Assignment 3

18K41A05E4

let us consider a sample dataset have one input (x_i^a) and one output (y_i^a) and number of samples 4. Develop a 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

⇒ Do manual calculations for 2 ituations, 2 samples

Step1 : x, y, m=1, c=-1, $\eta = 0.1$, epoches =2, ns = 4

Step2 : ite = 1

Step3 : sample = 1

Step4 : $\frac{\partial E}{\partial M} = -(3.4 - (1)(0.2) - (-1))\,0.2$

$= -0.84$

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

$= -4.2$

Step 5 : $\Delta m = -(0.1)(-0.84)$

$= 0.084$

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

$= 0.42$

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

$c = c + \Delta c = -1 + 0.42 = -0.58$

Step 7 : sample = sample + 1

$= 1 + 1 = 2$

Step 8 : if (sample > ns)
2 > 2

goto step 9

else

goto step 4

Step 4 : $\frac{\partial E}{\partial M} = -(3.8 - (1.084)(0.4) + 0.58)\,0.4$

$= -1.5785$

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

$= -3.9464$

Step 5 : $\Delta m = -(0.1)(-1.5785) = 0.1578$

$\Delta c = -(0.1)(-3.9464) = 0.3946$

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 = sample + 1

= 2 + 1

= 3

Step 8 :- if (sample > ns)

3 > 2

goto step 9

else

goto step 4.

Step 9 :- iter = iter + 1

= 1 + 1 = 2.

Step 10 : if (iter > epoches)

2 2

goto step 11

else

goto step 3

Step 3 : sample = 1

Step 4 : $\frac{\partial E}{\partial M} = -(3.4 - (1.2)(0.2) + 0.18)\ 0.2$

$= -(3.4 - 0.24 + 0.18)\ 0.2$

$= -(3.34)\ 0.2$

$= -0.668$

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

$= -3.34$

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

$= 0.066$

$\Delta C = -(0.1)(-3.34)$

$= +0.33$

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

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

Step 7 : sample = sample + 1

$= 1 + 1 = 2$

Step 8 : if (sample > ns)

$2 > 2$

goto step 9

else

goto step 4

Step 4 :- $\frac{\partial E}{\partial M} = -(3.9 - (1.3)(0.4) - 0.15)\ 0.4$

$= -(3.9 - 0.52 - 0.15)\ 0.4$

$= -1.25$

$\frac{\partial E}{\partial c} = -(3.9 - (1.3)(0.4) - 0.15)$

$= -3.13$

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

$= 2 + 1 = 3$

Step 8 if (sample > ns)

$3 > 2$

goto step 9

else

step 4

Step 9 : iter = iter + 1

= 2 + 1

= 3

Step 10 : if (iter > epochs)

3 > 2

goto step 11

else

goto step 3

Step 11 : print m & c

m = 1.42 c = 0.46