

Logaritmin laskusääntöjä.

$$\log_2(x) = \log_{10}(x) / \log_{10}(2) = \ln(x) / \ln(2)$$

$$\log_2(x^n) = n \log_2(x),$$

$$\log_2(ab) = \log_2(a) + \log_2(b),$$

$$\log_2(a/b) = \log_2(a) - \log_2(b)$$

Entropiaan liittyviä käsitteitä.

$$H := - \sum_i p_i \log_2(p_i).$$

$$H(X|Y = b_j)$$

$$= - \sum_{a_i} P(X = a_i | Y = b_j) \log_2(P(X = a_i | Y = b_j)).$$

$$H(X|Y) = E[H(X|Y = b_j)]$$

$$= \sum_{b_j} P(Y = b_j) H(X|Y = b_j)$$

$$= \sum_{a_i, b_j} P(X = a_i, Y = b_j) \log_2 \left(\frac{1}{P(X = a_i | Y = b_j)} \right)$$

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

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

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

Dekompositio-ominaisuus:

$$H(X) = H(P(A_1), \dots, P(A_k)) + \sum_j H(\mathcal{A}_j).$$

Todarin peruskaavoja.

$$P(A) = \sum_{B \in \mathcal{F}_2} P(A, B).$$

$$P(A|B) = \frac{P(A, B)}{P(B)}.$$

$$P(A, B) = P(A|B)P(B).$$

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}.$$

$$P(A|B, I) = \frac{P(B|A, I)P(A|I)}{P(B|I)}.$$

Kullback-Leibler.

$$D_{KL}(P||Q) := \sum_{x \in \Omega} P(x) \log_2 \left(\frac{P(x)}{Q(x)} \right).$$

$$I(X; Y) = D_{KL}(P(x, y) || P(x)P(y)),$$

Gibbsin epäyhtälö:

$$D_{KL}(P(x, y) || P(x)P(y)) = \sum_x P(x) \log \left(\frac{P(x)}{Q(x)} \right) \geq 0.$$

Kooditeoria.

$$\sum_{x \in S_\delta} P(x) \geq 1 - \delta.$$

$$H_\delta(X) := \log_2(|S_\delta|).$$

$$L(c, X) = E[\ell] = \sum_j p(a_i) \ell(a_i).$$

$$\sum_{x \in \Omega_X} 2^{-\ell(c(x))} \leq 1.$$

Sekalaisia.

$$\binom{N}{k} = \frac{N!}{k!(N-k)!}$$