

# Functions

Maksims.Oļševskis

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## **1 Introduction**

·The sigmoid function(or logistic)

$$\phi(x) = \frac{1}{1+\exp(-x)}.$$

·The hyperbolic tangent function("tanh")

$$\phi(x) = \frac{\exp(x)-\exp(-x)}{\exp(x)+\exp(-x)} = \frac{\exp(2x)-1}{\exp(2x)+1}.$$

·The hard threshold function

$$\phi_{\beta}(x) = 1_{x \geq \beta}.$$

·The Rectified Linear Unit(ReLU) activation function

$$\phi(x) = \max(0, x).$$