



# Distribution Expectation

## 1 Why

Suppose we are going to make a bunch of measurements. We associate to each element of a finite set a number. If the measurements we make are divided into proportions according to a distribution, if we make all the measurements and then average the results what do we expect to get.

## 2 Definition

Consider a distribution  $p$  and a real-valued function  $f$ . The *distribution expectation* of  $f$  under  $p$  is the sum of the product of the results of  $p$  and  $f$  on the elements of the set.

### 2.1 Notation

Let  $A$  a finite set. Let  $R$  denote the set of real numbers. Let  $p : A \rightarrow R$ . Let  $f : A \rightarrow R$ . The expectation of  $f$  under  $p$  is

$$\sum_{a \in A} p(a)f(a).$$