Machine Learning

Neural Networks

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Neural Networks

Informal definition: simplified models of the brain

- large number of basic computing units: *neurons*
- connected in a complex network

Neuron

Neuron: function $\mathbf{x} \to \sigma(\langle \mathbf{v}, \mathbf{x} \rangle)$, with $\mathbf{x} \in \mathbb{R}^d$

$\sigma : \mathbb{R} \to \mathbb{R}$ is the *activation function*

Example: $\mathbb{R}^5$

$$\vec{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} \in \mathbb{R}^5$$

$$\vec{v} = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{bmatrix} \in \mathbb{R}^5$$

$\langle \vec{v}, \vec{x} \rangle$

x_1 v_1
x_2 v_2
x_3 v_3
x_4 v_4
x_5 v_5

$\sigma(\langle v, x \rangle)$

NEURON