VJEROJATNOSTI U KOMUNIKACIJSKOM SUSTAVU

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

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

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

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

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

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

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:

$H(X) = -\sum_{i=1}^{n} p(x_i) \log_2 p(x_i)$ $[bit/simbol]$

Entropija na izlazu sustava:

$H(Y) = -\sum_{j=1}^{m} p(y_j) \log_2 p(y_j)$ $[bit/simbol]$

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

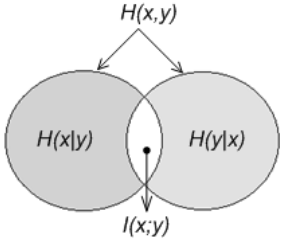
Srednji uzajamni sadržaj informacije, transinformacija:

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

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

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

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



KAPACITET DISKRETNOG KOMUNIKACIJSKOG KANALA

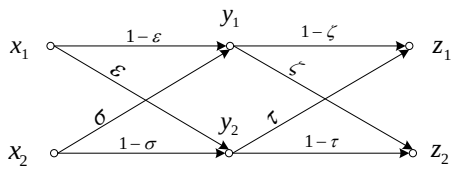
$C = \max_{\{p(x_i)\}} I(X;Y)$ $[bit/simbol]$

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

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

$L \geq H(X)$

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

KRAFTOVA NEJEDNAKOST

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

HUFFMANOVO KODIRANJE

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

$B \neq 2$

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

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

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

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

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