Amsterdam University College

Assessed Coursework 1

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1 Written Assignment

q.1.a)
The 'given' is historical data of results of soccer matches against ajax. the 'goal' is to predict whether teams will lose or win or draw against ajax.It's a example of supervised learning as classification.
q.1.b)

q.2.a)
$\theta_0 = 0$
$\theta_1 = 1$
$\alpha = 0.1$
m = 3

Iteration 1:
$\theta_0 := 0 - 0.1 * \frac{1}{3} * \sum_{i=1}^{3}(h_\theta(x_i) - y_i) = 0.3$

$\theta_1 := 1 - 0.1 * \frac{1}{3} * \sum_{i=1}^{3}(h_\theta(x_i) - y_i) * x_i = 2\frac{13}{30}$

Iteration 2:
$\theta_0 := 0.3 - 0.1 * \frac{1}{3} * \sum_{i=1}^{3}(h_\theta(x_i) - y_i) = -0.098889$

$\theta_1 := 2\frac{13}{30} - 0.1 * \frac{1}{3} * \sum_{i=1}^{3}(h_\theta(x_i) - y_i) * x_i = \frac{86}{225}$

Therefore:
$h_\theta(x) = -0.098889 + \frac{86}{225}x_i$

$MSE = \frac{1}{2n}\sum_{i=1}^{n}(h_\theta(x) - y_i)^2 = 18.72$

$q.2.b)$

$z - score - x = [-1.336, 0.267, 1.069]$
$z - score - y = [-0.981, -0.392, 1.373]$
Applying linear regression using the z-scores gives the following results:
Iteration 1:
$\theta_0 = 0$
$\theta_1 = 1$
Which are the same as the original theta's.

q.3) Did not manage this question in time, apologies.
$q.4)$

$MSE = \frac{1}{2n} \sum_{i=1}^{n} (h_\theta(x) - y_i)^2$

Find derivative and set equal to zero

$\frac{\delta}{\delta\theta_1} * \frac{1}{2n} \sum_{i=1}^{n} (\theta_0 + \theta_1 x_i - y_i)^2$

$\sum_{i=1}^{n} (\theta_0 + \theta_1 x_i - y_i) x_i = 0$

$\sum_{i=1}^{n} (\theta_0 x_i) + \sum_{i=1}^{n} (\theta_1 (x_i)^2) + \sum_{i=1}^{n} (-y_i x_i) = 0$

$\theta_1 \sum_{i=1}^{n} ((x_i)^2) = \sum_{i=1}^{n} (y_i x_i) - \sum_{i=1}^{n} (\theta_0 x_i)$

$\theta_1 = \frac{\sum_{i=1}^{n} (y_i x_i) - \theta_0 \sum_{i=1}^{n} (x_i)}{\sum_{i=1}^{n} (x_i)^2}$