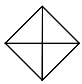


Why

We generalize the normal density to d-dimensional space.

Definition

Let $f : \mathbf{R}^d \to \mathbf{R}$ be a density such that

$$f(x) = \frac{1}{\sqrt{(2\pi)^d \det \Sigma}} \exp\left(-\frac{1}{2}(x-\mu)^\top \Sigma^{-1}(x-\mu)\right)$$

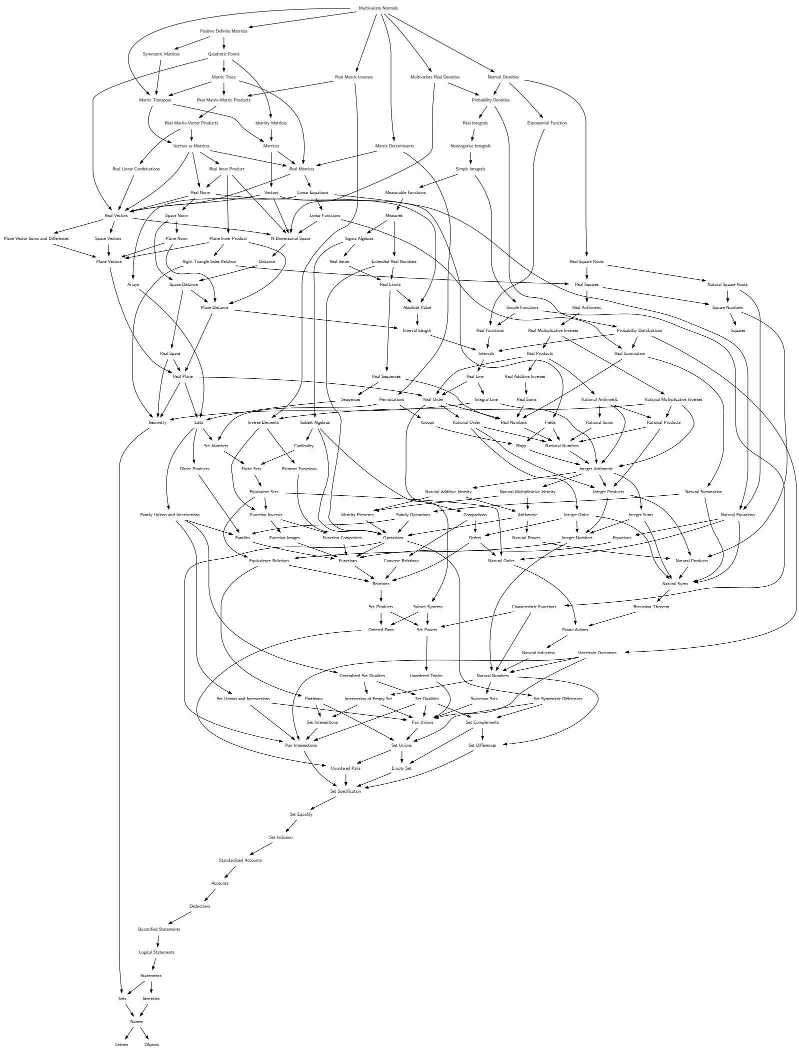
where $\mu \in \mathbf{R}^d$, $\Sigma \in \mathbf{S}^d$, and $\Sigma \succ 0$. We call f a *multivariate normal density*. A multivariate normal density with $d = 1$ is a normal density, so we refer to multivariate normal densities as *normal densities* without ambiguity. We frequently use the word normal as a substantive, and refer to *normals* when we mean multivariate normal densities. Many people call a multivariate normal distribution a *multivariate gaussian distribution* and speak of *gaussians* instead of normals.[1]

We call μ the *mean* and Σ the *covariance matrix*. We call Σ^{-1} the *precision matrix*.

Maximum

The maximum of a normal density is its mean, $\mu \in \mathbf{R}^d$.

[1] We avoid this usage in accordance with the project's policy on historical names.


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