



## Maximum Likelihood

### 1 Why

We provide a principle for distribution selection based on maximizing the probability of the dataset.

### 2 Definition

We have a set of outcomes  $A$  and a dataset  $(a^1, \dots, a^n)$ . We want a distribution  $p : A \rightarrow \mathbf{R}$ . We define  $\bar{p} : A^n \rightarrow \mathbf{R}$  by  $\bar{p}(a^1, \dots, a^n) = \prod_{i=1}^n p(a^i)$ .

The *principle of maximum likelihood* says to solve:

**find**    $p$ , a distribution  
**to maximize**    $\bar{p}(a^1, \dots, a^n)$