Why

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Definition

The *two-sample model* (or the *two-sample problem*) has input space $\{1, 2\}$ and regression function $\phi : \{1, 2\} \to \mathbf{R}^2$ where $\phi(1) = (1, 0)^\top$ and $\phi(2) = (0, 1)^\top$. In this case, we model two populations (corresponding to 1 and 2) with different means but a common variance. The regression range is the set $\{(1, 0), (0, 1)\}$.

Generalizing from two to a populations gives the *one-way classification model*. In that case the input space is $\{1, \dots, a\}$ and the regression function is $\phi : \{1, \dots, a\} \to \mathbf{R}^a$ defined by $\phi(i) = e_i$ where e_i is the standard unit vector in $\mathbf{R}^a$.[2] The regression range is $\{e_1, \dots, e_a\}$. In this case we say that the *factor* population takes *levels* $1, \dots, a$.

If there are more than one factors, then we have a *multiway classification model*. For example, the *two-way classification model with no interaction* has input domain $X = \{1, \dots, a\} \times \{1, \dots, b\}$ and the regression function $\phi : X \to \mathbf{R}^{a+b}$ is defined by $\phi(i, j) = (e_i, e_j)^\top$.

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[1]Future editions will include.

[2]Future editions will define the standard unit vector.

Multiway Classification Models

Probabilistic Event Linear Model

Feature Maps — Covariance

Least Squares Linear Regression — Random Variable Moments — Variance

Matrix Inverse — Expectation

Matrix-Matrix Products

Linear Prediction

Real Matrix-Matrix Products — Matrix-Vector Products — Loss Functions — Matrix Transpose — Real Function Approximation — Input Design

Real Matrix-Vector Products — Data Matrix — Vector Space Basis — Predictor Performance Metrics — Consistent Inductors — Regressors — Probabilistic Predictors

Vectors as Matrices — Matrices — Linear Transformation — Linearly Dependent Vectors — Span — Real Function Space — Norms — Predictors — Random Variables

Real Matrices — Real Inner Product — Real Linear Combinations — Transformations — Subspaces — Functionals — Topological Sigma Algebras — Measurable Functions — Probability Measures

Linear Equations — Real Vectors — Real Norm — Vectors — Approximation — Measure — Event Probabilities — Topological Spaces

Linear Function — Similarity Functions — Sigma Algebras

Plane Vector Sums and Differences — Space Vector — Plane Norm — N-Dimensional Space — Plane Inner Product — Metrics — Extended Real Numbers — Real Series

Plane Vectors — Distance — Right Triangle Sides Relation — Real Functions — Real Limits

Arrays — Space Distance — Real Square — Absolute Value

Plane Distance — Real Arithmetic — Square Numbers — Interval Length — Probability Distributions — Real Sequences

Real Space — Real Multiplication Inverse — Square — Intervals — Real Summation

Real Plane — Real Products — Sequence — Real Line — Real Addition Inverse

Lists — Rational Arithmetic — Rational Products — Integral Line — Real Sum — Real Optimizers

Geometry — Inverse Elements — Rational Order — Rational Sums — Fields — Real Numbers

Direct Products — Rational Numbers — Rings — Subset Algebras

Element Functions — Set Numbers — Integer Arithmetic — Finite Sets — Cardinality

Family Unions and Intersections — Natural Equations — Integer Products — Natural Multiplication Identity — Natural Addition Identity — Equivalent Sets — Natural Summation — Optimizers

Equations — Families — Function Inverse — Integer Order — Comparators — Integer Sums — Arithmetic — Identity Elements — Family Operations

Function Composites — Function Image — Integer Numbers — Orders — Natural Powers — Operations

Functions — Equivalence Relation — Converse Relation — Natural Order — Natural Products

Relations — Natural Sums — Recursion Theorem — Set Products — Subset Systems

Phase Axioms — Set Powers — Ordered Pairs

Natural Induction — Uncertain Outcomes

Generalized Set Dualities — Natural Numbers — Unordered Triples

Set Unions and Intersection — Set Dualities — Successor Sets — Intersection of Empty Set — Partitions — Set Symmetric Differences

Pair Union — Set Intersection — Set Complements

Pair Intersections — Set Differences — Set Unions

Empty Set — Unordered Pairs

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Sets — Identities

Names

Letters — Objects

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