Why

[1]

Discussion

Given two classifiers G_1 and G_2 and a dataset, we can associate to each its false positve and false negative rate on the dataset. For a finite dataset, these are two rational numbers. It is natural to prefer G_1 to G_2 if the former has a smaller false positive rate. Conversely, it is natural to prefer G_2 to G_1 if the former has a smaller false negative rate. Unfortunately, one may need to trade-off these two desiderata (see Combined Orders), since there is no total order. In other words, choosing betwen G_1 and G_2 is a multiobjective optimization problem.

Scalarization

Let $\mathcal{G}$ be a set of classifiers and let $f : \mathcal{G} \to \mathbf{R}^2$ be defined so that $f_1(G)$ is the false negative rate of G on some dataset and $f_2(G)$ is the false positive rate of G on the same dataset. The *κ-scalarized error metric* (or *Neyman-Pearson metric* associated with $G \in \mathcal{G}$ is $\kappa f_1(G) + f_2(G)$. In the case that $\kappa > 1$, false negatives are given higher cost than false positives, and vice versa whtn $\kappa < 1$. For $\kappa = 1$, the scalarized error metric is the same as the overall error rate.

[1] Future editions will include.

Optimal Classifiers
Classifier Errors
Multiobjective Optimization Problems
Continuous Orders
Matrix Transpose
Vectors as Matrices
Multivariate Functions
Real Matrices
Real Inner Products
Real Norms
Linear Equations
Image
Optimization Problems
Linear Functions
Real Vectors
Space Inner Product
Space Vectors
Plane Vector Sums and Differences
Multidimensional Space
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 Multiplication Inverses
Classifiers
Intervals
Real Spaces
Real Products
Predictions
Factorials
Real Sequences
Greatest Lower Bounds
Real Lines
Real Planes
Real Addition Inverses
Square Numbers
Squares
Intervals
Real Intervals
Real Order
Real Sums
Rational Arithmetic
Rational Multiplication Inverses
Integral Lists
Lists
Real Numbers
Rational Order
Rational Sums
Rational Products
Integers
Set Numbers
Rational Numbers
Comparisons
Integer Order
Direct Products
Finite Sets
Orders
Integer Arithmetic
Inverse Elements
Equivalent Sets
Natural Intersection
Natural Equations
Natural Multiplication Identity
Natural Addition Identity
Integer Products
Family Unions and Intersections
Function Inverses
Element Functions
Family Operations
Natural Order
Identity Elements
Arithmetic
Integer Sums
Families
Function Compositions
Function Images
Equations
Operations
Natural Powers
Integer Numbers
Natural Products
Concrete Relations
Functions
Equivalence Relations
Natural Sums
Relations
Recursion Theorems
Peano Axioms
Set Products
Natural Induction
Set Powers
Generalized Set Dualities
Natural Numbers
Set Unions and Intersections
Unordered Triples
Set Dualities
Successor Sets
Intersection of Empty Set
Partitions
Set Symmetric Differences
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
Nouns
Letters
Objects