Why

[1]

Why

A conditional distribution (density) $q : Y \times X \to \mathsf{R}$ is *functionally parametrizable* if there exists a function $f : X \to \Theta$ and distribution (density) family $\{p^{(\theta)} : Y \to \mathsf{R}\}_{\theta \in \Theta}$ satisfying $q(y, x) \equiv p^{(f(x))}(\gamma)$ for all $x \in X$ and $y \in Y$.

In this case we call f the *parameterizer* and we call $\{p^{(\theta)}\}_{\theta \in \Theta}$ the *parameterized family.* A *parameterized conditional distribution* is an ordered pair whose first coordinate is a function from X to Θ and whose second coordinate is a family of distributions on X with parameter set Θ. For a particular choice of parameterizer and family, it induces a conditional distribution.

Since all conditional distributions are functionally parametrizable (consider $\{q(\cdot, \xi)\}_{\xi \in X}$ with parameters X and identity parameterizer), we are interested in parameterizers and parameterized families that are simple. Said differently, we are interested in approximating a conditional distribution by selecting an appropriate parameterizer and parameterized family.

If $\{f_\phi : X \to \Theta\}_{\phi \in \Phi}$ is a family of functions and $\{q^{(\theta)}\}$ is a family of distributions, then $\{p^{(\phi)} : X \times Z \to \mathsf{R}\}_\phi$ defined by $p^{(\phi)}(\cdot, \zeta) \equiv q^{f_\phi(\zeta)}$ is a conditional distribution family called a *functionally parameterized conditional distribution family.* In other words, by selecting some parameters ϕ, we induce a conditional distribution $p^{(\phi)} : X \times Z \to \mathsf{R}$

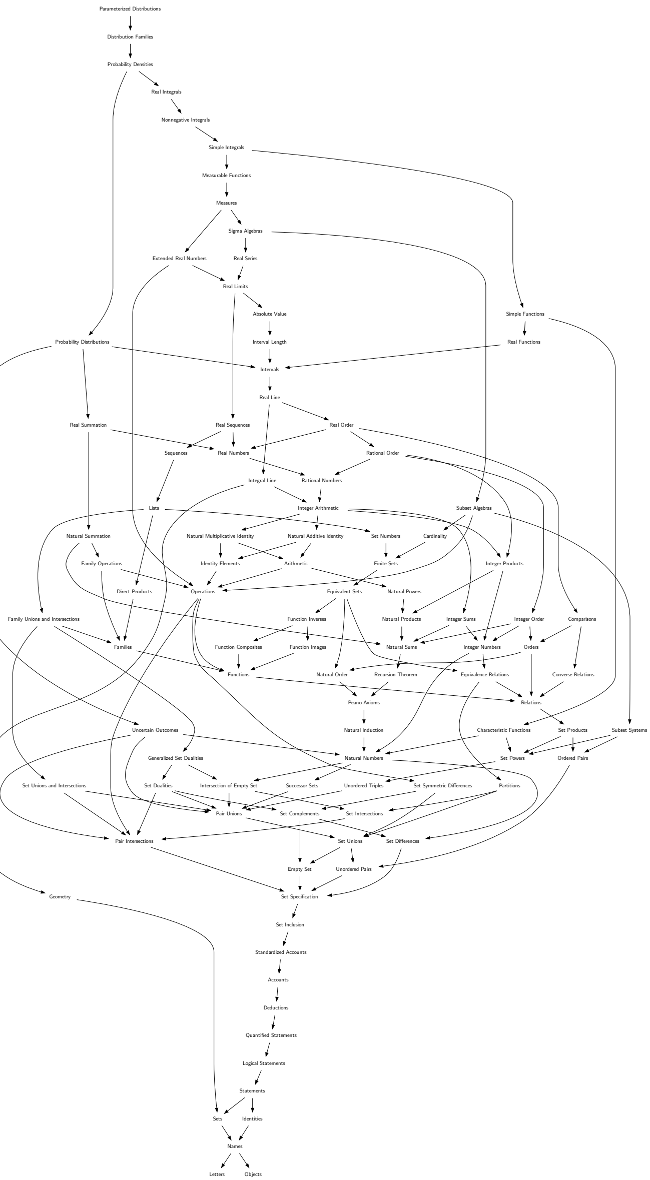
[1]Future editions will include.

We similarly define *parameterized conditional densities* and *functionally parameterized conditional density families*.

Basic example

Let $Z = \{1, 2\}$ and $X = \mathsf{R}$. Let $f : \{1, 2\} \to \mathsf{R} \times \mathsf{R}_+$ be defined by $f(1) = (\mu_1, \sigma_1)$ and $f(2) = (\mu_2, \sigma_2)$. Let $\{g^{(\theta)}\}_\theta$ be the normal family. Then $(f, \{g^{(\theta)}\})$ is a *functionally parameterized conditional density.*[2]

[2] Future editions will modify.


Parameterized Distributions
Distribution Families
Probability Densities
Real Integrals
Nonnegative Integrals
Simple Integrals
Measurable Functions
Measures
Sigma Algebras
Extended Real Numbers
Real Series
Real Limits
Absolute Value
Simple Functions
Probability Distributions
Interval Length
Real Functions
Intervals
Real Line
Real Summation
Real Sequences
Real Order
Sequences
Real Numbers
Rational Order
Integral Line
Rational Numbers
Lists
Integer Arithmetic
Subset Algebras
Natural Summation
Natural Multiplicative Identity
Natural Additive Identity
Set Numbers
Cardinality
Family Operations
Identity Elements
Arithmetic
Finite Sets
Integer Products
Direct Products
Operations
Equivalent Sets
Natural Powers
Family Unions and Intersections
Function Inverses
Natural Products
Integer Sums
Integer Order
Comparisons
Families
Function Composites
Function Images
Natural Sums
Integer Numbers
Orders
Functions
Natural Order
Recursion Theorem
Equivalence Relations
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Peano Axioms
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Uncertain Outcomes
Natural Induction
Characteristic Functions
Set Products
Subset Systems
Generalized Set Dualities
Natural Numbers
Set Powers
Ordered Pairs
Set Unions and Intersections
Set Dualities
Intersection of Empty Set
Successor Sets
Unordered Triples
Set Symmetric Differences
Partitions
Pair Unions
Set Complements
Set Intersections
Pair Intersections
Set Unions
Set Differences
Empty Set
Unordered Pairs
Geometry
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects