

## Assignment - III

18K4UA0562

\* simple linear regression model using stochastic gradient descent optimizer.

| sample (i) | $x_i^a$ | $y_i^a$ |
|------------|---------|---------|
| 1          | 0.2     | 3.4     |
| 2          | 0.4     | 3.8     |
| 3          | 0.6     | 4.2     |
| 4          | 0.8     | 4.6     |

Calculations :-

step-1:  $[x, y]$ ,

$$m = 1$$

$$c = -1$$

$$\eta = 0.1$$

$$\text{epoches} = 2$$

$$ns = 2$$

step2: iter = 1

step3: sample = 1

step4:  $\frac{\partial E}{\partial m} = - (3.4 - 1(0.2) + 1) (0.2) = -0.84$

$$\frac{\partial E}{\partial c} = - (3.4 - 1(0.2) + 1) = -4.2$$

step5:  $\Delta m = + (0.1) (0.84) = 0.084$

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

step 6:-  $m = m + \Delta m = 1 + 0.084 = 1.084$   
 $c = c + \Delta c = -1 + 0.42 = -0.58$

step 7: sample  $t = 1$

step 8: if (sample > ns) //  $2 > 2$

goto step 9

else

goto step 4

step 4:-  $\frac{\partial E}{\partial m} = -(3.8 - (1.084)(0.4) + 0.58) \cdot 0.4$   
 $= -1.5785$

$\frac{\partial E}{\partial c} = -(3.8 - (1.084)(0.4) + 0.58)$   
 $= -3.89464$

step 5:  $\Delta m = -(0.1)(-1.5785) = 0.1578$   
 $\Delta c = -(0.1)(-3.89464) = 0.3946$

step 6:  $m = m + \Delta m = 1.084 + 0.1578 = 1.2418$   
 $c = c + \Delta c = -0.58 + 0.3946 = -0.1854$

step 7: sample  $t = 1$

step 8: if (sample > ns) //  $3 > 2$

goto step 9

else

goto step 4

step 9: iter  $t = 1$  // iter = 2

step 10: if (iter > epochs) //  $2 > 2$   
goto step 11

else

goto step 3

step 3: sample = 1

step 4:  $\frac{\partial E}{\partial m} = -((3.4) - (1.2)(0.2) + 0.18)(0.2)$   
 $= -0.668$

$\frac{\partial E}{\partial c} = -(3.4 - (1.2)(0.2) + 0.18)$   
 $= -3.34$

step 5:  $\Delta m = -(0.1)(-0.668) = 0.0668$

$\Delta c = -(0.1)(-3.34) = 0.334$

step 6:  $m = m + \Delta m = 1.24 + 0.066 = 1.3$

$c = c + \Delta c = 0.18 + 0.33 = 0.51$

step 7: sample++ = 1

step 8: if (sample > ns) // 2 > 2  
 goto step 9

else  
 goto step 4.

step 4:  $\frac{\partial E}{\partial m} = -(3.8 - (1.3)(0.4) - 0.15)(0.4)$   
 $= -1.25$

$\frac{\partial E}{\partial c} = -(3.8 - (1.3)(0.4) - 0.15)$   
 $= -3.13$

step 5:  $\Delta m = -(0.1)(-1.25) = 0.12$

$\Delta c = -(0.1)(-3.13) = 0.31$

step 6:  $m = m + \Delta m = 1.3 + 0.12 = 1.42$

$$c = c + \Delta c = 0.15 + 0.31 = 0.46$$

step 7:  $\text{sample} += 1$

step 8  $\text{if } (\text{sample} > n_s) \quad // 3 > 2$

goto step 9

else

goto step 4

step 9:  $\text{iter} += 1$

step 10:  $\text{if } (\text{iter} > \text{epochs}) \quad // 3 > 2$

goto step 11

else

goto step 3

step 11:  $m = 1.42$

$$c = 0.46$$