



# Empirical Distribution

## 1 Why

A natural distribution to associate with a dataset is to assign probabilities which are the proportions.

## 2 Definition

The *empirical distribution* of a dataset is to assign probabilities to outcomes in accordance to their proportions of appearance in the dataset. The proportions are nonnegative and sum to one, so this definition yields in a probability distribution.

### 2.1 Notation

Let  $(a^1, \dots, a^n)$  be a data set in  $A$ . Let  $q : A \rightarrow \mathbf{R}$  be defined by

$$q(a) = \frac{1}{n} |\{k \in \{1, \dots, n\} \mid a^k = a\}|$$

Then  $q$  is the empirical distribution of  $(a^1, \dots, a^n)$ .