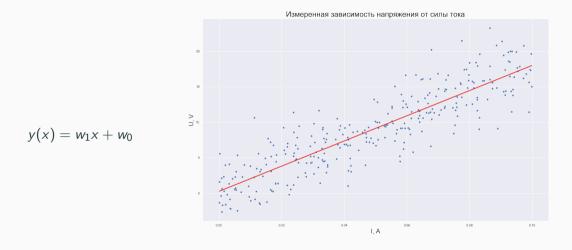
4.

— 27.11.2023



price	lotsize	bedrooms	bathrms	stories	driveway	recroom	fullbase	gashw	airco	garagepl	prefarea
42000.0	5850	3	1	2	yes	no	yes	no	no	1	no
38500.0	4000	2	1	1	yes	no	no	no	no	0	no
49500.0	3060	3	1	1	yes	no	no	no	no	0	no
60500.0	6650	3	1	2	yes	yes	no	no	no	0	no
61000.0	6360	2	1	1	yes	no	no	no	no	0	no

$$m=11 \quad \hat{\mathbf{y}}(\mathbf{x})=\sum_{i=0}^m w_i x_i$$

$$\vec{y} = \begin{pmatrix} y_1 \\ \vdots \\ y_N \end{pmatrix} \quad X = \begin{pmatrix} 1 & x_{11} & \cdots & x_{1m} \\ \vdots & \vdots & \ddots & \vdots \\ 1 & x_{N1} & \cdots & x_{Nm} \end{pmatrix} \quad \vec{w} = \begin{pmatrix} w_0 \\ \vdots \\ w_m \end{pmatrix}$$

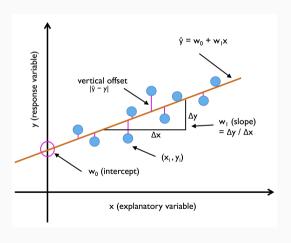
$$\hat{\vec{y}} = X\vec{w}$$

:

$$\mathcal{L}_{MSE}(y, \hat{y}) = rac{1}{N} \sum_{i=1}^{N} (y_i - \hat{y}_i)^2$$
  $ec{w}^* = \operatorname{arg\,min} \mathcal{L}$ 

:

$$\vec{w}^* = (X^T X)^{-1} X^T y$$



$$\vec{w}^* = (X^T X)^{-1} X^T y$$

- , ?
- , ?
- !

$$\vec{w}^* = (X^T X)^{-1} X^T y$$

- ,
- , ?
- ?
- $n = 100, m = 12 \rightarrow N_{ops} = 100^{12} = 10^{24}$

$$\vec{w}^* = (X^T X)^{-1} X^T y$$

- , ?
- , ?
- ?
- $n = 100, m = 12 \rightarrow N_{ops} = 100^{12} = 10^{24}$

4



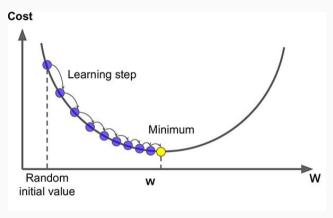
:

$$w_{i,t+1} = w_{i,t} - \alpha \frac{\partial \mathcal{L}_t}{\partial w_i}$$

:

$$\vec{\nabla} \mathcal{L}_t = \left( \frac{\partial \mathcal{L}_t}{\partial w_1}, \frac{\partial \mathcal{L}_t}{\partial w_2}, \cdots \right)$$

$$\vec{w}_{t+1} = \vec{w}_t - \alpha \vec{\nabla} \mathcal{L}_t$$

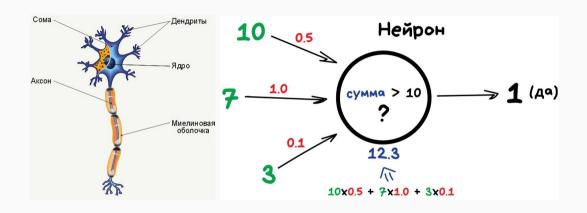


 $\alpha$  — learning rate, ()

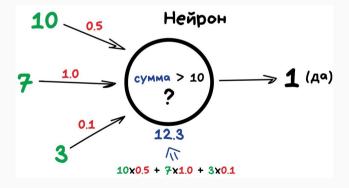


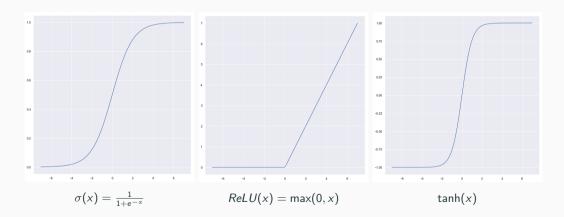


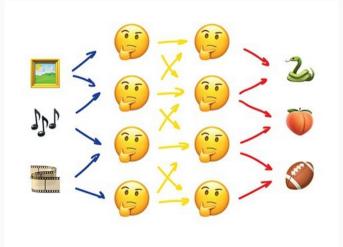


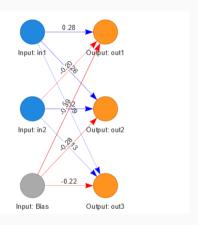


$$: + n_{out} = f(w_0 + \sum_{i=1}^{m} w_i x_i)$$









$$\overrightarrow{out} = \begin{pmatrix} out_1 \\ out_2 \\ out_3 \end{pmatrix} \quad X = \begin{pmatrix} 1 & in1_1 & in2_1 \\ \vdots & \vdots & \vdots \\ 1 & in1_N & in2_N \end{pmatrix}$$

$$W = \begin{pmatrix} b_1 & b_2 & b_3 \\ w_{11} & w_{12} & w_{13} \\ w_{21} & w_{22} & w_{23} \end{pmatrix}$$

$$\widehat{out} = f(XW)$$

