

ĆW (Sieci Hopfielda)

Algorytm sieci Hopfielda

$t = 0, i = 1, \dots, n$

$$x_i(0) = \begin{cases} 0 & \text{z prawdopodobieństwem } \frac{1}{2} \quad (\text{rand}() \% 2 = 0) \\ 1 & \text{z prawdopodobieństwem } \frac{1}{2} \quad (\text{rand}() \% 2 = 1) \end{cases}$$

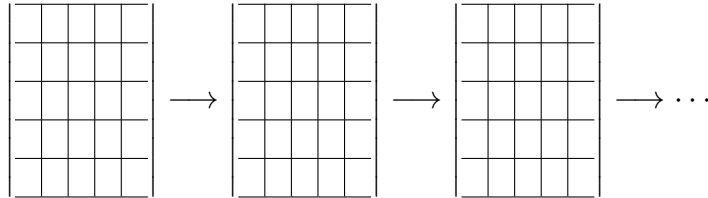
$t = 0, 1, 2, \dots, \quad i = 1, \dots, n$

$$u_i(t) = \left\{ \sum_{j=1}^{25} w_{ij} x_j(t) \right\} - \theta_i$$

$$x_i(t+1) = \begin{cases} 0 & \text{gdy } u_i(t) < 0 \\ x_i(t) & \text{gdy } u_i(t) = 0 \\ 1 & \text{gdy } u_i(t) > 0 \end{cases}$$

Zadanie. Implementować algorytm sieci Hopfielda i wyświetlić $x(t) = (x_1(t), \dots, x_n(t))$ ($t = 0, 1, 2, \dots$).

$$x(0) \longrightarrow x(1) \longrightarrow x(2) \longrightarrow \dots$$



(1) Uruchomić sieć Hopfielda dla poniżej podanych parametrów w_{ij} .

□ = 0.0, ■ = 1.0

$$z = (z_i)_{i=1}^{25} = (z_1, \dots, z_{25}) = \begin{bmatrix} & & & & \\ & \blacksquare & \blacksquare & & \\ & & \blacksquare & & \\ & & & \blacksquare & \\ & & & \blacksquare & \end{bmatrix} \in \mathbb{R}^{25}$$

$$1 \leq i, j \leq 25$$

$$c_{ij} = \begin{cases} (z_i - \frac{1}{2})(z_j - \frac{1}{2}) & \text{gdy } i \neq j \\ 0 & \text{gdy } i = j \end{cases}$$

$$w_{ij} = 2c_{ij}, \quad \theta_i = \sum_{j=1}^{25} c_{ij}$$

(2) Uruchomić sieć Hopfielda dla poniżej podanych parametrów w_{ij} .

□ = 0.0, ■ = 1.0

$$z = (z_i)_{i=1}^{25} = (z_1, \dots, z_{25}) = \begin{bmatrix} & & & & \\ & \blacksquare & \blacksquare & & \\ & & \blacksquare & & \\ & & & \blacksquare & \\ & & & \blacksquare & \end{bmatrix} \in \mathbb{R}^{25}$$

$$1 \leq i, j \leq 25$$

$$c_{ij} = \begin{cases} (z_i - \frac{1}{2})(z_j - \frac{1}{2}) & \text{gdy } i \neq j \\ 0 & \text{gdy } i = j \end{cases}$$

$$z' = (z'_i)_{i=1}^{25} = (z'_1, \dots, z'_{25}) = \begin{bmatrix} & \blacksquare & \blacksquare & \blacksquare & \\ & \blacksquare & & \blacksquare & \\ & \blacksquare & & \blacksquare & \\ & \blacksquare & & \blacksquare & \\ & \blacksquare & \blacksquare & \blacksquare & \end{bmatrix} \in \mathbb{R}^{25}$$

$$1 \leq i, j \leq 25$$

$$d_{ij} = \begin{cases} (z'_i - \frac{1}{2})(z'_j - \frac{1}{2}) & \text{gdy } i \neq j \\ 0 & \text{gdy } i = j \end{cases}$$

$$w_{ij} = 2(c_{ij} + d_{ij}), \quad \theta_i = \sum_{j=1}^{25} (c_{ij} + d_{ij})$$

Notacja. (Propozycja)

$x_i(t) \rightsquigarrow x[i]$, $u_i(t) \rightsquigarrow u[i]$ (Nie prowadzić kroków t !)

$z_i \rightsquigarrow z[i]$, $z'_i \rightsquigarrow z'[i]$

$c_{ij} \rightsquigarrow c[i][j]$, $d_{ij} \rightsquigarrow d[i][j]$

$w_{ij} \rightsquigarrow w[i][j]$, $\theta_i \rightsquigarrow \theta[i]$