

1.
 Given: results of soccer matches playing against Ajax Goal: predict whether at a certain moment a team will win or lose
 The learning task is supervised classification.

2.

$$\theta_0 = 0, \theta_1 = 1$$

Gradient Descent:

$$\theta_j = \theta_j - \alpha \int J_{(\theta)} d_{(\theta)}$$

$$\theta_0 = 0 - 0.1 * 1/3 * (-3 - 2 - 4) = 0.3$$

$$\theta_1 = 1 - 0.1 * 1/3 * (-3 * 3 - 2 * 5 - 4 * 6) = 2.43$$

$$y = 0.3 + 2.43x$$

$$\theta_0 = 0.3 - 0.1 * 1/3 * (1.59 + 5.45 + 4.88) = -0.0097$$

$$\theta_1 = 2.43 - 0.1 * 1/3 * (4.77 + 27.25 + 29.28) = 0.387$$

$$y = -0.097 + 0.387x$$

$$MSE = 1/6 * (60.45 + 24 + 26.646) = 9.63$$

Z-scores

$$x = (x - 4.7) / 1.5$$

$$y = (y - 7.7) / 4.3$$

$$x: -1.13; 0.2; 0.87$$

$$y: -0.4; -0.16; 0.53$$

$$\theta_0 = 0 - 0.1 * 1/3 * (-0.73 + 0.36 + 0.34) = 0.001$$

$$\theta_1 = 1 - 0.1 * 1/3 * (0.82 + 0.072 + 0.296) = 0.96$$

$$y = 0.001 + 0.96x$$

$$\theta_0 = 0.001 - 1/3 * 0.1 * (-0.68 + 0.353 + 0.31) = 0.00157$$

$$\theta_1 = 0.96 - 1/3 * 0.1 * (0.768 + 0.07 + 0.2697) = 0.923$$

$$MSE = 1/6 (10.43 + 5.68 + 19.89) = 6$$

3.

$$a) MSE(new) = MSE$$

$$b) MSE(new) = MSE^2$$

4. |

$$J_{(\theta)} = 1/2m \sum (h_{\theta}(x^i) - y^i)^2$$

$$\int J_{\theta} d_{(\theta)} = 2 \sum (\theta_0 + \theta_1 x - y) * x = 0$$

$$\theta_1 = (\sum yx - \sum \theta_0 x) / \sum x^2$$