

CLASSIFIERS

Why

We name a predictor whose set of outputs is finite.

Definition

A classifer is a predictor whose codomain is a finite set. In this case, we call the outputs classes (or labels, categories, label set). 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 Example

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

If the case $B = \{\text{No}, \text{Maybe}, \text{Yes}\}$, 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. Often convenient to take $B = \{1, \ldots, k\}$ for $k \in \mathbb{N}$.

Other terminology

Following our terminology, but speaking of processes, some authors refer to the application of inductors for these special cases as bi- $nary\ classification\ and\ multi-class\ classification.$ Or they speak of $classification\ and\ a\ classification\ problems.$ 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.

