# Assignment-3

18K41A0479

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

→ Do manual calculations for 2 iterations with 1st 2 samples.

→ Write python code to build simple linear regression model using SGD optimizer (consider all 4 samples)

step1 : [x, y], m=1, c=-1, $\eta$=0.1, epoches = 2, ns=2

step2 : itr=1

step3 : sample=1

step4 : $\frac{d\epsilon}{\partial m} = (-8.4(1))(0.2) - (-1)(0.2)$

$= -0.84$

$\frac{d\epsilon}{\partial c} = -(3.4)(1)(0.2+1)$

$= -4.2$

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

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

$= 0.42$

step6 : $m = m + \Delta m$

$1 + 0.084 = 1.084$

$c = c + \Delta c$

$= -1 + 0.42 = -0.58$

tep7: sample += 1 $\Rightarrow 1+1 = 2$

ep 8: if (sample > ns)

$2 > 2$

goto step-9

else
goto step 4

step4: $\frac{\partial f}{\partial m} = -(3.8 - (1.084)(0.4) + 0.58)0.4$

$= -1.57$

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

$= -3.9464$

step5: $\Delta m = -(0.1)(-1.5785) = 0.157$

$\Delta c = -(0.1)(-3.9464) = 0.3966$

step6: sample = 2+1 = 3

step7: $m = m + \Delta m = 1.084 + 0.157$

$= 1.2418$

$c = c + \Delta c = -0.58 + 0.3946$

$= -0.1854$

step8: if (sample > ns)

3 > 2

goto step-9

else goto step-4

step9: ib++

1+1 = 2

step10: if (ib > epoches)

2 > 2

goto step-11

else

goto step-3

step3 - sample = 1

step4 - $\frac{\partial \epsilon}{\partial m} = -(3.4 - (1.2)(0.2) + 0.18)0.2$

$= -(3.34)0.2 = -0.668$

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

$$= -3.34$$

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

$= 0.0668$

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

$c = c + \Delta C = 0.18 + 0.33 = 0.15$

step 7: sample = sample + 1

$= 1 + 1 = 2$

step 8: if (sample $> n_s$)

$2 > 2$

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: sample = sample + 1

step 8: if (sample $> n_s$)

$3 > 2$

goto step-9

else

goto step-4

step 9 iter = iter+1

= 2+1 = 3

step 10 if (itr = epoches)

3 > 2

goto step -11

else

goto step-3

step -11 print m&c

m = 1.42, c = 0.46