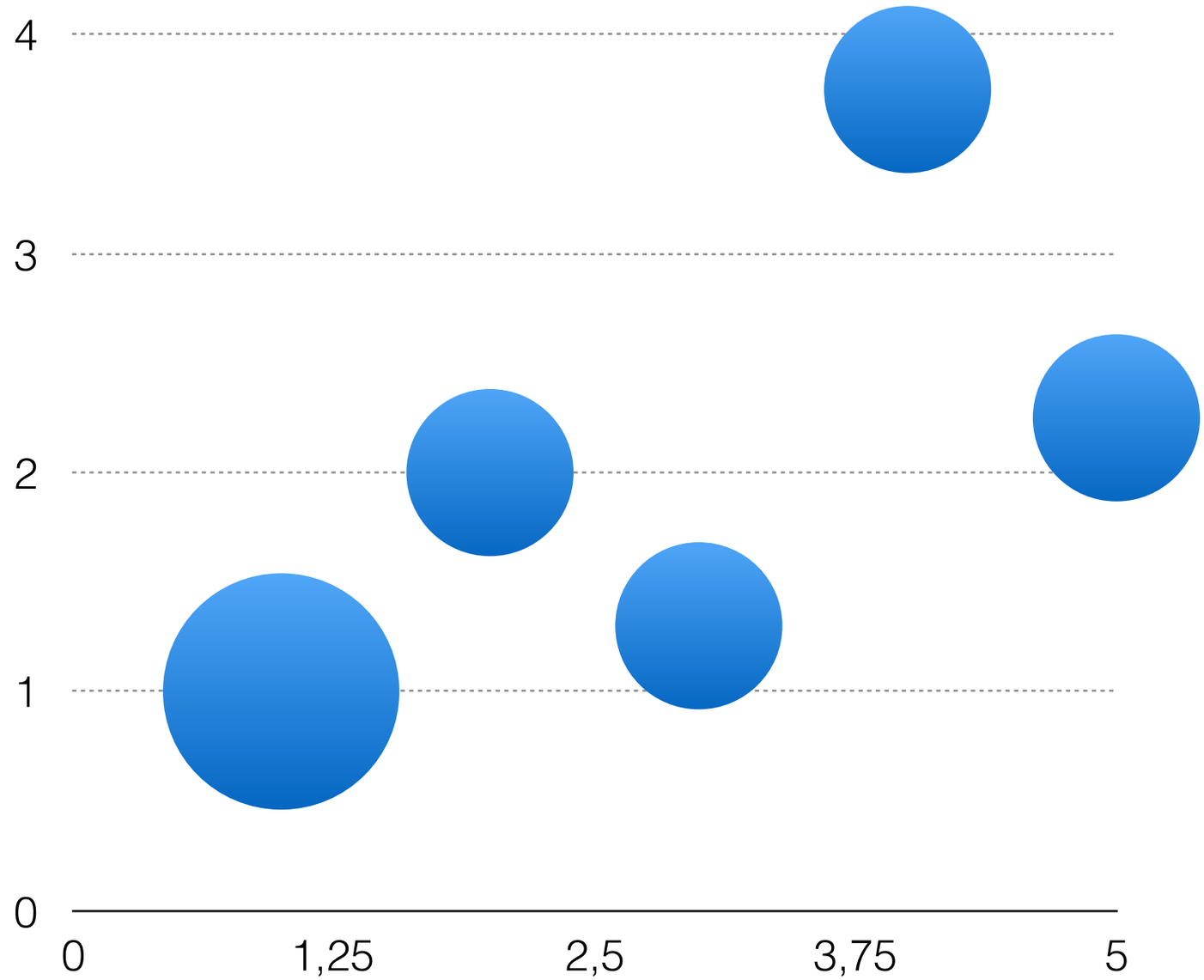
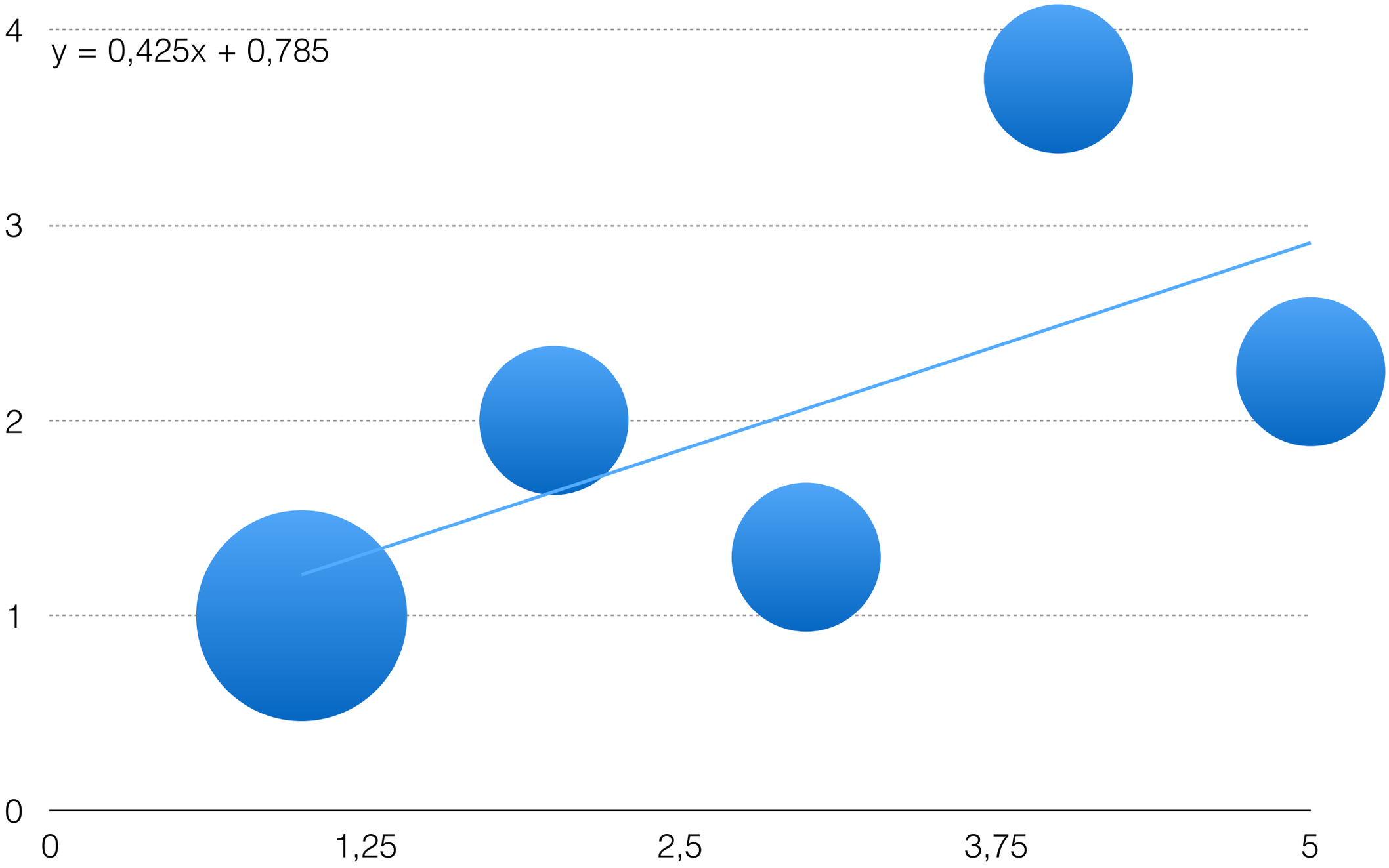
Linear regression

Example

X	Y
1	1
2	2
3	1,3
4	3,75
5	2,25



Example



A scatter plot of the example data. The black line consists of the

predictions, the points are the actual data, and the vertical lines between the points and the black line represent errors of prediction

Example

X	Y	Y'	Y-Y'	$(Y-Y')^2$
1	1	1.21	-0.21	0.044
2	2	1.635	0.365	0.133
3	1.3	2.06	-0.76	0.578
4	3.75	2.485	1.265	1.6
5	2.25	2.91	-0.66	0.436

Formula

$$Y' = bX + A$$

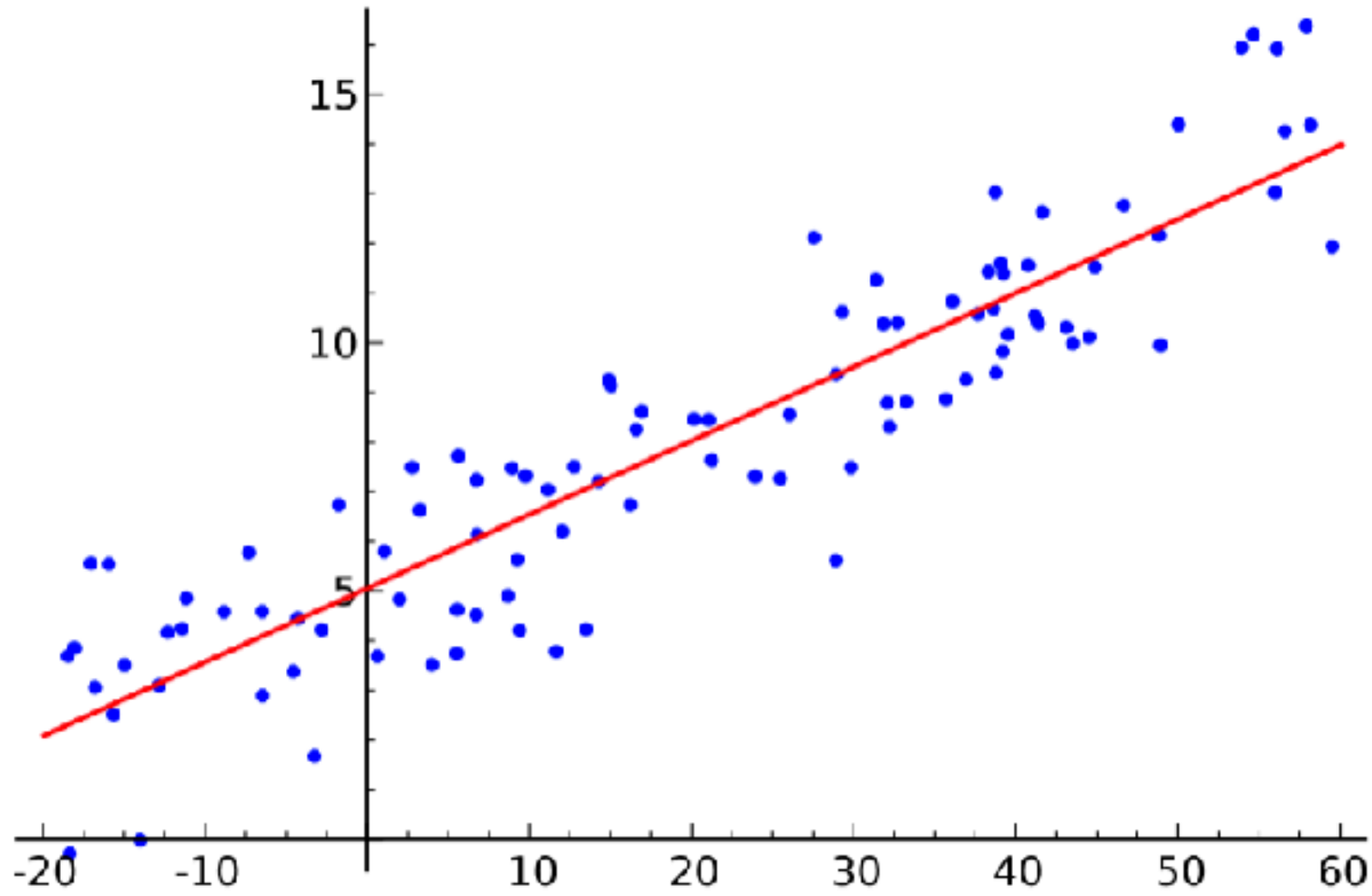
$$Y' = 0.425X + 0.785$$

Least-squares estimation

$$\hat{\boldsymbol{\beta}} = (\mathbf{X}^\top \mathbf{X})^{-1} \mathbf{X}^\top \mathbf{y} = \left(\sum \mathbf{x}_i \mathbf{x}_i^\top \right)^{-1} \left(\sum \mathbf{x}_i y_i \right)$$

$$\mathbf{E}[\, \mathbf{x}_i \varepsilon_i \,] = 0$$

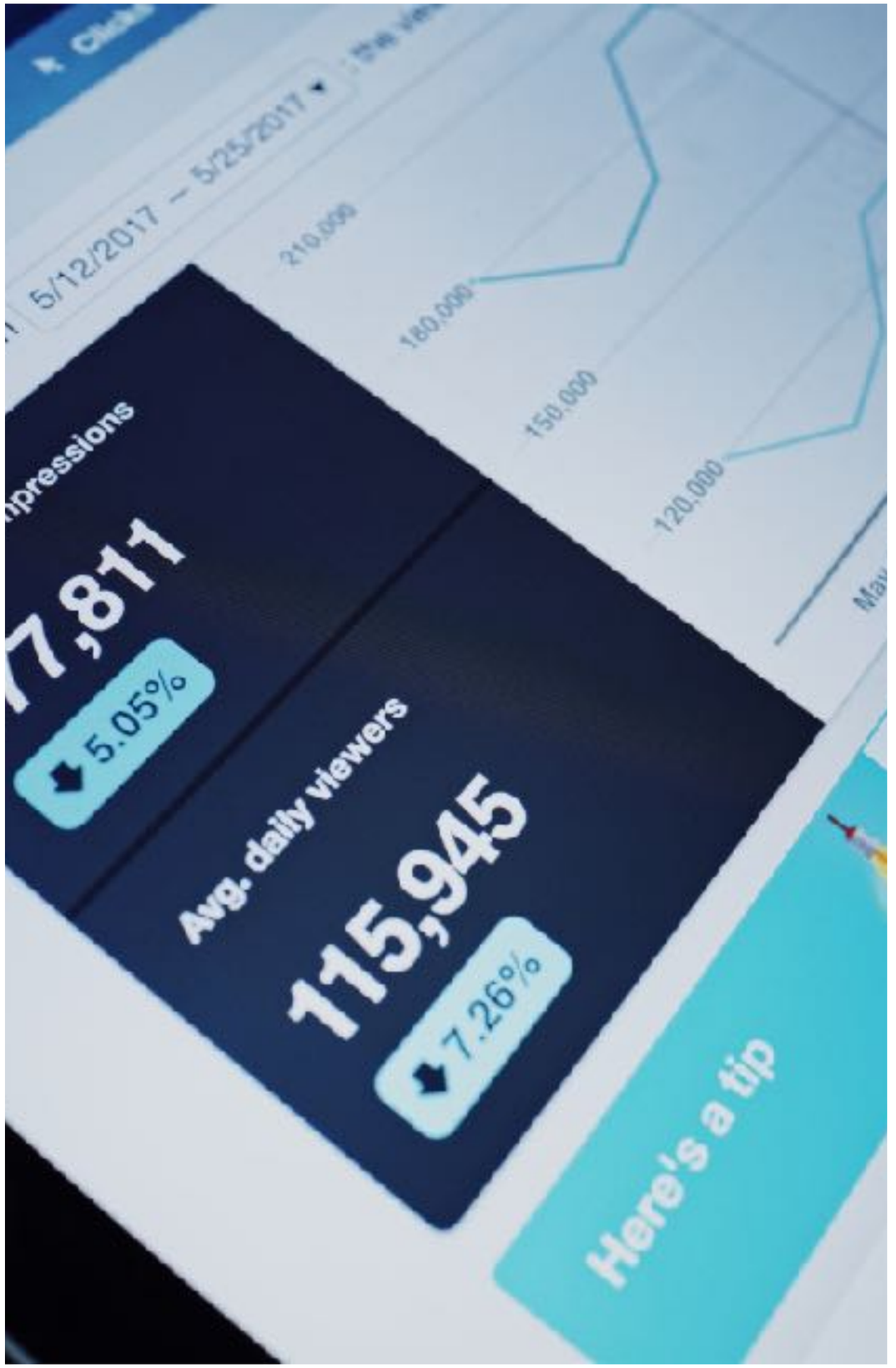
Simple and multiple regression



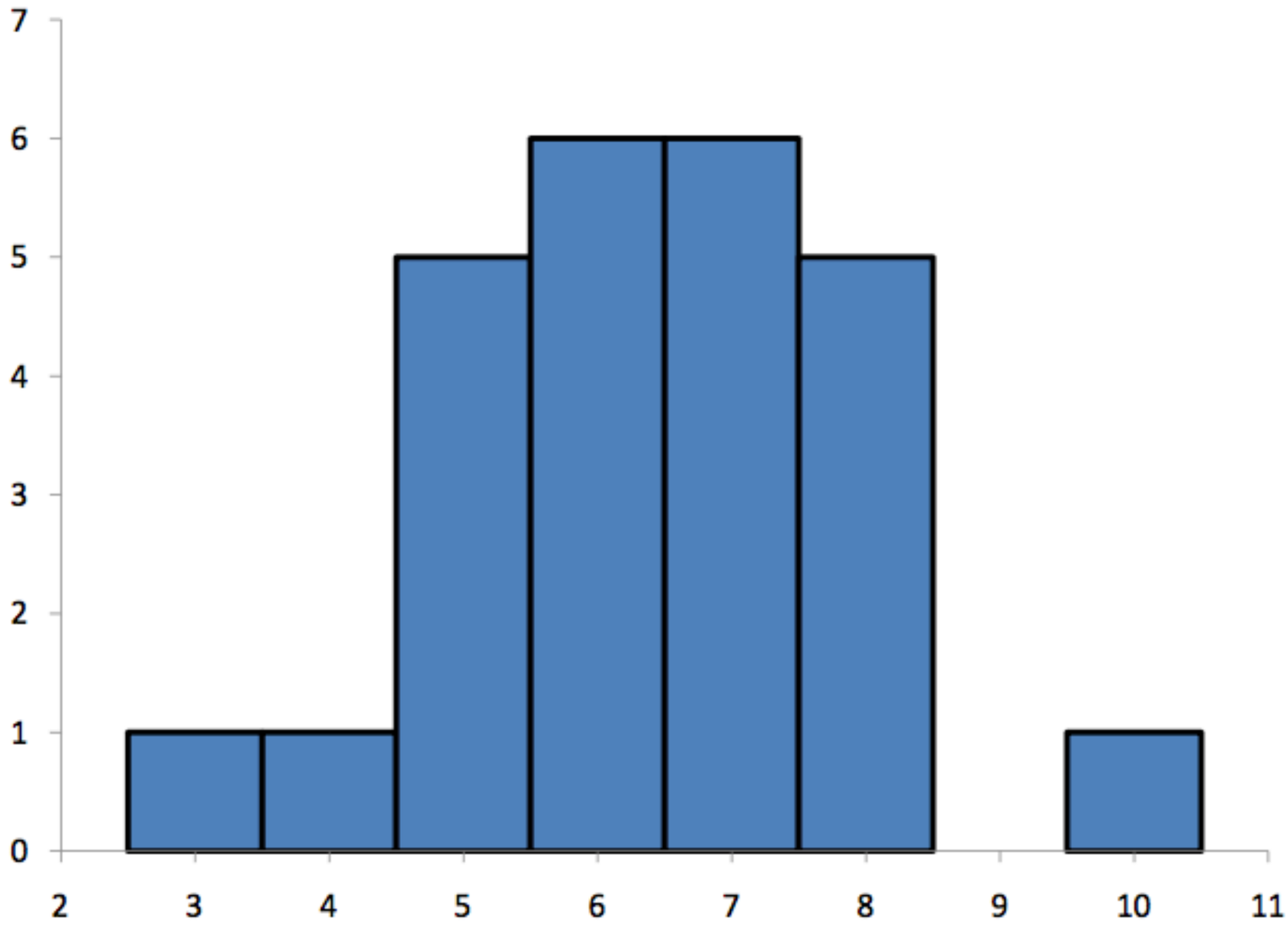
Example of simple linear regression, which has one independent variable

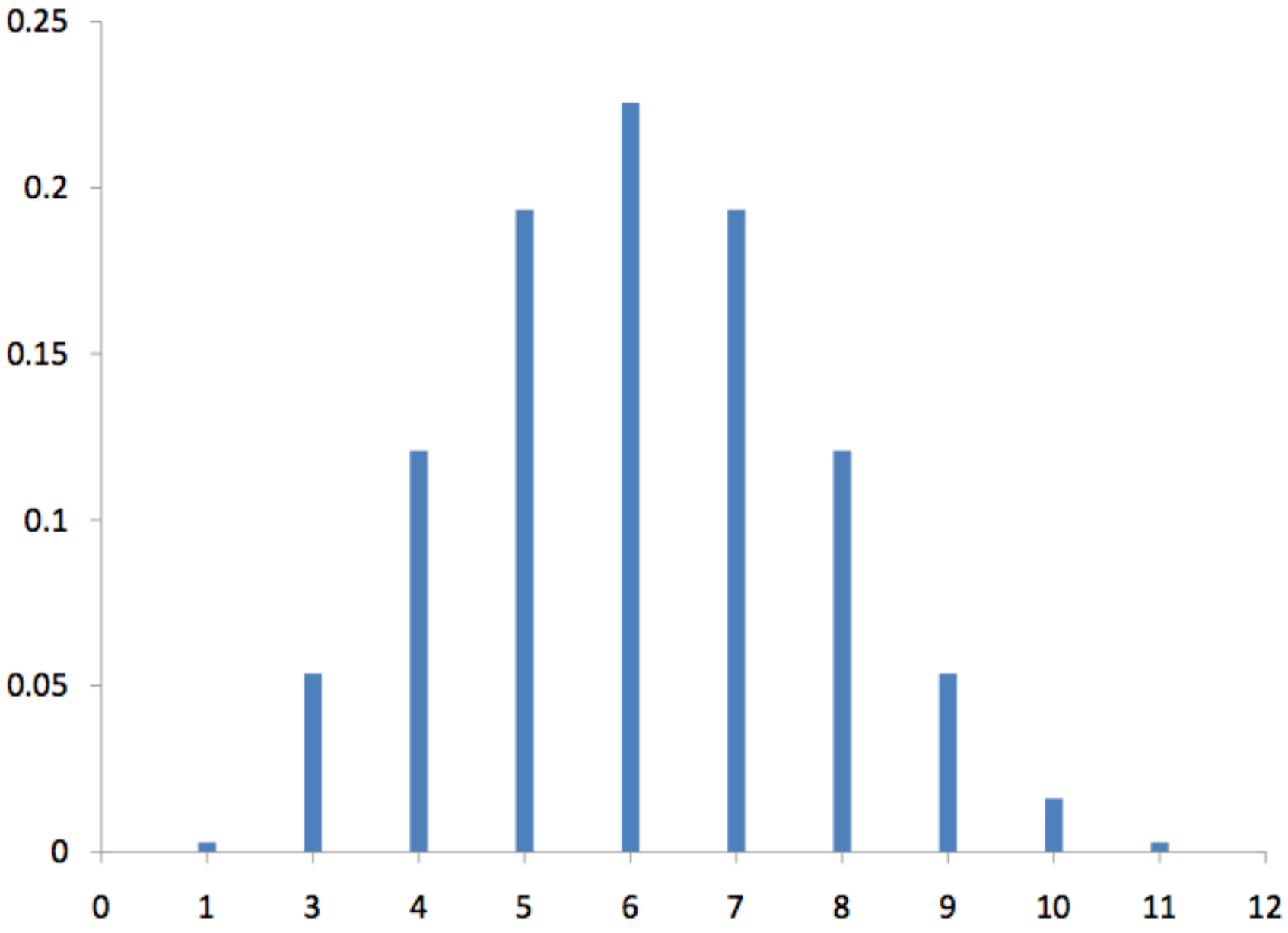
Source: wikipedia.org

Regression toward the Mean



histogram of example




0.25
0.2
0.15
0.1
0.05
0
0
1
3
4
5
6
7
8
9
10
11
12

- Thanks for attention