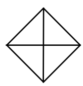


Why

How should we compare two classifiers?

Definitions

Let $a^1, \dots, a^n$ in A be a dataset of inputs and $b^1, \dots, b^n$ in B be a dataset of labels. Let $G : A \to B$ be a classifier.

For each $i = 1, \dots, n$, the classifier associates a prediction $G(a^i)$ with a_i The prediction $G(a^i)$ is *correct* if $G^(a^i) = b^i$ and *incorrect* (*wrong*, *error*) if $G(a^i) \neq b^i$. The *error rate* is the proportion of the dataset for which the classifier's prediction is an error. In other words, $1/n \left|\{i \mid G(a^i) \neq b^i\}\right|$.

Given two classifiers, we may be interested in the one with a lower error rate. Or given that these two are the results of different inductors applied on a shared dataset, we can use a different separate dataset to *validate* these.

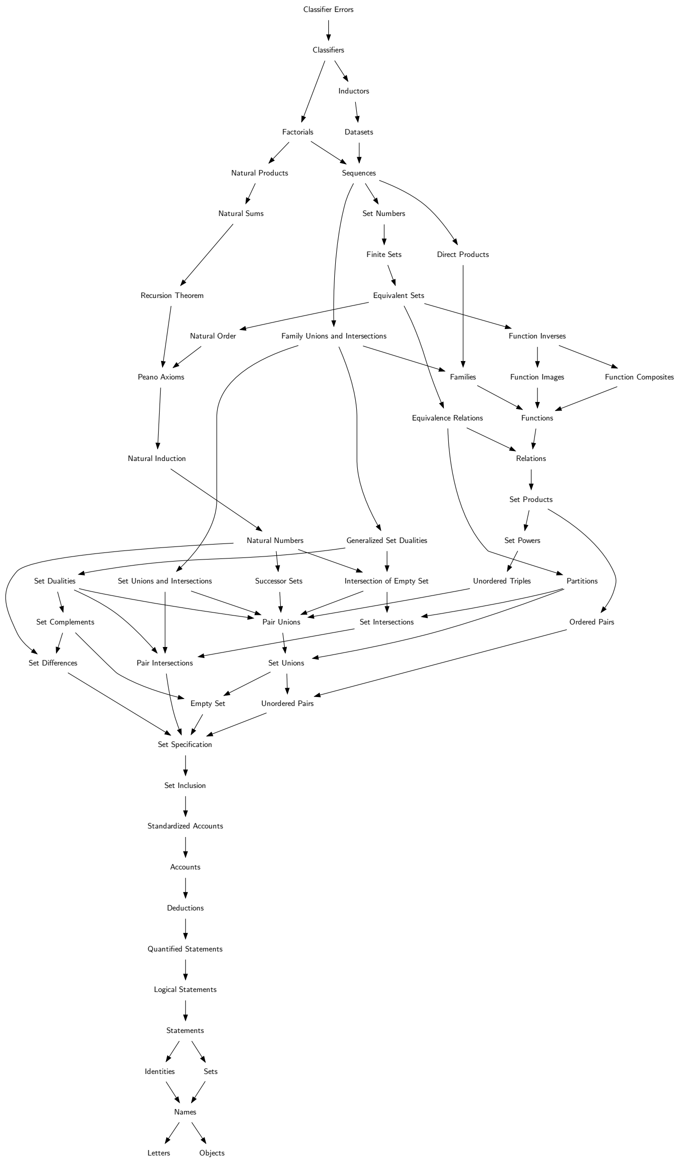
Boolean case

In the case that $B = \{-1, 1\}$, we call the class -1 *negative* and the class $+1$ positive. Similarly, we call an example (a^i, b^i) a *negative example* if $b^i = -1$ and a *positive example* if $b^i = 1$.

We call the result of G on a^i a *true positive* if $b^i = 1$ and $G(a^i) = 1$, a *true negative* if $b^i = -1$ and $G(b^i) = -1$, a *false negative* (or *type II error*, read "type two error") if $b^i = 1$ and $G(a^i) = -1$ and a *false positive* (or *type I error*, read "type one error") if $b^i = -1$ and $G(a^i) = 1$.

The *false positive rate* (*false negative rate*) of a classifier on a dataset is the proportion of dataset elements for which it predicts a *false positive* (*false negative*).

The *true positive rate* (or *sensitivity*, *recall*) of the classifier G on the dataset is the proportion of positive examples which G labels positive. The *true negative rate* (or *specificity*) is the proportion of negative examples which G labels negative. On the other hand, the *false alarm rate* is the proportion of negative examples which G (incorrectly) labels positive. The *precision* of G is the proportion of all examples which the classifier labels *positive* whose label is positive.


Classifier Errors
Classifiers
Inductors
Factorials
Datasets
Natural Products
Sequences
Natural Sums
Set Numbers
Finite Sets
Direct Products
Recursion Theorem
Equivalent Sets
Natural Order
Family Unions and Intersections
Function Inverses
Peano Axioms
Families
Function Images
Function Composites
Equivalence Relations
Functions
Natural Induction
Relations
Set Products
Natural Numbers
Generalized Set Dualities
Set Powers
Set Dualities
Set Unions and Intersections
Successor Sets
Intersection of Empty Set
Unordered Triples
Partitions
Set Complements
Pair Unions
Set Intersections
Ordered Pairs
Set Differences
Pair Intersections
Set Unions
Empty Set
Unordered Pairs
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects