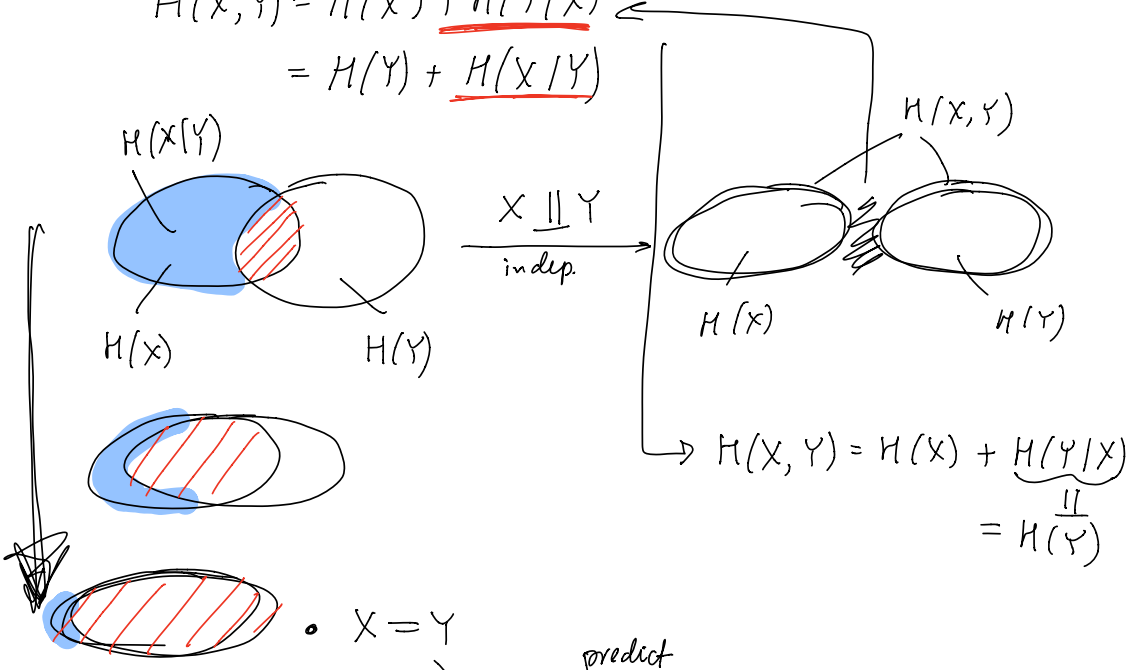
$$H(X,Y) = H(X) + H(Y|X)$$
$$= H(Y) + H(X|Y)$$



- $X = Y$

$$H(X|Y) = H(X|X) = 0.$$

(predict; determ.)

- $X = f(Y)$

determ. function

$$H(X|Y) = 0.$$

Knowledge.

$$H(X|Y) \leq H(X)$$

Cond. reduces entropy.

$$H(X,Y) = -\mathbb{E}_{p(x,y)}[\log p(x,y)]$$

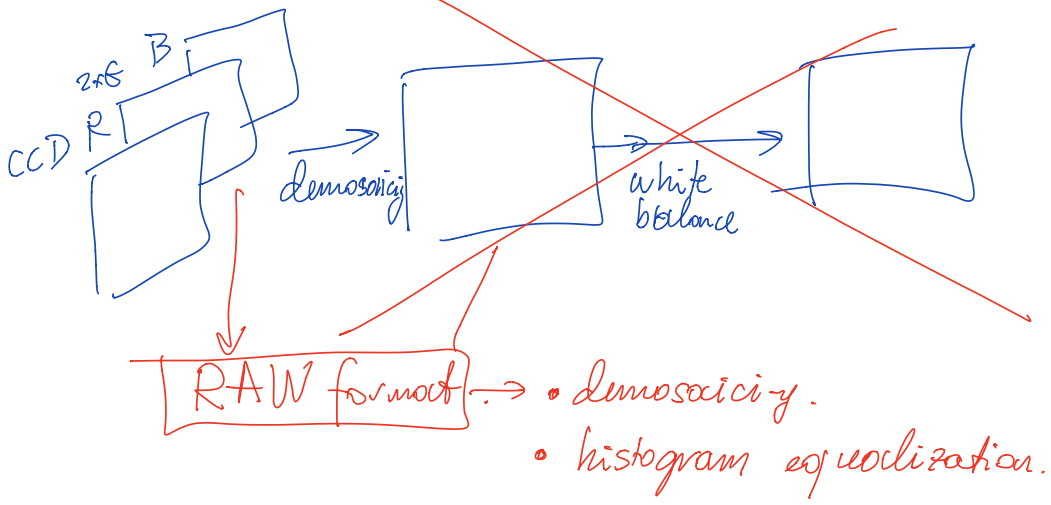
chain rule

$$p(x,y) = p(x)\cdot p(y|x)$$
$$= p(y)\cdot p(x|y).$$

$$\log(a\cdot b) = \log a + \log b$$

$$\log p(x,y) = \log p(x) + \log p(y|x)$$
$$= \log p(y) + \log p(x|y).$$

$$= -\underbrace{\mathbb{E}_{p(x,y)}[\log p(x)]}_{H(X)} - \underbrace{\mathbb{E}_{p(x,y)}[\log p(y|x)]}_{+\ H(Y|X)}.\ \square$$



- demosaicing.
- histogram equalization.