ASSIGNMENT-3

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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 stothastic 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 two iterations with first two samples.
- write the program python code to build simple linear regression model using SGD optimizer consider all 4 samples.

Step 1: x, y, m = 1, c = -1, η = 0.1, epoches = 2, ns = 2

Step 2: itr = 1

Step 3: sample = 1

Step 4: $\frac{dE}{dm} = -(84(1))(0.2) - (-1))0.2$

$= -0.84$

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 += 1

1 + 1 = 2

Step 8: if (sample > ns)

2 > 2

goto step-9

else

goto step-4

Step 4: $\frac{\partial F}{\partial m} = -(3.8-(1.084)(0.4)+0.54)0.4$

$= 1.5785$

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

$= -3.9464$

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

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

Step 7: sample +1=1

$2+1=3$

Step 8: $m = m+\Delta m = 1.084+0.1578$

$= 1.2418$

$c = c+\Delta c = 0.584+0.3946$

$= -0.1854$

Step-8: if (sample >ns)

$3>2$

goto step-9

else

goto step-4

Step 9: itr += 1

$1+1=2$

Step 10: if (itr > epochs)

$2>2$

goto step-11

else

goto step-3

Step-3: sample = 1

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

$= -(3.34)(0.2)$

$= -0.668$

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

$= -3.34$

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

$= 0.0668$

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

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

Step-7 : sample += 1

1+1 = 2

Step 8 : if (sample > ns)

2 > 2

goto step-9

else

goto step-4

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

$= -1.25$

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

$= -3.13$

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

2+1 = 3

Step 8 : if (sample > ns)

3 > 2

goto step-9

else

go to step-4

step-9 : itr = itr + 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