Why

1

Why

A conditional distribution (density) $q : Y \times X \to \mathbf{R}$ is *functionally parametrizable* if there exists a function $f : X \to \Theta$ and distribution (density) family $\{p^{(\theta)} : Y \to \mathbf{R}\}_{\theta \in \Theta}$ 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 $\{p^{(\phi)} : X \times Z \to \mathbf{R}\}_\phi$ 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 $p^{(\phi)} : X \times Z \to \mathbf{R}$

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

---

[1]Future editions will include.

Basic example

Let $Z = \{1, 2\}$ and $X = \mathbf{R}$. Let $f : \{1, 2\} \to \mathbf{R} \times \mathbf{R}_+$ 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

Single Integrals

Measurable Functions

Measures

Sigma Algebras

Extended Real Numbers

Real Series

Real Limits

Absolute Value

Interval Length

Simple Functions

Probability Distributions

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

Families

Function Inverse

Function Composites

Function Images

Natural Products

Integer Sums

Integer Order

Comparisons

Functions

Natural Sums

Integer Numbers

Orders

Converse Relations

Natural Order

Recursion Theorem

Equivalence Relations

Peano Axioms

Relations

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 Union

Set Complements

Set Intersections

Pair Intersection

Set Unions

Set Differences

Empty Set

Unordered Pairs

Geometry

Set Specification

Set Equality

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Sets

Identities

Names

Letters

Objects