Assignment-5

Let us consider a sample dataset have one input (x_i) & one output (y_i) of number of samples 4 & develop a simple linear regression using MBGD

Sample (i)	x_i	y_i	
1	0.2	3.4	batch 1
2	0.4	3.8	
3	0.6	4.2	batch 2
4	0.8	4.6	

Do manual calculations for 2 iterations with batch size 2

step 1: $[X, Y]$, $m=1$, $c=-1$, $\eta=0.1$, $bs=2$, epochs $=2$

step 2: $n_b = \frac{ns}{bs} = \frac{4}{2} = 2$

step 3: iter $=1$

step 4: batch $=1$

step 5: $\frac{\partial E}{\partial m} = \frac{-1}{bs}\sum_{i=1}^{bs}(y_i - mx_i - c)x_i$

$= \frac{-1}{2}[(3.4-(1)(0.2)+1)0.2]$
$+[3.8-0.4+1]0.4]$

$= -1.34$

$\frac{\partial E}{\partial c} = \frac{-1}{2}[(3.4-0.2(1)+(3.8-0.4+1)]$

$= -4.3$

step 6 : $\Delta m = -(0.1)(-1.34) = 0.134$

$\Delta c = -(0.1)(-4.3) = 0.43$

step 7: $m = m + \Delta m = 1 + 0.134 = 1.134$

$c = c + \Delta c = -1 + 0.43 = -0.57$

step 8: Batch = batch + 1

$1 + 1 = 2$

step 9: if (batch > nb) => True then go to nextstep

$2 > 2$ False go to step 5

step 5: $\frac{\partial E}{\partial m} = \frac{-1}{2}[(4.2 - (1.134)(0.6) + 0.57)0.6$

$+ (4.6 - (1.134)(0.8) + 0.57)0.8]$

$= -2.93$

$\frac{\partial E}{\partial c} = \frac{-1}{2}[(4.2 - (1.134)(0.6) + 0.57) +$

$(4.6 - (1.134)(0.8) + 0.57)]$

$= -4.1762$

step 6: $\Delta m = -(0.1)(-2.932) = 0.2932$

$\Delta c = -(0.1) - (-4.17) = 0.41$

step 7: $m = m + \Delta m = 1.134 + 0.29 = 1.42$

$c = c + \Delta c = -0.57 + 0.41 = -0.15$

step 8: Batch = Batch + 1 = 2 + 1 = 3.

step 9: if (batch > nb) : True then go to step 10

$3 > 2$ false go to step 5

step10: iter = iter + 1

1 + 1 = 2

step11: if (iter > epoch) True go to next step

2 > 2

false go to step 4

step4: Batch = 1

step5: $\frac{\partial E}{\partial m} = -\frac{1}{2}[(3.4 - (1.42)(0.2) + 0.15)0.2$

$+(3.8 - (1.427)(0.4) + 0.15)0.4]$

$= -1.002$

$\frac{\partial E}{\partial c} = -\frac{1}{2}[(3.4) - (1.427)(0.2) + 0.15)$

$+(3.8 - (1.42)(0.4) + 0.15]$

$= -3.32$

step6: $\Delta m = -(0.1)(-1.002) = 0.100$

$\Delta c = (-0.1)(-3.32) = 0.332$

step7: $m = m + \Delta m = 1.42 + 0.100 = 1.52$

$c = c + \Delta c = -0.152 + 0.33 = 0.179$

step8: Batch = Batch + 1

$= 1 + 1 = 2$

step9: if (batch > nb) True go to next step

2 > 2

else go to step 5

step 5: $\frac{\partial E}{\partial m} = \frac{-1}{2}\{(4.2-(1.52)(0.6)-1.79)0.6$

$+ (4.6-(1.52)(0.8)-0.179)0.8]$

$= -2.21$

$\frac{\partial E}{\partial c} = -3.15$

step 6: $\Delta m = -0.1 \times -2.21 = 0.22$

$\Delta c = -0.1(-3.15) = 0.315$

step 7: $m = m + \Delta m = 1.527 + 0.22 = 1.74$

$c = c + \Delta c = 0.179 + 0.31 = 0.49$

step 8: Batch = batch + 1

$= 2 + 1 = 3$

step 9: if (batch > nb) : True go to next step

else goto step 5

step 10: iter = iter + 1 = 2 + 1 = 3

step 11: if (iter > epochs) : go to next step

3 > 2 false goto step 4

step 12: print values of m & c

$m = 1.74$, $c = 0.49$