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 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 $(\{1, 2\}, \{(1, 2)\}), (Z, x)$.[1]

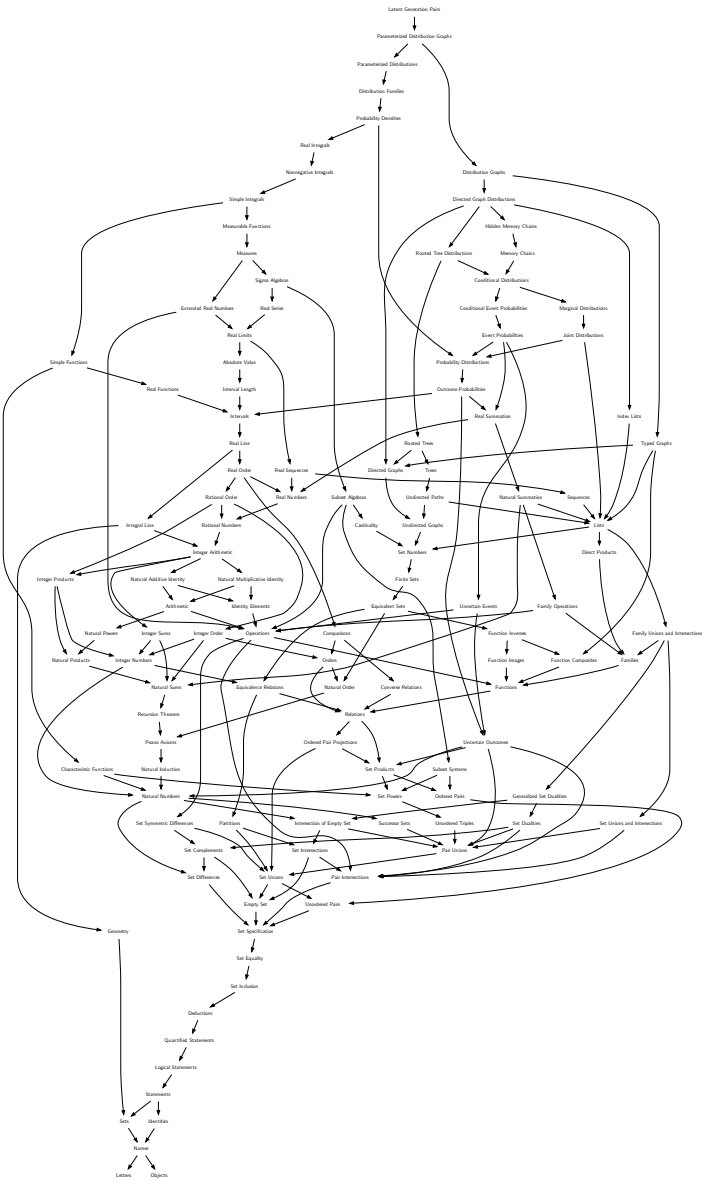
Parametrizations

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.

[1] Future editions will include a visualization.


Latent Generation Pain
Parameterized Distribution Graphs
Parameterized Distributions
Distribution Families
Probability Densities
Real Integrals
Nonnegative Integrals
Distribution Graphs
Simple Integrals
Directed Graph Distributions
Measurable Functions
Hidden Memory Chains
Measures
Rooted Tree Distributions
Memory Chains
Sigma Algebras
Conditional Distributions
Extended Real Numbers
Real Series
Conditional Event Probabilities
Marginal Distributions
Real Limits
Event Probabilities
Joint Distributions
Simple Functions
Absolute Value
Probability Distributions
Real Functions
Interval Length
Outcome Probabilities
Intervals
Real Summation
Index Lists
Real Line
Rooted Trees
Typed Graphs
Real Order
Real Sequences
Directed Graphs
Trees
Rational Order
Real Numbers
Subset Algebras
Undirected Paths
Natural Summation
Sequences
Integral Line
Rational Numbers
Cardinality
Undirected Graphs
Lists
Integer Arithmetic
Set Numbers
Direct Products
Integer Products
Natural Addition Identity
Natural Multiplication Identity
Finite Sets
Arithmetic
Identity Elements
Equivalent Sets
Uncertain Events
Family Operations
Natural Powers
Integer Sums
Integer Order
Operations
Comparisons
Function Inverses
Family Unions and Intersections
Natural Products
Integer Numbers
Orders
Function Images
Function Composites
Families
Natural Sums
Equivalence Relations
Natural Order
Converse Relations
Functions
Recursion Theorem
Relations
Peano Axioms
Ordered Pair Projections
Uncertain Outcomes
Characteristic Functions
Natural Induction
Set Products
Subset Systems
Natural Numbers
Set Powers
Ordered Pairs
Generalized Set Dualities
Set Symmetric Differences
Partitions
Intersection of Empty Set
Successor Sets
Unordered Triples
Set Dualities
Set Unions and Intersections
Set Complements
Set Intersections
Pair Unions
Set Differences
Set Unions
Pair Intersections
Empty Set
Unordered Pairs
Geometry
Set Specification
Set Equality
Set Inclusion
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Notions
Letters
Objects