Infocode Előadás

Emlékeztető:

$x \in (x_1, \dots, x_N)$

IT forrás — $p(x)$

$c(x)$

$\ell(x) = \dim(x)$

$$H(x) = \sum_x p(x)\, \mathrm{ld}\frac{1}{p(x)}$$

$$L(x) = \sum_x p(x)\, \ell(x)$$

$$\boxed{L(x) \geq H(x)}$$

unitmetikai

entrópia alapú

SFE
SF
HUFFMAN

példák

$L(x) \leq H(x) + 2$

$L(x) \leq H(x) + 1$

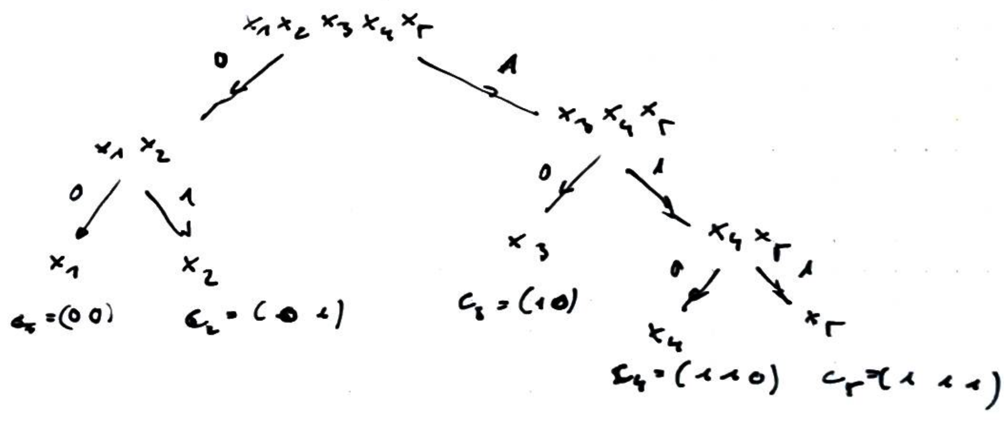
Számválasztó alapú

- ~~adaptív~~
  adaptív - ... kódolók
- PCA

(1.) $\underline{p} = (0.25 \quad 0.25 \quad 0.25 \quad 0.125 \quad 0.125)$ SF táblázat

a) entrópia? $H(x) = \sum_x p(x)\, \mathrm{ld}\frac{1}{p(x)} = 2.25$

SF | 1. sorrendbe a valószínűséget (nagyon)



$L(x) = \sum_x p(x)\, \ell(x) = \dots = 2.25$

HUFFMAN

$p_1 = 0.25$
$p_2 = 0.25$
$p_3 = 0.25$
$p_4 = 0.125$
$p_5 = 0.125$

$p_1 = 0.25$
$p_2 = 0.25$
$p_3 = 0.25$
$p_{45} = 0.25$

$p_{345} = 0.5$
$p_1 = 0.25$
$p_2 = 0.25$

$p_{345} = 0.5$
$p_{12} = 0.5$

$p_{12345} = 1$

c_{12} 0 $\quad c_1$ 0 0
c_{345} 1 $\quad c_2$ 0 1
c_{345} 1

c_{12} 0	c_1 00	c_1 00	c_1 00	2	
c_{345} 1	c_2 01	c_2 01	c_2 01	2	$L(x) = 2.25$
	c_{345} 1	c_3 10	c_3 10	2	
		c_{45} 11	c_4 110	3	
			c_5 111	3	

x	$p(x)$	$F(a) = \sum p(x)$	$\bar{F}(a) = F(a) + \frac{1}{2}p(x)$	$\lceil ld \frac{1}{p(x)} \rceil + 1$	$c(x)$
x_1	0.25	0	0.125	3	001
x_2	0.25	0.25	0.375	3	011
x_3	0.25	0.5	0.625	3	101
x_4	0.125	0.75	0.8125	4	1101
x_5	0.125	0.875	0.9375	4	1111

<u>példa 2</u>

1 | 0 | 11 | 01 | 010 | 00 | 10 | ...

(0001) (0000) (0011) (0101) (1000)

(0100) (0010) ...... (111)

dekódolás

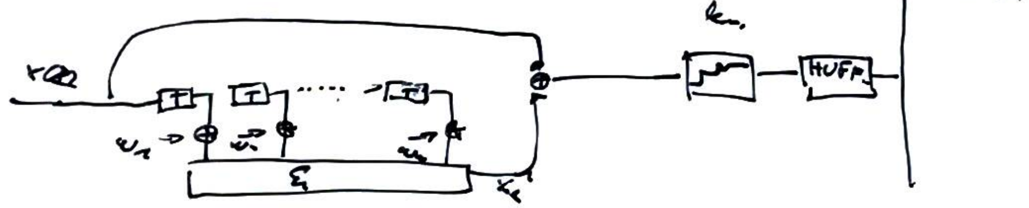
[illegible]	n	szótár	bejegyz.
	0		
⟨0, 1⟩	1	001	1
⟨0, 0⟩	2	010	0
⟨1, 1⟩	3	011	10
⟨2, 1⟩	4	100	01
⟨4, 0⟩	5	101	010
⟨2, 0⟩	6	110	00
⟨1, 0⟩	7	111	10

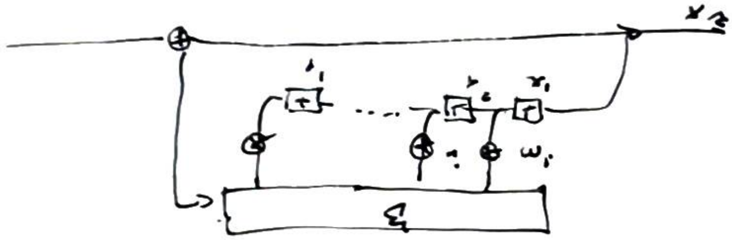
$\lceil \log_2 (7+1) \rceil = 3$

Adaptív - prediktív

$x_t \quad \hat{x}_t = \sum_{i=1}^{j} w_i \cdot x_{t-i} \quad e_n = x_t - \hat{x}_t$ → Hatékonyabb ~~[illegible]~~ reprezentáció

kódoló





$$w_{opt} = \min_{\underline{w}} E\{x_k^2\} = \min_{\underline{w}} E\{(x_k - \ldots)^2\}$$

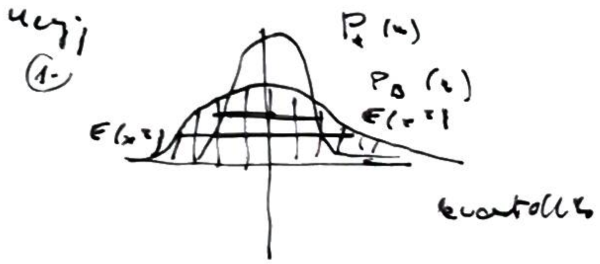
$$\Downarrow$$

$R(\varepsilon)$ kv. fv.

$$\underline{\underline{R}} : R_{i,j} = E\{x_{k-i}, x_{k-j}\}$$

$$r_1, \ldots, r_L - E\{x_k, x_{k-L}\}$$

$$\underline{\underline{R}}\,\underline{w_{opt}} = \underline{r}$$



$$E\{\varepsilon_k^2\} = E\{x_k^2\} - w_{opt}^T \underline{\underline{R}}\, w_{opt}$$

$$E\{\varepsilon_k^2\} << E\{x_k\}$$

$$H(\varepsilon) << H(x)$$

$$\Downarrow$$

$$L(\varepsilon) << H(x)$$

$R(\varepsilon)$ kv. fv. Általános: $64\ \frac{bit}{1} \rightarrow 1.2\ \frac{bit}{1}$

(2.) Robinson Módszer, ...

Principal Components Analysis (PCA)

$\underline{x}$ $\underline{\underline{R}} = E\{\underline{x}^T x\}$ $R_{i,j} = E\{x_i, x_j\}$

dim $x = N$

$$\underline{\underline{R}}\,\underline{s_i} = \lambda_i s_i \qquad i = 1, \ldots, N$$

$$\lambda_1 > \lambda_2 > \ldots > \lambda_M > \ldots \lambda_N$$

$$s_1 \quad s_2 \quad \ldots \quad s_M \quad \ldots \quad s_N$$

ortonormált bázis $s_i^T s_j = \delta_{ij}$

$$\underline{x} = \sum_{k=1}^{N} y_i s_i \rightarrow y_i = s_i^T \cdot \underline{x}$$

$$\underline{x} \rightarrow y = (y_1, y_2, \ldots, y_M, \ldots, y_N)$$

PCA

$\hat{\underline{y}} = (y_1, y_2, \ldots, y_M)$

$\hat{\underline{x}} = \sum_{i=1}^{M} \hat{y}_i \, \underline{s}_i$

$E\{\|\underline{x} - \hat{\underline{x}}\|^2\} = \ldots \sum_{i=M+1}^{N} \lambda_i$

Alg: adott $\underline{\underline{R}}$, ε

(1) $\underline{\underline{R}}\, s_i = \lambda_i s_i$

(2) $\lambda_1 > \lambda_2 > \ldots > \lambda_M > \ldots > \lambda_N$

(3) $M: \sum_{i=M+1}^{N} \lambda_i < \varepsilon$

(4) $\underline{\underline{S}} = \begin{pmatrix} s_1^T \\ s_2^T \\ \vdots \\ s_M^T \end{pmatrix}$

Megj: (1) $\underline{\underline{R}}$ ismeretlen!

$z^{(k)} = \{\underline{x}(k), k-1 \ldots 1\}$

U_{PCA} = alg

$\underline{w}(k+1) = w(k) + \alpha\left(\underline{x}(k) - y(k)w(k)\right) y(k)$

$w(k) \to s_1$

Általánosított Hebbi jelenség

(2)