Why

We often want to predict one of several outcomes.

Definition

A *classifer* is a predictor whose codomain is a finite set. In this case, we call the codomain the *label set* and we call its elements *classes* (or *labels*, *categories*). We call the *prediction* of a classifier on an input a *classification*.

If the set of labels has two elements, then we call the classifier a *binary classifier* (or *two-way classifier*, *two-class classifier*, *boolean classifier*). In the case that there are k labels, we call the classifier a *k-way classifier* (or *k-class classifier*, *multi-class classifier*). The second term is meant to indicate, not that the classifier assigns to each point several classes, but that the classification decision is made *between* several classes.

Basic examples

Let A be a set of inputs and let B be a set of labels. Define $B = \{0, 1\}$ (or $\{-1, 1\}$, FALSE, TRUE, NEGATIVE, POSITIVE). Then B is finite with two elements and $f : A \to B$ is a binary classifier with labels 0 and 1.

If the case $B = \{$NO, MAYBE, YES$\}$, we call $f : A \to B$ a three-way classifier. Other examples for B include a list of languages, the set of English words in some dictionary, or the set of $m!$ possible orders of m horses in a race.

When dealing with a finite set of k arbitrary objects, it is often convenient to take associate the objects with the first k positive integers and take the set $B = \{1, \ldots, k\}$ as the set of labels; here $k \in \mathbf{N}$.

Other terminology

Following our terminology, but speaking of processes, some authors refer to the application of inductors for these special cases as *binary classifi-*

cation and *multi-class classification.* Or they speak of *classification* and *classification problems.* Roughly speaking, a classifier *classifies* all inputs into categories.

Alternatively, some authors (especially in the statistics literature) refer to a classifier as a *discriminator* and reference *discrimination problems.*

Classifiers

Factorials   Predictors

Size of Direct Product   Sequences

Number of Set Products   Finite Set Examples   Lists

Natural Products   Number of Disjoint Unions   Direct Products

Natural Sums   Set Numbers

Finite Sets

Recursion Theorem   Equivalent Sets

Natural Order   Function Inverses   Family Unions and Intersections

Peano Axioms   Function Images   Function Composites   Families

Equivalence Relations   Functions

Natural Induction   Relations

Ordered Pair Projections

Set Products

Natural Numbers   Set Powers   Generalized Set Dualities

Set Partitions   Intersection of Empty Set   Successor Sets   Unordered Triples   Set Unions and Intersections   Set Dualities

Set Intersections   Pair Unions   Ordered Pairs   Set Complements   Pair Intersections

Set Unions   Set Differences

Empty Set   Unordered Pairs

Set Specification

Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Identities   Sets

Names

Letters   Objects