

Proposition 2.18 The mutual information between a random variable X and itself is equal to the entropy of X , i.e., $I(X; X) = H(X)$.

Proof

$$\begin{aligned} I(X; X) &= E \log \frac{p(X, X)}{p(X)p(X)} \\ &= E \log \frac{p(X)}{p(X)p(X)} \\ &= -E \log p(X) \\ &= H(X). \end{aligned}$$

Remark The entropy of X is sometimes called the *self-information* of X .