

Proposition 2.19

$$I(X; Y) = H(X) - H(X|Y),$$

$$I(X; Y) = H(Y) - H(Y|X),$$

and

$$I(X; Y) = H(X) + H(Y) - H(X, Y),$$

provided that all the entropies and conditional entropies are finite. ([Exercise](#))

Remark

$$I(X; Y) = H(X) + H(Y) - H(X, Y)$$

is analogous to

$$\mu(A \cap B) = \mu(A) + \mu(B) - \mu(A \cup B),$$

where μ is a set-additive function and A and B are sets.