



Why

We want to talk about learning associations between objects in time or space.

Definition

Let A and B be sets. An *inductor* is a function mapping a dataset of paired records in $A \times B$ to a function from A to B .

We call the elements of A the *inputs* and the elements of B the *outputs*. We call a function from the inputs to the outputs a *predictor*. We call the result of an input under a predictor a *prediction*.

Using this language, an inductor maps datasets to predictors. A predictor maps precepts to postcepts.

Notation

Let D be a dataset of size n in $A \times B$. Let $g : A \rightarrow B$, a predictor, which makes prediction $g(a)$ on precept $a \in A$. Let $f : (A \times B)^n \rightarrow (A \rightarrow B)$, an inductor. Then $f(D)$ is the predictor which the inductor associates with dataset D .

Other terminology

Many authorities call the inputs the *independent variables*, *explanatory variables*, *precepts*, *covariates*, *patterns* or *observations*. Similarly, some call the outputs the *dependent variables*, *postcepts*, *targets*, *outcomes* or *observational outcomes*.

Some call a predictor an *input-output* mapping, a *point predictor*,¹, *prediction rule*, *hypothesis*, or *classifier*. Some authors refer to a prediction as a *guess*.

Other authors refer to the set of inputs A as the *domain set* and elements of A as *instances*. Likewise, some authors refer to the argument to the inductor as the *training data*, *training set*,² or *training examples*.

Learning algorithms

We use a predictor to make guesses on precepts which do not appear in the dataset that was used to construct the predictor. We refer to the task of proposing a predictor for a particular dataset a *learning problem*.

It is common in this context to refer to an inductor as a *learning algorithm* and call the task or problem of constructing a predictor from a dataset *supervised learning*. By supervision, we mean to indicate that we have the outputs corresponding to the inputs.

In line with this usage, the outputs are often called *labels* and the labels are said “to provide supervision.” In this context, the dataset used to construct the predictor (i.e., the argument to the inductor) is called the *training dataset*.

¹Future editions may remove this. The intuition for the word point is from the real numbers, which is not a prerequisite sheet.

²The use of the word “set” is rough, since we are really speaking of a sequence.

