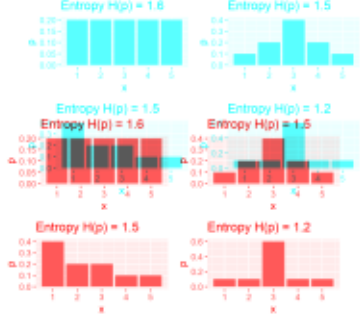
Introduction to Machine Learning

Information Theory

Joint Entropy and Mutual Information I



Learning goals

- Know the joint entropy
- Know conditional entropy as remaining uncertainty
- Know mutual information as the amount of information of an RV obtained by another

JOINT AND CONDITIONAL ENTROPY

The following relations hold:

$$H(X, X) = H(X)$$
$$H(X|X) = 0$$
$$H((X, Y)|Z) = H(X|Z) + H(Y|(X, Z))$$

Which can all be trivially derived from the previous considerations.

Furthermore, if $H(X|Y) = 0$ and X, Y are discrete RV, then X is a function of Y, so for all y with $p(y) > 0$, there is only one x with $p(x, y) > 0$. Proof is not hard, but also not completely trivial.