Assignment 3:

Manual calculations

Data

x	y
0.2	3.4
0.4	3.8

step 1 : [x, y], epochs: 2, $\eta = 0.1$, m: 1, c: -1.

step 2 : iter = 1

step 3 : sample = 1

step 4 : Error $\epsilon = \frac{1}{2} \times (3.4 - (1 \times 0.2 - 1))^2$

$= 0.5 \times (3.4 + 0.8)^2$

$= 8.32$

$\frac{\partial \epsilon}{\partial m} = -(y_i - mx_i - c)x_i = -(3.4 - (1)(0.2) - (-1))(0.2)$

$= -(3.4 - 0.2 + 1)(0.2) = (4.2)(0.2) = -0.84$

$\frac{\partial \epsilon}{\partial c} = -(y_i - mx_i - c) = -4.2$

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$\Delta c = -\eta \frac{\partial \epsilon}{\partial c} = -(0.1)(-4.4)$

step 6: $m = m + \Delta m = 1 + 0.084 = 1.084$

$c = c + \Delta c = -1 + 0.442 = -0.56$

step 7: sample = sample + 1 = 1 + 1 = 2

step 8: sample < total no: of samples → True

go to next step 4

step 9: $y = (1.084)(0.4) - 0.56$

$y = -0.1464$

$\epsilon = (0.5)(3.84 + 0.1464)^2 = 7.79$

$\frac{\partial \epsilon}{\partial m} = -(y_i - mx_i - c)x_i$

$= -(3.8 - (1.084)(0.4) + 0.56)(0.4)$

$= -(3.8 + 0.1464) * 0.4 = -1.58$

$\frac{\partial \epsilon}{\partial c} = -(y_i - mx_i - c) = -3.94$

step 10: $\Delta m = -\eta \frac{\partial \epsilon}{\partial m} = -(0.1)(-1.58) = 0.158$

$\Delta c = -\eta \frac{\partial \epsilon}{\partial c} = -(0.1)(-3.94) = 0.394$

Step 11: $m = m + \Delta m = 1.084 + 0.158 = 1.242$

$c = c + \Delta c = -0.56 + 0.394 = -0.136$

step 12: sample = 2 + 1 = 3

step 13: sample > 3 → no: of samples

go to next step

step 14: iter = iter + 1 = 1 + 1 = 2

step 15: iter < epochs

go to step 3

step 16: sample = 1

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step 17: $Y = (1.0242)(0.2) + (-0.186) = 0.00624$

$\epsilon = \frac{1}{2}(3.4 - 0.00624) = 1.6688$

$\frac{\partial \epsilon}{\partial m} = -(3.4 - 0.00624)(0.2) = -0.66752$

$\frac{\partial \epsilon}{\partial c} = -3.3376$

step 18: $\Delta m = -\eta\left(\frac{\partial \epsilon}{\partial m}\right) = -(0.1)(-0.66752) = 0.066752$

$\Delta c = -(0.1)(-3.3376) = 0.33376$

step 19: $m = m + \Delta m = 1.0242 + 0.66752 = 1.09052$

$c = c + \Delta c = -0.186 + 0.33376 = 0.14776$

step 20: sample = 1+1 = 2

step 21: sample < no of samples

go to step 4

step 22: $\frac{\partial \epsilon}{\partial m} = -(3.8 - (1.090952)(0.4) - (0.14776)(0.4)$

$= -(2.888432)(0.4) = -1.155372$

$\frac{\partial \epsilon}{\partial c} = -2.888432$

step 23: $\Delta m = -\eta\left(\frac{\partial \epsilon}{\partial m}\right) = 0.1155372$

$\Delta c = 0.2888432$

step 24: $m = m + \Delta m$

$= 2.025057$

$c = c + \Delta c = 0.43660032$

step 25: sample = 2+1 = 3

step 26: sample > no: of samples

go

step 27: iter = iter + 1 = 2+1 = 3

step 28: iter > epoch

go to step 29

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Step 29. print m_1 C

$m = 2.025057$

$C = 0.04366082$

step 30. compute msc

$$= \frac{(3.4 - 0.841614) + (3.8 - 1.0246626)}{2}$$

$$= \frac{(2.558386) + (2.775374)}{2}$$

$msc = 2.556063.$

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