Why

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Definition

A *distribution family* (*density family*) on X is a family of distributions (densities) $\{p^{(\theta)}\}_{\theta \in \Theta}$ on X. We call the index set Θ (see Families) the *parameters*. Frequently $\Theta \subset \mathbf{R}^p$.

Similarly, a *conditional distribution family* (*conditional density family*) on Z from X is a family $\{q^{(\theta)}\}_{\theta \in \Theta}$ whose terms $q^{(\theta)} : Z \times X \to \mathbf{R}$ are such that $q^{(\theta)}(\cdot, \xi) : Z \to \mathbf{R}$ is a distribution (density) for every $\xi \in X$.

Examples

For example, let $\Theta = [0, 1]$ and consider the family of distributions $\{p^{(\theta)} : \{0, 1\} \to [0, 1]\}_{\theta \in [0,1]}$ defined by, for each $\theta \in [0, 1]$,

$$p^{(\theta)}(1) = \theta \text{ and } p^{(\theta)}(0) = 1 - \theta.$$

This family is called the *Bernoulli family* and $p^{(\theta)}$ is called a *Bernoulli distribution* with parameter θ.

For a second example, let $\Theta = \mathbf{R} \times \mathbf{R}_+$ and consider the family of densities $\{f^{(\theta)} : \mathbf{R} \to \mathbf{R}\}_{\theta \in \Theta}$ defined by, for each $\theta = (\mu, \sigma) \in \Theta$,

$$f^{(\theta)}(x) = \left(1/\sqrt{2\pi}\sigma\right) \exp\left((x-\mu)/\sigma^2\right).$$

This family is called the *normal family* and $f^{(\theta)}$ with $\theta = (\mu, \sigma)$ is called a *normal density* with mean μ and variance σ^2.

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[1]Future editions will include.

Distribution Families

Probability Densities

Real Integrals

Nonnegative Integrals

Simple Integrals

Measurable Functions

Measures

Sigma Algebras

Extended Real Numbers — Real Series — Simple Functions

Real Functions

Real Limits

Absolute Value

Interval Length

Intervals

Real Line

Probability Distributions

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 — Converse Relations

Peano Axioms — Relations

Uncertain Outcomes — Natural Induction — Characteristic Functions — Set Products — Subset Systems

Generalized Set Dualities — Natural Numbers — Set Power — 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 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

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