VJEROJATNOSTI U KOMUNIKACIJSKOM SUSTAVU

$\sum_{i=1}^{n} p(x_i) = \sum_{j=1}^{m} p(y_j) = 1$

$p(x_i) = \sum_{j=1}^{m} p(x_i, y_j)$

$p(y_j) = \sum_{i=1}^{n} p(x_i, y_j)$

$p(x_i, y_j) = p(x_i)p(y_j|x_i) = p(y_j)p(x_i|y_j)$

$p(x_i|y_j) = \frac{p(x_i, y_j)}{p(y_j)} = \frac{p(x_i, y_j)}{\sum_{i=1}^{n} p(x_i, y_j)} = \frac{p(x_i)p(y_j|x_i)}{\sum_{i=1}^{n} p(x_i)(y_j|x_i)}$

$$[p(x_i, y_i)] = \begin{bmatrix} p(x_1, y_1) & p(x_1, y_2) & \dots & p(x_1, y_m) \\ p(x_2, y_1) & p(x_2, y_2) & \dots & p(x_2, y_m) \\ \dots & \dots & \dots & \dots \\ p(x_n, y_1) & p(x_n, y_2) & \dots & p(x_n, y_m) \end{bmatrix} \begin{matrix} \}\sum = p(x_1) \\ \}\sum = p(x_2) \\ \\ \}\sum = p(x_n) \end{matrix}$$

$\underbrace{\quad}\sum = p(y_1) \quad \underbrace{\quad}\sum = p(y_2) \quad \underbrace{\quad}\sum = p(y_m)$

ENTROPIJA

$X = \{x_1, x_2, \dots x_i, \dots, x_n\}$

$Y = \{y_1, y_2, \dots y_j, \dots, y_m\}$

Svojstva entropije:

    1. $H(X) \geq 0$
    2. $H(X) = 0 \Leftrightarrow \exists i \mid p(x_i) = 1$
    3. $H(X)_{max} = \log n, p(x_i) = \frac{1}{n}$
    4. $H(XY) = H(X) + H(Y)$

Entropija na ulazu sustava:
$H(X) = -\sum_{i=1}^{n} p(x_i) \log_2 p(x_i) \quad [bit/simbol]$

Entropija na izlazu sustava:
$H(Y) = -\sum_{j=1}^{m} p(y_j) \log_2 p(y_j) \quad [bit/simbol]$

Združena entropija ili entropija para slučajnih varijabli:
$H(X, Y) = -\sum_{i=1}^{n} \sum_{j=1}^{m} p(x_i, y_j) \log_2 p(x_i, y_j)$

Entropija šuma, irelevantnost:
$H(Y|X) = -\sum_{i=1}^{n} \sum_{j=1}^{m} p(x_i, y_j) \log_2 p(y_j|x_i)$

Ekvivokacija, mnogoznačnost:
$H(X|Y) = -\sum_{i=1}^{n} \sum_{j=1}^{m} p(x_i, y_j) \log_2 p(x_i|y_j)$
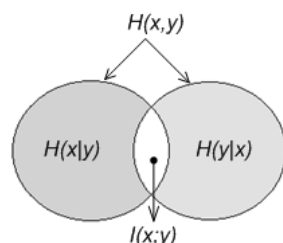
$H(X, Y) = H(X) + H(Y|X)$

TRANSINFORMACIJA
Srednji uzajamni sadržaj informacije, transinformacija:

$I(X;Y) = \sum_{i=1}^{n} \sum_{j=1}^{m} p(x_i, y_j) \log_2 \frac{p(x_i, y_j)}{p(x_i)p(y_j)}$

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

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

$I(X;Y) = I(Y;X)$
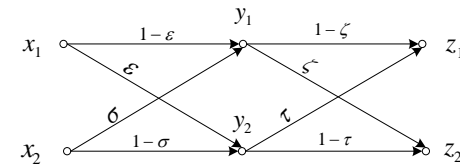

KAPACITET DISKRETNOG KOMUNIKACIJSKOG KANALA

$C = \max_{\{p(x_i)\}} I(X;Y) \quad [bit/simbol]$

RELATIVNA ENTROPIJA

$D(p||q) = \sum_{i=1}^{n} p(x_i) \log_2 \frac{p(x_i)}{q(x_i)}$

$D(p||q) \neq D(q||p)$

KASKADIRANJE KANALA

$[p(z)] = [p(y)] * [p(z|y)] = [p(x)] * [p(z|x)]$

PROSJEČNA DULJINA KODNE RIJEČI

$L = \sum_{i=1}^{n} p(x_i)l(x_i) \quad [bit/simbol]$

$L \geq H(X)$

efikasnost koda: $\varepsilon = \frac{H(X)}{L(X)}$

KRAFTOVA NEJEDNAKOST

$\sum_{i=1}^{n} d^{-l_i} \leq 1, \quad d = 2,3, \dots$

HUFFMANOVO KODIRANJE

$B = baza, \quad N = br. simbola$

$B \neq 2$

$k = \lceil \frac{N-1}{B-1}$

$N' = (B-1) \cdot k + 1$

ako $N \neq N'$ dodajemo $(N' - N)$ simbola

ARITMETIČKO KODIRANJE

$D' = D + (G - D) \cdot D_S$

$G' = D + (G - D) \cdot G_S$

TRAJANJE I BRZINA GENERIRANJA SIMBOLA

$T_s = \sum_{i=1}^{n} t_i + t_s \ [s/simbol]$

$R = \frac{H(X)}{T_s}$