Why

1

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 $\{1,\ldots,a\}$ and the regression function is $\phi : \{1,\ldots,a\} \to \mathbf{R}^a$ defined by $\phi(i) = e_i$ where e_i is the standard unit vector in $\mathbf{R}^a$.[2] The regression range is $\{e_1,\ldots,e_a\}$. In this case we say that the *factor* population takes *levels* $1,\ldots,a$.

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 $X = \{1,\ldots,a\} \times \{1,\ldots,b\}$ and the regression function $\phi : X \to \mathbf{R}^{a+b}$ is defined by $\phi(i,j) = (e_i, e_j)^\top$.

---

[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 Designs

Real Matrix-Vector Products — Data Matrix — Vector Space Bases — Predictor Performance Metric — Consistent Inductors — Regressors — Probabilistic Prediction

Vectors as Matrices — Matrices — Linear Transformations — Linearly Dependent Vectors — Span — Real Function Space — Norms — Predictors

Real Matrices — Real Inner Product — Real Bases — Linear Combinations — Transformations — Subspaces — Functionals — Random Variables

Linear Equations — Real Linear Combinations — Real Vectors — Vectors — Approximation — Topological Sigma Algebra — Measurable Functions — Probability Measures

Linear Function — Real Norms — Similarity Function — Measures — Event Probabilities — Topological Spaces

Plane Vector Sums and Differences — Space Vectors — Plane Norm — N-Dimensional Space — Plane Inner Product — Metrics — Sigma Algebras

Plane Vectors — Distance — Right Triangle Sides Relation — Extended Real Numbers — Real Series

Arrays — Space Distance — Real Squares — Real Functions — Absolute Value — Real Limits

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

Real Space — Square — Intervals — Real Summation — Real Sequences

Real Plane — Real Products — Real Addition Inverse

Sequences — Real Lists — Real Sums

Lists — Rational Multiplicative Inverse — Rational Arithmetic — Real Order — Integral Lists — Fields — Real Number — Real Optimizers

Geometry — Inverse Elements — Rational Products — Rational Order — Rational Numbers — Rings — Subset Algebras

Direct Products — Set Number — Natural Numbers — Finite Sets — Cardinality

Element Function — Integer Arithmetic — Natural Multiplication Identity — Natural Additive Identity — Equivalent Sets — Natural Summation — Optimizers

Family Unions and Intersections — Natural Equations — Function Inverse — Integer Products — Integer Numbers — Comparators — Integer Sums — Arithmetic — Identity Elements — Family Operations

Equations — Families — Function Composites — Function Image — Integer Number — Orders — Natural Powers — Operations

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

Relations — Natural Sums

Recursion Theorem — Set Products — Subset Systems

Peano Axioms — Set Powers — Ordered Pairs

Natural Induction — Uncertain Outcomes

Generalized Set Dualities — Natural Sums — Unordered Triples

Natural Numbers — Successor Sets — Intersection of Empty Set — Partitions — Set Symmetric Differences

Set Unions and Intersections — Set Dualities — Pair Unions — Set Intersection — Set Complements

Pair Intersection — Set Differences — Set Unions

Empty Set — Unordered Pairs

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deduction

Quantified Statements

Logical Statements

Statements

Sets — Identities

Names

Letters — Objects