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function MI=bitsTransmittted(N)
%% X is input bit, Y is output bit
%% The probability of not being transmitted correctly
p=N/196;
%% P(X=0)=1/2
%% P(Y=0|X=0)=1-p
%% P(Y=1|X=0)=p

%% P(X=1)=1/2
%% P(Y=0|X=1)=p
%% P(Y=1|X=1)=1-p

%% P(X,Y)=P(X)P(Y|X);
%% probability table
%%      Y=0    Y=1
pxy = [(1-p)/2  p/2      %X=0
        p/2    (1-p)/2]; %X=1
%% H(X) and H(Y)

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$$H(X) = - \sum_{x \in \mathcal{X}} p(x) \log p(x)$$

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px = sum(pxy, 2);
py = sum(pxy, 1);
hx = -sum(px .* log2(px + 1e-10));
hy = -sum(py .* log2(py + 1e-10));
%% joint entropy H(X,Y)

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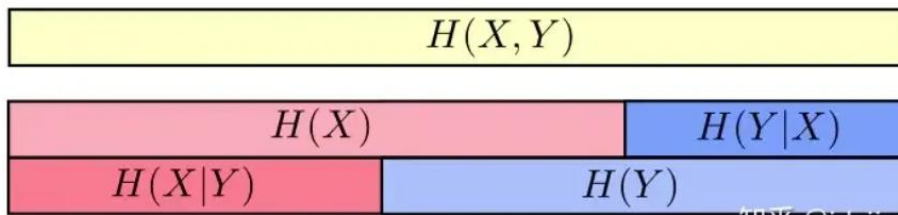
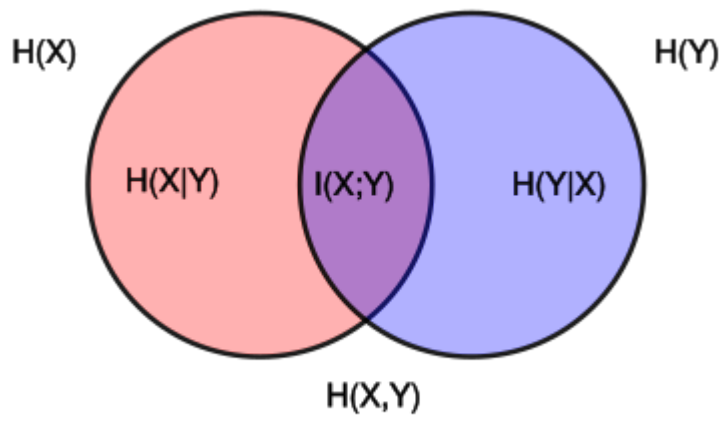
$$H(X, Y) = - \sum_{x \in \mathcal{X}} \sum_{y \in \mathcal{Y}} P(x, y) \log_2 P(x, y)$$

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hxy = -sum(pxy(:) .* log2(pxy(:) + 1e-10));
%% I(X;Y) = H(X) + H(Y) - H(X,Y)
MI = 196 * (hx + hy -hxy);% H(X)+H(Y)-H(X,Y)
%% Conditional entropy

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$$H(Y|X) = - \sum_{x \in \mathcal{X}, y \in \mathcal{Y}} p(x, y) \log \frac{p(x, y)}{p(x)}$$



熵的关系图

知乎 @idejie