Why

What is a reasonable normal density to associate with some data?

Definition

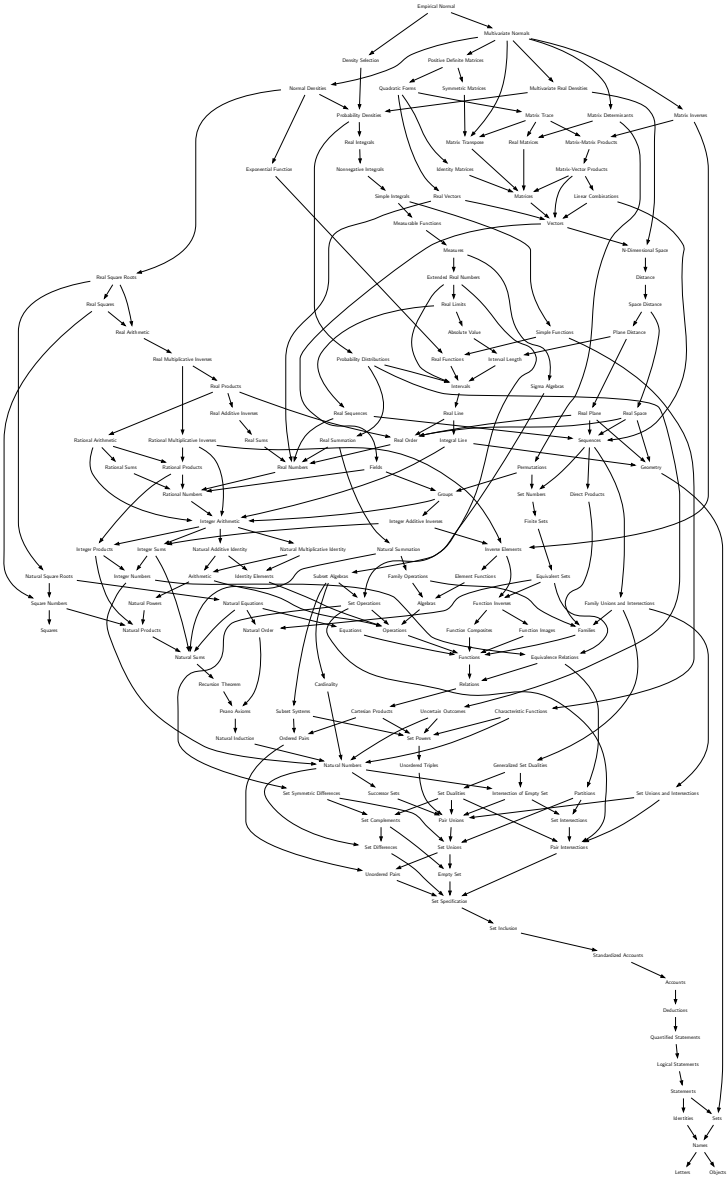
Let $x^1, \ldots, x^n$ be a dataset in $\mathbf{R}^d$. The *empirical mean* of the dataset is

$$\frac{1}{n}\sum_{k=1}^{n} x^k.$$

The *empirical covariance* of the dataset is

$$\frac{1}{n}\sum_{i=1}^{n}(x^k - \frac{1}{n}\sum_{k=1}^{n} x^k)(x^k - \frac{1}{n}\sum_{k=1}^{n} x^k)^\top.$$

The *empirical normal* associated with the dataset is the normal density whose mean is the empirical mean and whose covariance is the empirical covariance.


Empirical Normal
Multivariate Normals
Density Selection
Positive Definite Matrices
Normal Densities
Quadratic Forms
Symmetric Matrices
Multivariate Real Densities
Probability Densities
Matrix Trace
Matrix Determinants
Matrix Inverses
Real Integrals
Matrix Transpose
Real Matrices
Matrix-Matrix Products
Exponential Function
Nonnegative Integrals
Identity Matrices
Matrix-Vector Products
Simple Integrals
Real Vectors
Matrices
Linear Combinations
Measurable Functions
Vectors
Measures
N-Dimensional Space
Real Square Roots
Extended Real Numbers
Distance
Real Squares
Real Limits
Space Distance
Real Arithmetic
Absolute Value
Simple Functions
Plane Distance
Real Multiplicative Inverses
Probability Distributions
Real Functions
Interval Length
Integrals
Signed Algebras
Real Products
Real Additive Inverses
Real Sequences
Real Line
Real Plane
Real Space
Rational Arithmetic
Rational Multiplicative Inverses
Real Sums
Real Summation
Real Order
Integral Line
Sequences
Rational Sums
Rational Products
Real Numbers
Fields
Permutations
Geometry
Rational Numbers
Groups
Set Numbers
Direct Products
Integer Arithmetic
Integer Additive Inverses
Finite Sets
Integer Products
Integer Sums
Natural Additive Identity
Natural Multiplicative Identity
Natural Summation
Inverse Elements
Integer Numbers
Arithmetic
Identity Elements
Subset Algebras
Family Operations
Element Functions
Equivalent Sets
Natural Square Roots
Natural Equations
Set Operations
Algebras
Function Inverses
Family Unions and Intersections
Square Numbers
Natural Powers
Natural Products
Natural Order
Equations
Operations
Function Composites
Function Images
Families
Squares
Natural Sums
Functions
Equivalence Relations
Recursive Theorem
Cardinality
Relations
Peano Axioms
Subset Systems
Cartesian Products
Uncertain Outcomes
Characteristic Functions
Natural Induction
Ordered Pairs
Set Powers
Natural Numbers
Unordered Triples
Generalized Set Qualifiers
Set Symmetric Differences
Successor Sets
Set Qualifiers
Intersection of Empty Set
Partitions
Set Unions and Intersections
Set Complements
Pair Unions
Set Intersections
Set Differences
Set Union
Pair Intersections
Unordered Pairs
Empty Set
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects