Why

Often we care about multiple criteria at once.[1]

Definition

A *multiobjective optimization problem* is a pair $(X, f : X \to \mathbf{R}^d)$. As before, X is the *constraint set* and f is called the *objective function*. Since f is vector valued, and there is no natural order on $\mathbf{R}^d$, there may exist $x \in X$ with non-comparable images under f.

Scalarization

The $\alpha \in \mathbf{R}^d$ *scalarization* of a multiobjective optimization problem (X, f) is the optimization problem (X, g) where $g : X \to \mathbf{R}$ is defined by $g(x) = \alpha^\top f(x)$. We call g the *scalarized objective*.

[1] Future editions will modify.


Multiobjective Optimization Problems
Matrix Transpose
Multivariate Functions
Combined Orders
Vectors as Matrices
Real Matrices
Real Inner Product
Linear Equations
Real Norm
Arrays
Optimization Problems
Linear Functions
Real Vectors
Space Inner Product
N-Dimensional Space
Space Vectors
Plane Vector Sums and Differences
Space Norm
Plane Inner Product
Extended Real Numbers
Plane Norm
Distance
Right Triangle Sides Relation
Real Limits
Plane Vectors
Space Distance
Real Squares
Real Functions
Absolute Value
Plane Distance
Real Arithmetic
Optimizers
Interval Length
Real Multiplicative Inverses
Intervals
Real Spaces
Real Products
Real Sequences
Greatest Lower Bounds
Real Plane
Real Line
Real Additive Inverses
Square Numbers
Sequences
Real Summation
Real Order
Real Sums
Rational Arithmetic
Rational Multiplication Inverses
Integral Lins
Squares
Lists
Real Numbers
Rational Order
Rational Sums
Rational Products
Geometry
Comparisons
Set Numbers
Integer Order
Rational Numbers
Direct Products
Orders
Finite Sets
Integer Arithmetic
Natural Summation
Inverse Elements
Equivalent Sets
Natural Equations
Natural Additive Identity
Natural Multiplicative Identity
Integer Products
Family Unions and Intersections
Family Operations
Function Inverses
Element Functions
Natural Order
Identity Elements
Arithmetic
Integer Sums
Families
Function Images
Function Composites
Equations
Operations
Natural Powers
Integer Numbers
Convene Relations
Functions
Equivalence Relations
Natural Products
Relations
Natural Sums
Recursion Theorem
Peano Axioms
Set Products
Natural Induction
Generalized Set Dualities
Natural Numbers
Set Unions and Intersections
Unordered Triples
Set Dualities
Intersection of Empty Set
Successor Sets
Partitions
Set Symmetric Difference
Ordered Pairs
Pair Unions
Set Intersections
Set Complements
Pair Intersections
Set Unions
Set Differences
Unordered Pairs
Empty Set
Set Specification
Set Equality
Set Inclusion
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects