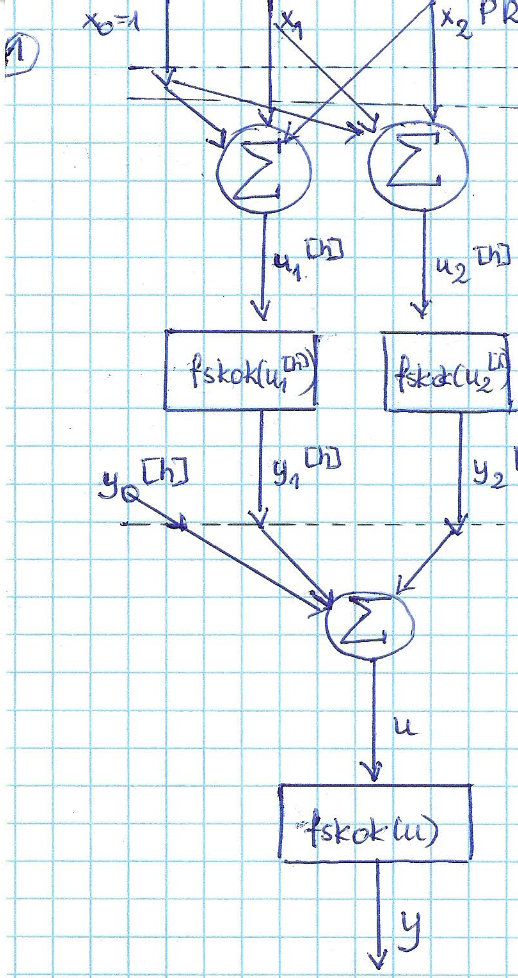
PRZYKŁAD „4"

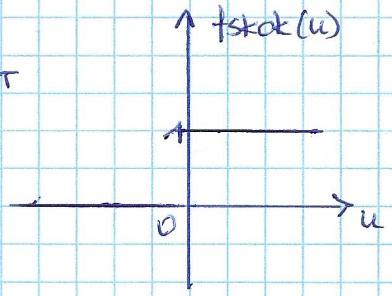
(1)



$\underline{w}_1^{[h]} = [w_{10}^{[h]}, w_{11}^{[h]}, w_{12}^{[h]}]^T$

$\underline{w}_2^{[h]} = [w_{20}^{[h]}, w_{21}^{[h]}, w_{22}^{[h]}]^T$

$\underline{w} = [w_0, w_1, w_2]^T$



(2)

- NE. 1

- Jeżeli $w_{10}^{[h]} \neq 0$, $w_{11}^{[h]} \neq 0$, $w_{12}^{[h]} \neq 0$ to: $w_{10}^{[h]} + w_{11}^{[h]} x_1 + w_{12}^{[h]} x_2 = 0$

$$\Rightarrow x_2 = \frac{-w_{11}^{[h]}}{w_{12}^{[h]}} - \frac{w_{10}^{[h]}}{w_{12}^{[h]}}$$

$x_1 = 0$ to: $w_{10}^{[h]} + w_{12}^{[h]} x_2 = 0 \Rightarrow x_{20(1)} = \frac{-w_{10}^{[h]}}{w_{12}^{[h]}} = -1 \Rightarrow w_{10}^{[h]} = w_{12}^{[h]}$

$x_2 = 0$ to: $w_{10}^{[h]} + w_{11}^{[h]} x_1 = 0 \Rightarrow x_{10(1)} = \frac{-w_{10}^{[h]}}{w_{11}^{[h]}} = -1 \Rightarrow w_{10}^{[h]} = w_{11}^{[h]}$

Obiekty, dla których $y_1^{[h]} = 1$ są POD linią decyzyjną (1) stąd: $w_{12}^{[h]} < 0$:

$$\left.\begin{aligned} w_{12}^{[h]} &= w_{1du}^{[h]} \\ w_{10}^{[h]} &= w_{1du}^{[h]} \\ w_{11}^{[h]} &= w_{1du}^{[h]} \end{aligned}\right\} \underline{w}_1^{[h]} = [w_{1du}^{[h]}, w_{1du}^{[h]}, w_{1du}^{[h]}]^T$$

- NE. 2

Jeżeli $w_{20}^{[h]} \neq 0$, $w_{21}^{[h]} \neq 0$, $w_{22}^{[h]} \neq 0$ to: $w_{20}^{[h]} + w_{21}^{[h]} x_1 + w_{22}^{[h]} x_2 = 0 \Rightarrow$

$$x_2 = -\frac{w_{21}^{[h]}}{w_{22}^{[h]}} - \frac{w_{20}^{[h]}}{w_{22}^{[h]}}$$

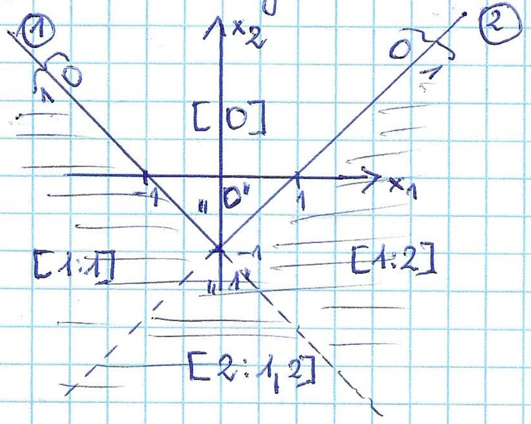
$x_1 = 0$ to: $w_{20}^{[h]} + w_{22}^{[h]} x_2 = 0 \Rightarrow x_{20(2)} = \frac{-w_{20}^{[h]}}{w_{22}^{[h]}} = -1 \Rightarrow w_{20}^{[h]} = w_{22}^{[h]}$

$x_2 = 0$ to: $w_{20}^{[h]} + w_{21}^{[h]} x_1 = 0 \Rightarrow x_{10(2)} = \frac{-w_{20}^{[h]}}{w_{21}^{[h]}} = 1 \Rightarrow w_{21}^{[h]} = -w_{20}^{[h]}$

Obiekty, dla których $y_2^{[h]} = 1$ są pod linią decyzyjną (2) stąd: $w_{22}^{[h]} < 0$:

$$\left.\begin{aligned} w_{22}^{[h]} &= w_{2\,du}^{[h]} \\ w_{20}^{[h]} &= w_2^{[h]}{}_{du} \\ w_{21}^{[h]} &= -w_2^{[h]}{}_{du} \end{aligned}\right\} \underline{w}_2^{[h]} = [w_2^{[h]}{}_{du}, -w_2^{[h]}{}_{du}, w_2^{[h]}{}_{du}]^T$$

• Wyznaczanie wag neuronu w warstwie ukrytej:



Obszar [0]: odp systemu 0:

(1) $w_0 < 0$

Obszar [1]: odp systemu 0:

(2) $w_0 + w_1 < 0$

(3) $w_0 + w_2 < 0$

Obszar [2]: odp systemu 1:

(4) $w_0 + w_1 + w_2 > 0$

•Dodawanie stronami:

$4+(-2)$: $w_0 + w_1 + w_2 - w_0 - w_1 > 0 \Rightarrow w_2 > 0$

$4+(-3)$: $w_0 + w_1 + w_2 - w_0 - w_2 > 0 \Rightarrow w_1 > 0$

$4+(-1)$: nie będzie nam już potrzebne.

$$-(w_1 + w_2) < w_0 < -w_1$$

$$-(w_1 + w_2) < w_0 < -w_2$$

Np: $w_1 = 1, w_2 = 1$ to: $-2 < w_0 < -1$, więc $w_0 \in (-2, -1)$

c)

$\underline{w} = [-1.5, 1, 1]^T$

$\underline{w}_1^{[h]} = [-1, -1, -1]^T$

$\underline{w}_2^{[h]} = [-1, 1, -1]^T$

(2) PRZYKŁAD „6":

- **NE. 1**

Jeżeli $w_{10}^{[h]} \neq 0, w_{11}^{[h]} \neq 0, w_{12}^{[h]} \neq 0$ to: $w_{10}^{[h]} + w_{11}^{[h]} x_1 + w_{12}^{[h]} x_2 = 0 \to x_2 = -\frac{w_{11}^{[h]}}{w_{12}^{[h]}} x_1 - \frac{w_{10}^{[h]}}{w_{12}^{[h]}}$

$$x_1 = 0 \to w_{10}^{[h]} + w_{12}^{[h]} x_2 \Rightarrow x_{20(1)} = \frac{-w_{10}^{[h]}}{w_{12}^{[h]}}$$

$$x_{20(1)} = \frac{-w_{10}^{[h]}}{w_{12}^{[h]}} = 1 \Rightarrow w_{12}^{[h]} = -w_{10}^{[h]}$$

$$x_2 = 0 \to w_{10}^{[h]} + w_{11}^{[h]} x_1 \Rightarrow x_{10(1)} = \frac{-w_{10}^{[h]}}{w_{11}^{[h]}}$$

$$x_{10(1)} = \frac{-w_{10}^{[h]}}{w_{11}^{[h]}} = -1 \Rightarrow w_{10}^{[h]} = w_{11}^{[h]}$$

Obiekty, dla których $y_1^{[h]} = 1$ są POD linią decyzyjną (1) stąd: $w_{12}^{[h]} < 0$:

$$w_{12}^{[h]} = w_{1\,du}^{[h]}$$

$$w_{10}^{[h]} = -w_{1\,du}^{[h]}$$

$$w_{11}^{[h]} = -w_{1\,du}^{[h]}$$

$$\underline{w}_1^{[h]} = [-w_1^{[h]}{}_{du}, -w_1^{[h]}{}_{du}, w_1^{[h]}{}_{du}]^T$$

- **NE. 2:**

Jeżeli $w_{20}^{[h]} \neq 0, w_{21}^{[h]} \neq 0, w_{22}^{[h]} \neq 0$ to: $w_{20}^{[h]} + w_{21}^{[h]} x_1 + w_{22}^{[h]} x_2 = 0 \Rightarrow x_2 = \frac{-w_{21}^{[h]}}{w_{22}^{[h]}} x_1 - \frac{w_{20}^{[h]}}{w_{22}^{[h]}}$

$$x_1 = 0 \text{ stąd: } w_{20}^{[h]} + w_{22}^{[h]} x_2 = 0 \Rightarrow x_{20(2)} = \frac{-w_{20}^{[h]}}{w_{22}^{[h]}}$$

$$x_{20(2)} = \frac{-w_{20}^{[h]}}{w_{22}^{[h]}} = -1 \Rightarrow w_{20}^{[h]} = w_{22}^{[h]}$$

$$x_2 = 0 \text{ stąd: } w_{20}^{[h]} + w_{21}^{[h]} x_1 = 0 \Rightarrow x_{10(2)} = \frac{-w_{20}^{[h]}}{w_{21}^{[h]}}$$

$$x_{10(2)} = \frac{-w_{20}^{[h]}}{w_{21}^{[h]}} = -1 \Rightarrow w_{20}^{[h]} = w_{21}^{[h]}$$

Obiekty, dla których $y_2^{[h]} = 1$ są NAD linią decyzyjną (2) stąd: $w_{22}^{[h]} > 0$:

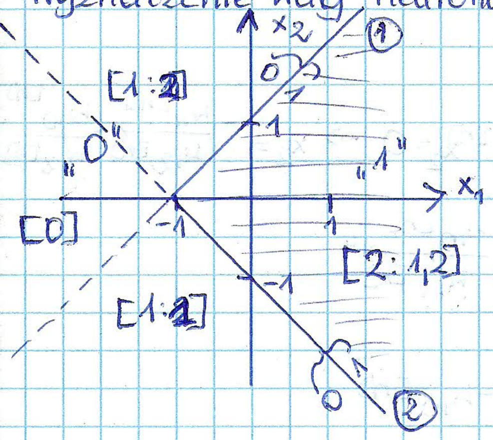
$$w_{22}^{[h]} = w_{2\,dd}^{[h]}$$

$$w_{21}^{[h]} = w_{2\,dd}^{[h]}$$

$$w_{20}^{[h]} = w_{2\,dd}^{[h]}$$

$$\underline{w}_2^{[h]} = [w_2^{[h]}{}_{dd}, w_2^{[h]}{}_{dd}, w_2^{[h]}{}_{dd}]^T$$

• Wyznaczenie wag neuronu w warstwie ukrytej:



Obszar [0] (odp. 0):

1) $w_0 < 0$

Obszary [1] (odp: 0):

2) $w_0 + w_1 < 0$

3) $w_0 + w_2 < 0$

Obszary [2] (odp: 1):

4) $w_0 + w_1 + w_2 > 0$

• Dodawanie stronami:

$4+(-2)$: $w_0 + w_1 + w_2 - w_0 - w_1 > 0 \rightarrow w_2 > 0$

$4+(-3)$: $w_0 + w_1 + w_2 - w_0 - w_2 > 0 \rightarrow w_1 > 0$

$4+(-1)$: nie będzie nam już potrzebne.

•

$$-(w_1 + w_2) < w_0 < -w_1$$

$$-(w_1 + w_2) < w_0 < -w_2$$

Np: $w_1 = 1$, $w_2 = 1$ to:

$$-2 < w_0 < -1 \quad \text{stąd:} \quad w_0 \in (-2, -1)$$

c) Przykładowe wektory wag:

$$\underline{w} = [-1.5, 1, 1]^T$$

$$\underline{w}_1^{[1]} = [1, 1, -1]^T$$

$$\underline{w}_2^{[1]} = [1, 1, 1]^T$$

Opracowano dn. 12/11/17

Osak