# Techniki eksploracji danych

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Section 1

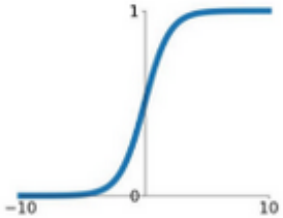
# Sztuczne sieci neuronowe

Subsection 1

# Funkcje aktywacji i ich pochodne

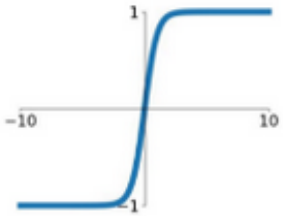
**Sigmoid**

$$\sigma(x) = \frac{1}{1+e^{-x}}$$



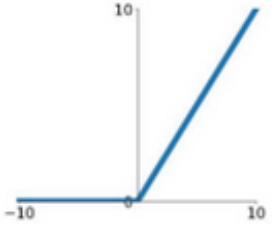

**tanh**

$$\tanh(x)$$



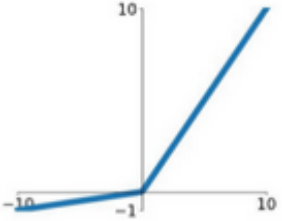

**ReLU**

$$\max(0, x)$$




**Leaky ReLU**

$$\max(0.1x, x)$$

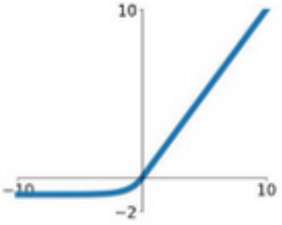



**Maxout**

$$\max(w_1^T x + b_1, w_2^T x + b_2)$$

**ELU**

$$\begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases}$$



- Pochodna $Sigmoid(x)$:

$$\frac{df}{dx} = x(1-x)$$

- Pochodna $Tanh(x)$:

$$\frac{df}{dx} = 1 - tanh(x)^2$$

- Pochodna $ReLu(x)$ (the rectified linear unit):

$$\frac{df}{dx} = \begin{cases} 1 & \text{jeżeli } x > 0 \\ 0 & \text{jeżeli } x \leq 0 \end{cases}$$

Subsection 2

# Funkcje błędu i ich pochodne

- Suma kwadratów reszt:

$$L = f(\boldsymbol{W}) = \frac{1}{2}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2$$

- jej pochodna:

$$\frac{\partial L}{\partial \hat{\boldsymbol{y}}} = \sum_{i=1}^{n} y_i - \hat{y}_i$$

- Entropia krzyżowa:

$$L = f(\boldsymbol{W}) = -\sum_{i=1}^{n}\sum_{j=1}^{k} y_i^{(j)} \log \hat{y}_i^{(j)}$$

- jej pochodna:

$$\frac{\partial L}{\partial \hat{\boldsymbol{y}}} = \sum_{i=1}^{n}\sum_{j=1}^{k} y_i^{(j)} - \hat{y}_i^{(j)}$$

Section 2

# Literatura

- *Friedman, J., Hastie, T., Tibshirani, R. (2001). The elements of statistical learning (Vol. 1, No. 10). New York: Springer series in statistics.*