Why

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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.

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[1]Future editions will include.

Optimal Classifiers

Classifier Errors

Multiobjective Optimization Problems

Combined Orders

Matrix Transpose

Matrices Vectors as Matrices Multivariate Functions

Real Matrices Real Inner Product

Linear Equations Vectors Real Norm

Optimization Problems Linear Functions Real Vector

N-Dimensional Space Space Vector Plane Vector Sums and Differences Plane Norm Plane Inner Product

Extended Real Numbers Real Functions Distance Plane Vectors

Arrays Optimizers Real Limits Absolute Value Space Distance Plane Distance Right Triangle Sides Relation

Interval Length Real Squares

Classifiers Real Arithmetic Square Numbers

Predictors Factorials Real Sequences Greatest Lower Bounds Real Line Real Plane Real Additive Inverse Real Multiplicative Inverse Real Products Squares

Lists Sequences Real Summation Real Order Real Sums Rational Arithmetic Rational Multiplicative Inverse Integral Line Geometry

Set Numbers Comparisons Orders Fields Real Numbers Rational Order Rational Sum Rational Products

Direct Products Finite Sets Integer Order Rings Rational Numbers

Equivalent Sets Inverse Elements Natural Summation Natural Multiplication Identity Natural Additive Identity Integer Products

Family Unions and Intersections Function Inverses Element Functions Family Operations Natural Order Identity Elements Arithmetic Integer Sums

Families Function Images Function Composites Equations Operations Integer Numbers Natural Powers Natural Products

Converse Relations Functions Equivalence Relations Natural Sums

Relations Peano Axioms Recursion Theorem

Natural Induction

Set Products Generalized Set Dualities Set Powers Natural Numbers

Set Unions and Intersections Partition Intersection of Empty Set Set Dualities Unordered Triples Successor Sets Set Symmetric Differences

Ordered Pairs Set Intersections Pair Unions Set Complements

Pair Intersections Set Unions Set Differences

Unordered Pairs Empty Set

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Identities Sets

Names

Letters Objects

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