



# Relative Entropy

## 1 Why

## 2 Definition

Consider two distributions on the same finite set. The **relative entropy** of the first distribution **relative** to the second distribution is the difference of the cross entropy of the first distribution relative to the second and the entropy of the second distribution.

### 2.1 Notation

Let  $R$  denote the set of real numbers. Let  $A$  be a finite set. Let  $p : A \rightarrow R$  and  $q : A \rightarrow R$  be distributions. Let  $H(q, p)$  denote the cross entropy of  $p$  relative to  $q$  and let  $H(q)$  denote the entropy of  $q$ . The relative entropy of  $p$  relative to  $q$  is

$$H(q, p) - H(q).$$