Assignment - 3

Sample (i)	x_i	y_i
1	0.2	3.4
2	0.4	3.8

Step 1: Read dataset, $\eta = 0.1$, $m = 1$, $c = -1$

Step 2: No. of iterations = 2

Step 3: Set iteration = 1, Set sample = 1

Step 4: $y_i = mx_i + c$

$y_1 = 1(0.2) + (-1)$

$y_1 = 0.2 - 1$

$= -0.8$

$y_2 = 1(0.4) + (-1)$

$= 0.4 - 1$

Step.5 $e = \frac{1}{2}(3.4 - (0.8))^2$

$= \frac{1}{2}(4.2)^2$

$= \frac{1}{2} \times 17.64$

$= 8.82$

Step. 6 :

$\frac{\partial E}{\partial m} = (y_i - mx - c)(-x)$

$= -(4.2)^1 (0.2)$

$= -0.84$

$\frac{\partial E}{\partial c} = (y_i - mx - c)(-1)$

$= (4.2 - 4.4) - 4.2$

Step. 7 : $\Delta m = -(0.1)(-0.84) = 0.084$

$\Delta c = -(0.1)(-4.2) = 0.42$

Step. 8 : $m = 1 + 0.084 = 1.084$

$c = -1 + 0.42 = -0.58$

Step. 9 : Sample $i = i + 1 = 2$ $4 \; 2 \leq 2$

Step. 10:

$$y = (1.084)(0.4) - 0.58$$

$$= -0.1464$$

Step. 11: $E = \frac{1}{2}(3.8 + 0.1464)^2$

$$= 7.79$$

Step. 12. $\frac{\partial E}{\partial m} = -(3.8 + 0.1464)^* 0.4$

$$= -1.58$$

$$\frac{\partial E}{\partial c} = -(3.8 + 0.1464)$$

$$= -3.94$$

Step. 13. $\Delta m = -(0.1)(-1.58)$

$$= 0.158$$

$$\Delta c = -(0.1)(-3.94)$$

$$= 0.394$$

Step. 14: $m = 1.084 + 0.158$

$$= 1.242$$

$$c = -0.58 + 0.394 = -0.186$$

Step 15 Sample 1: 1+1 = 2 ≤ 2

Step 16 iter = iter + 1 = 2 ≤ 2

∴ set sample = 1.

Step 17. $y = (1.242)(0.2) + (-0.186)$

$= 0.2484 - 0.186$

$= 0.0624$

Step 18: $e = \frac{1}{2}(3.4 - 0.0624)^2$

$= \frac{(3.3376)^2}{2} = \frac{11.13957376}{2}$

$= 1.6688 = 5.56978688$.

Step 19:

$\frac{\partial E}{\partial m} = -(3.3376)(0.2)$

$= -0.66752$

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

Step. 20: $\Delta m = -(0.1)(-0.666752)$

$= +0.066752$

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

$= 0.3376$

Step. 21: $m = m + \Delta m$

$= 1.242 + 0.066752$

$= 1.308752$

$c = c + \Delta c$

$= -0.186 + 0.3376$

$= 0.1516$

Step. 22: Sample $i = i + 1 = 2$

Step 23: $y = (1.308752)(0.4) + 0.1516$

$= 0.5235008 + 0.1516$

$= 0.6751008$

Step 24: $e = \frac{1}{2}(3.8 - 0.6751008)$

$= \frac{1}{2}(3.1248992)^2 = \frac{9.76499501}{2}$

$= 1.56924496$

$= 4.88249751$

Step 25: $\frac{\partial E}{\partial m} = (3.1248992)(-0.4)$

$= -1.24995968$

$\frac{\partial E}{\partial c} = -3.1248992$

Step 26: $\Delta m = -(0.1)(-1.24995968)$

$= 0.124995968$

$\Delta c = -(0.1)(-3.1248992)$

$= 3.1248992$

Step 27: $m = m + \Delta m$

$= 1.308752 + 0.124995968$

$= 2.55871168$

$C = C + \Delta C$

$= 0.1516 + 3.1248992$

$= 3.2764992$

Step: 28: Sample = Sample1 = 3 > 2

Iter = Iter1 = 3 > 2

End.

Step: 29: $q = \frac{1}{2}(y_i - mx - c)^2$

$= \frac{1}{2}(3.4 - (2.55871168)(0.2) - 3.2764992)^2$

$= \frac{1}{2}(3.4 - 0.511742336 - 3.2764992)^2$

$= \frac{0.15073149}{2}$

$= 0.075365745$

$$e_2 = \frac{1}{2}(y_i - mx - c)^2$$

$$= \frac{1}{2}(3.8 - (2.558\,71168)(0.4) - 3.2764992)^2$$

$$= 0.124991936$$

$$MSE = e_1 + e_2$$

$$= 0.075365745 + 0.124991936$$

$$= 0.200357681$$

$\therefore$ $c = 3.2764992$

$m = 2.55871168$