Why

We want to summarize the (label, prediction) pairs for a particular classifier on a particular dataset in a two-dimensional table, or matrix.

Definition

Let A be a nonempty set and $B = \{-1, 1\}$. For a dataset $(a^1, b^i), \ldots, (a^n, b^n)$ in $A \times B$, and classifier $G : A \to B$, the *confusion matrix* C is defined

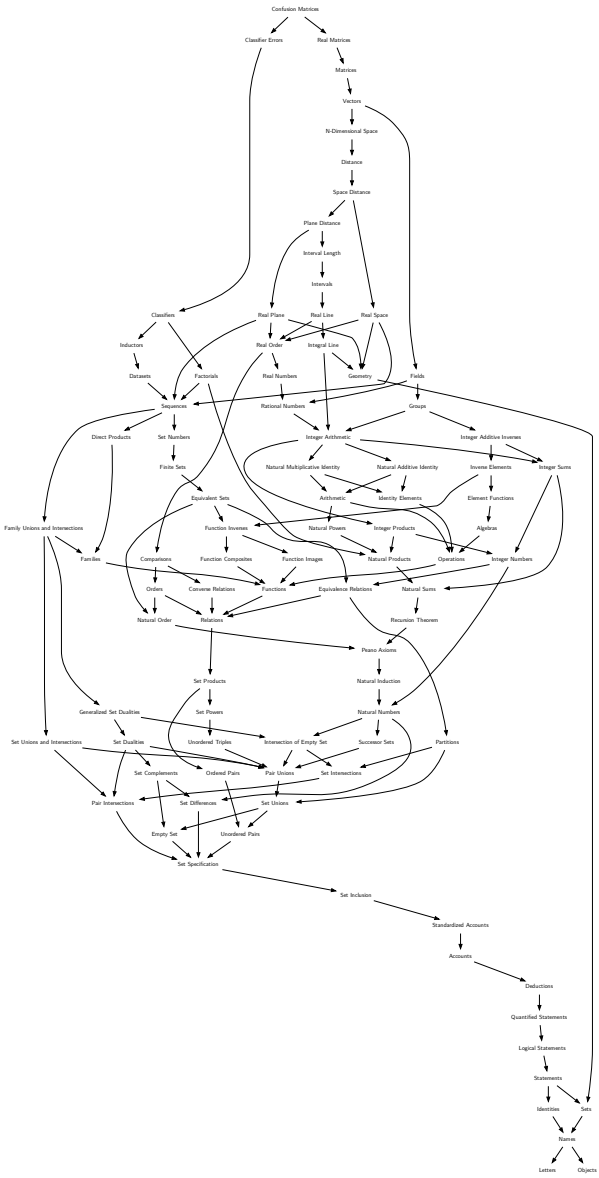
$$C = \begin{bmatrix} \#\text{ true negatives} & \#\text{ false negatives} \\ \#\text{ false positives} & \#\text{ true positives} \end{bmatrix} = \begin{bmatrix} C_{\text{tn}} & C_{\text{fn}} \\ C_{\text{fp}} & C_{\text{tp}} \end{bmatrix}.$$

Using this notation, $C_{\text{tn}} + C_{\text{fn}} + C_{\text{fp}} + C_{\text{tp}} = n$. $N_{\text{n}} := C_{\text{tn}} + C_{\text{fp}}$ is the number of negative examples. $N_{\text{p}} := C_{\text{fn}} + C_{\text{tp}}$ is the number of positive examples.

The diagonal elements of the confusion matrix give the numbers of correct predictions. The off-diagonal entries give the numbers of incorrect predictions for the two types of errors (see Classifier Errors).

In this notation, the false positive rate is C_{fp}/n, the false negative rate is C_{fn}/n and the error rate is the sum of these, $(C_{\text{fn}} + C_{\text{fp}})/n$.

The true positive rate is $C_{\text{tp}}/(C_{\text{fn}} + C_{\text{tp}})$. The true negative rate is $C_{\text{tn}}/(C_{\text{tn}} + C_{\text{fp}})$. The false alarm rate is $C_{\text{fp}}/(C_{\text{tn}} + C_{\text{fp}})$. The precision is $C_{\text{tp}}/C_{\text{tp}} + C_{\text{fp}}$


Confusion Matrices
Classifier Errors
Real Matrices
Matrices
Vectors
N-Dimensional Space
Distance
Space Distance
Plane Distance
Interval Length
Intervals
Classifiers
Real Plane
Real Line
Real Space
Induction
Real Order
Integral Line
Datasets
Factorials
Real Numbers
Geometry
Fields
Sequences
Rational Numbers
Groups
Direct Products
Set Numbers
Integer Arithmetic
Integer Additive Inverses
Finite Sets
Natural Multiplicative Identity
Natural Additive Identity
Inverse Elements
Integer Sums
Equivalent Sets
Arithmetic
Identity Elements
Element Functions
Family Unions and Intersections
Function Inverses
Natural Powers
Integer Products
Algebras
Families
Comparisons
Function Compositions
Function Images
Natural Products
Operations
Integer Numbers
Orders
Converse Relations
Functions
Equivalence Relations
Natural Sums
Natural Order
Relations
Recursion Theorem
Peano Axioms
Set Products
Natural Induction
Generalized Set Dualities
Set Powers
Natural Numbers
Set Unions and Intersections
Set Dualities
Unordered Triples
Intersection of Empty Set
Successor Sets
Partitions
Set Complements
Ordered Pairs
Pair Unions
Set Intersections
Pair Intersections
Set Differences
Set Unions
Empty Set
Unordered Pairs
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects