Marginal Distributions

1 Why

2 Definition

We associate with a distribution over a product of n sets n **marginal distributions**,

2.1 Notation

Let $A_1, \dots, A_n$ be non-empty finite sets. Let $A = \prod_{i=1}^{n} A_i$ Let $p : A \to \mathsf{R}$ be a distribution. For $i = 1, \dots, n$, define $p_i : A_i \to \mathsf{R}$ by

$$p_i(b) = \sum_{a_i = b} p(a).$$

for each $b \in A_i$. Then p_i is the ith marginal of p.

Similarly, for $i, j = 1, \dots, n$ and $i \neq j$ define $p_{ij} : A_i \times A_j \to \mathsf{R}$ by

$$p_{ij}(b, c) = \sum_{a_i = b, a_j = c} p(a)$$

for every $b \in A_i$ and $c \in A_j$. Then p_{ij} is the marginal over i and j.