



Distribution Approximators

1 Why

We have a distribution to approximate. It is, for some reason, unsuitable to our needs and we want to replace it with one more suitable.

2 Definition

A *distribution approximator* is an approximator of a probability distribution. It is also a distribution. The criterion of approximation is any similarity function on distributions over the same space..

3 Notation

Let A be a non-empty set and $q : A \rightarrow \mathbf{R}$ be a distribution. Let $p : A \rightarrow \mathbf{R}$ be a distribution. Then $p : A \rightarrow \mathbf{R}$ is a distribution approximator of q .

4 Reasons for approximation

Infeasible to represent. If there are many outcomes, many numbers are required to specify the distribution. If $p : A^n \rightarrow \mathbf{R}$ where $|A| = k$, then there are k^n outcomes; take, for example, $k = 2$ and $n = 100$. So we might want to find a distribution which requires fewer numbers to

express. In other words, we want a different distribution, selected from the set of those which is easier to express, which is close to the original.

Unreasonable from common sense. The distribution may be unreasonable as a result of our common sense. For example, it may give zero probability to an outcome which we know to be possible, and would like to model with non-zero probability. This may happen when working with an empirical distribution: a particular outcome does not appear in the dataset, however, our common sense suggests is possible. In this case, we want to find a different distribution, selected from the set of those which is more reasonable based on common sense, which is close to the original.