Why

We can summarize the (label, prediction) pairs for a particular classifier on a particular dataset in a matrix.

Boolean case

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

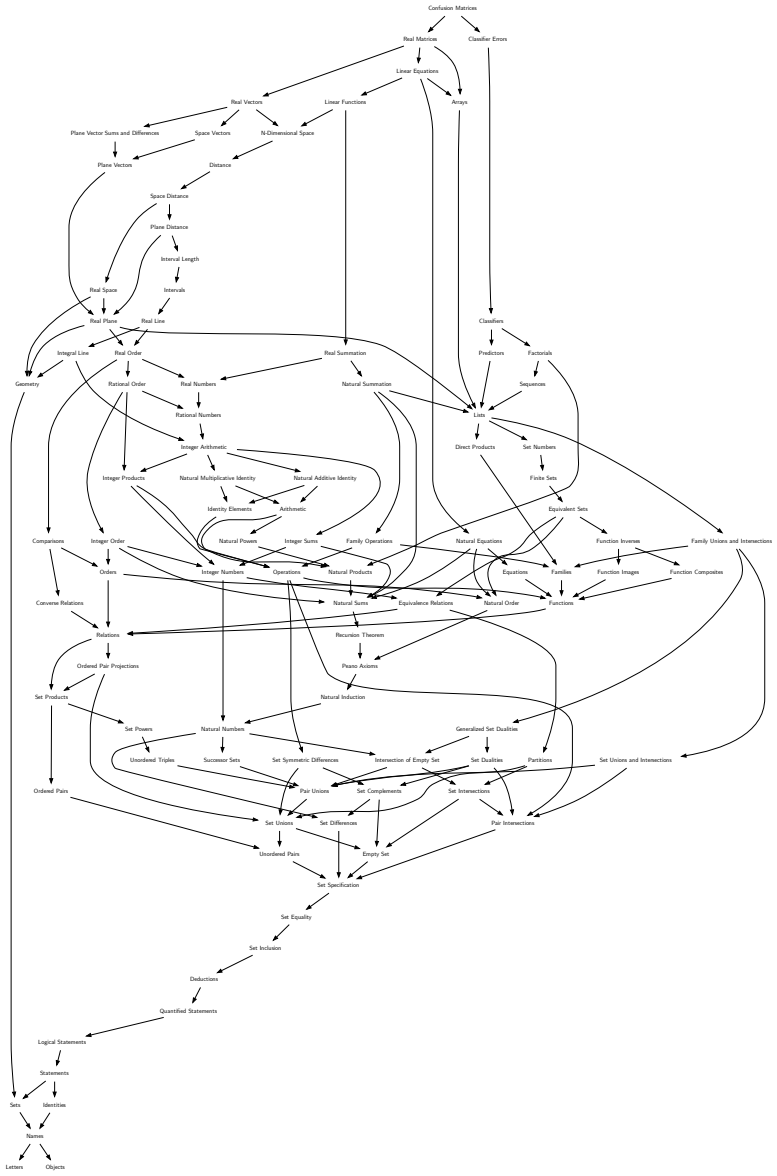
$$C = \begin{bmatrix} \#\text{ true negatives} & \#\text{ false negatives} \\ \#\text{ false positives} & \#\text{ true positives} \end{bmatrix} = \begin{bmatrix} C_{\text{tn}} & C_{\text{fn}} \\ C_{\text{fp}} & C_{\text{tp}} \end{bmatrix}.$$

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
Real Matrices
Classifier Errors
Linear Equations
Real Vectors
Linear Functions
Arrays
Plane Vector Sums and Differences
Space Vectors
N-Dimensional Space
Plane Vectors
Distance
Space Distance
Plane Distance
Interval Length
Real Space
Intervals
Real Plane
Real Line
Classifiers
Predictors
Factorials
Integral Line
Real Order
Real Summation
Geometry
Rational Order
Real Numbers
Natural Summation
Sequences
Rational Numbers
Lists
Integer Arithmetic
Direct Products
Set Numbers
Integer Products
Natural Multiplicative Identity
Natural Additive Identity
Finite Sets
Identity Elements
Arithmetic
Equivalent Sets
Comparisons
Integer Order
Natural Powers
Integer Sums
Family Operations
Natural Equations
Function Inverses
Family Unions and Intersections
Orders
Integer Numbers
Operations
Natural Products
Equations
Families
Function Images
Function Composites
Converse Relations
Natural Sums
Equivalence Relations
Natural Order
Functions
Relations
Recursion Theorem
Ordered Pair Projections
Peano Axioms
Set Products
Natural Induction
Set Powers
Natural Numbers
Generalized Set Dualities
Unordered Triples
Successor Sets
Set Symmetric Differences
Intersection of Empty Set
Set Dualities
Partitions
Set Unions and Intersections
Ordered Pairs
Pair Unions
Set Complements
Set Intersections
Set Unions
Set Differences
Pair Intersections
Unordered Pairs
Empty Set
Set Specification
Set Equality
Set Inclusion
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects