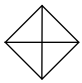


Why

Definition

A *normal random function* (or *normal process* or *gaussian process*)[1] is a real-valued random function with the property that any subset of results has a multivariate normal density.

Let $(\Omega, \mathcal{A}, \mathbf{P})$ be a probability space. Let $x : I \to (\Omega \to \mathsf{R})$. Then x is a normal random function if there exists $m : I \to \mathsf{R}$ and positive definite $k : I \times I \to \mathsf{R}$ with the property that if $J \subset I$, $|J| = d$, then $x_J \sim \mathcal{N}(m(J), k(J \times J))$. In other words, $x_J : \Omega \to \mathsf{R}^d$ is a Gaussian random vector. We call m the *mean function* and k the *covariance function*.

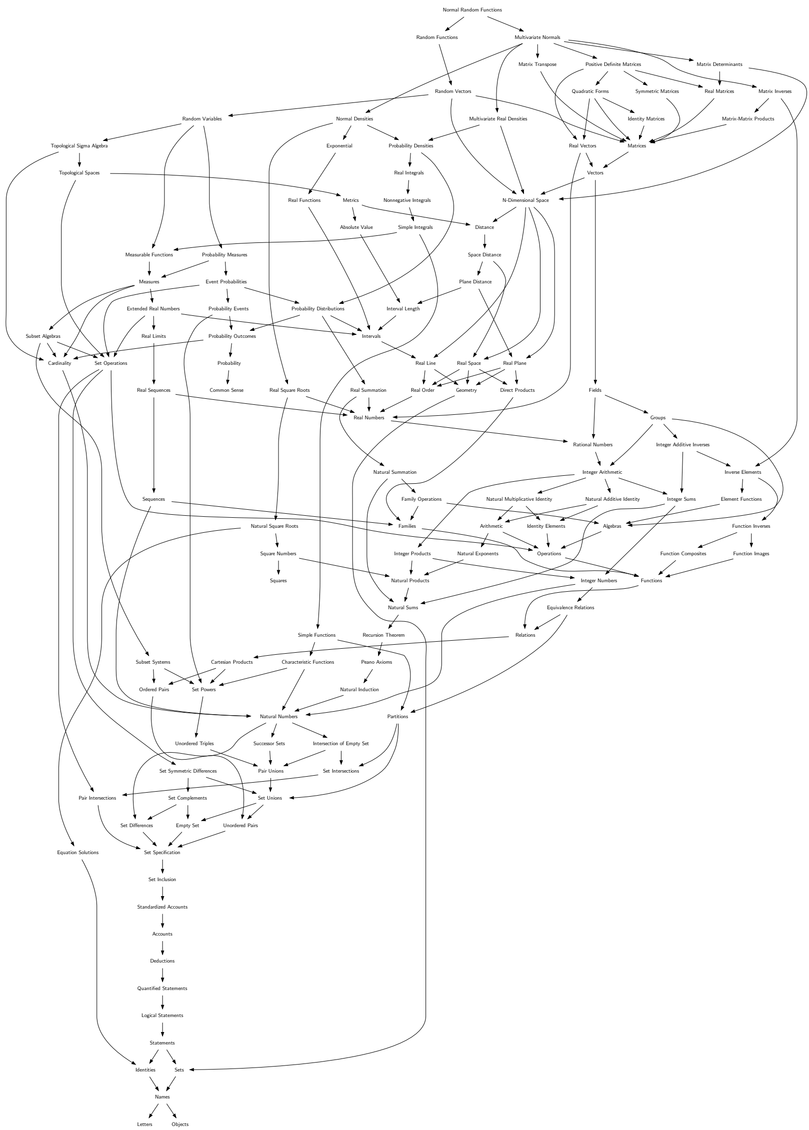
Random function interpretation

Many authorities discuss a normal random function as "putting a prior" on a "space" (see, for example, Real Function Space). One can draw a sample from this space by first selecting $\omega \in \Omega$, and then defining a sample $f : I \to \mathsf{R}$ by $f(i) = x(i, \omega)$.

Multivariate normal special case

If the index set is finite, and can be ordered, then the normal random function is a multivariate normal random vector.

[1] The choice of "normal" is a result of the Bourbaki project's convention to eschew historical names. Though here, as in Multivariate Normals the language of the project is nonstandard.


Normal Random Functions
Random Functions
Multivariate Normals
Matrix Transpose
Positive Definite Matrices
Matrix Determinants
Random Vectors
Quadratic Forms
Symmetric Matrices
Real Matrices
Matrix Inverses
Random Variables
Normal Densities
Multivariate Real Densities
Identity Matrices
Matrix-Matrix Products
Topological Sigma Algebra
Exponential
Probability Densities
Real Vectors
Matrices
Topological Spaces
Real Integrals
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Real Functions
Metrics
Nonnegative Integrals
N-Dimensional Space
Absolute Value
Simple Integrals
Distance
Measurable Functions
Probability Measures
Space Distance
Measures
Event Probabilities
Plane Distance
Extended Real Numbers
Probability Events
Probability Distributions
Interval Length
Subset Algebras
Real Limits
Probability Outcomes
Intervals
Cardinality
Set Operations
Probability
Real Line
Real Space
Real Plane
Real Sequences
Common Sense
Real Square Roots
Real Summation
Real Order
Geometry
Direct Products
Fields
Real Numbers
Groups
Rational Numbers
Integer Additive Inverses
Natural Summation
Integer Arithmetic
Inverse Elements
Sequences
Family Operations
Natural Multiplicative Identity
Natural Additive Identity
Integer Sums
Element Functions
Natural Square Roots
Families
Arithmetic
Identity Elements
Algebras
Function Inverses
Square Numbers
Integer Products
Natural Exponents
Operations
Function Composites
Function Images
Squares
Natural Products
Integer Numbers
Functions
Natural Sums
Equivalence Relations
Simple Functions
Recursion Theorem
Relations
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Cartesian Products
Characteristic Functions
Peano Axioms
Ordered Pairs
Set Powers
Natural Induction
Natural Numbers
Partitions
Unordered Triples
Successor Sets
Intersection of Empty Set
Set Symmetric Differences
Pair Unions
Set Intersections
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