for all $\xi \in X$ and $\zeta \in Z$. It is a distribution (density) if (not only if) both p_z and $p_{x|z}$ are distributions (densities). Regardless, we define the marginal function $p_x: X \to \mathbf{R}$ by $p_x(\xi) = \int_Z p_{zx}(\xi, \cdot)$. It too may be a distribution, density, or neither. In cases we construct, it is often one a distribution or a density, but it need not be either.

Interpretation as distribution graph

The latent generation pairs from Z to X are isomorphic to the graph distributions whose typed graph $(\{1,2\},\{(1,2)\}),(Z,x)$.

Parametrizations

By parameterizing either or both of the coordinates of the pair, we have latent generation family.

Other terminology

Other terminology for latent generation pair includes *latent variable model*. Some authorities refer to the marginal function as the *generative model*, still others use this term to refer to the pair.

¹Future editions will include.

²Future editions will include a visualization.

