Assignment-3

18K41A0508

Let us consider a simple 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 two iterations with first two 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 : $\frac{d\epsilon}{dm} = -((8.4-(1))(0.2) - (-1))0.2$

$= -0.84$

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

$= -4.2$

step 5 : $\Delta m = -(0.1)(-0.84) = 0.084$

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

$= 0.42$

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

$= -1.5785$

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

$= -3.9464$

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

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

Step 7 : sample + = 1

$2 + 1 = 3$

Step 6 : $m = m + \Delta m = 1.084 + 0.1578$

$= 1.2418$

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

$= -0.1854$

Step 8 : if (sample > ns)

$3 > 2$

goto step 9

else

goto step 4

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step 9 : itr += 1

1+1 = 2

step 10 : if (itr > epoches)

2 > 2

goto step 11

else

goto step 3

step 3 : Sample = 1

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

$= -(3.34)(0.2) \Rightarrow -0.668$

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

$= -3.34$

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

$= -1.25$

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

$= -3.13$

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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

goto 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

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