Assignment-9

– 18K41A0491

let us consider a sample dataset have 1 input (x_i) and one output (y_i) and number of samples 4. Develop a simple linear regression model using momentum optimiser

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

step 1 :- [x, y] m=1, c=-1, η=0.1, epochs = 2, γ = 0.9 $V_m = V_c = 0$ ns = 2.

step 2 : itr = 1

step 3 : sample = 1

step 4 : $g_m = \frac{\partial f}{\partial m} = -(y_1 - mx_1 - c)x_i$

$= -(3.4 - (1)(0.2) + 1)(0.2)$

$= -0.84$

$g_c = \frac{\partial f}{\partial c} = -(y_i - mx_i - c)$

$= -(3.4 - 0.2 + 1)$

$= -4.2$

step 5 : $v_m = \gamma V_m - \eta g_m$

$= (0.9)0 - (-0.1)(-0.84)$

$= 0 - 0.084$

$= -0.084$

$v_c = \gamma V_c = \eta g_c$

$= 0.9 \times 0 - (-0.1)(-4.2)$

$= -0.42$

step 6 :- $m = m + \nabla m$

$= 1 + (-0.84)$

$= -0.916$

$c = c + \nabla c$

$= -1 - 0.42$

$= -1.42$

step-7 : sample+ = 1

1+1 = 2

step 8 :- if (sample > ns)

goto step-9

2 > 2

else

goto step-4

step4 : $g_m = \frac{\partial E}{\partial m} = -(3.8 - 10.916)(0.4) + 1.12)(0.4)$

$= -1.941$

step 5 : $g_c = \frac{\partial E}{\partial c} = -4.853$

$\nabla m = \delta \nabla m - \eta g_m$

$= (0.9)(-0.084) - [-0.1 \times -1.941]$

$= -0.2697$

$\nabla c = \delta \nabla c - \eta g_c$

$= (0.9)(-0.42) - [-0.1 \times -4.853]$

$= -0.863$

step 6 :- $m = m + \nabla m$

$= 0.966 + (-0.2697)$

$= 0.6963$

$c = c + \nabla c$

$= -1.42 - 0.863$

$= -2.283$

step 7 : sample = sample + 1

2 + 1 = 3

step 8 : if (sample > ns)

goto step-9

else goto step-4

step 9 : ite + = 1

1 + 1 = 2

step 10 : if (ite > epochs)

goto step-4

else goto step-3.

step 3 : sample = 1

step 4 : $gm = \frac{\partial E}{\partial m} = -(3.4 - (0.646)(0.2) + 2.283)(0.2)$

$= -1.110.$

$gc = \frac{\partial E}{\partial c} = -(3.4 - (0.646)(0.2) + 2.283$

$= -5.553$

step 5 : $Vm = \delta Vm - \eta gm$

$= (0.9)(-0.2697) - [-0.1 \times -1.110]$

$= -0.353$

$Vc = \delta Vc - \eta gc$

$= (0.9)(-0.863) - [-0.1 \times -5.53]$

$= -1.332.$

step 6 : $m = m + Vm$

$= 0.6463 + (-0.353)$

$= 0.293$

$C = c + Vc$

$= -2.283 - 1.332$

$= -3.615$

step 7: sample + = 1

1+1 = 2

step 8: if (sample > ns)

goto step-9

else

goto step-4

step 4: $g_m = -(3.8 - (0.293)(0.4) + 3.615)(0.4)$

$= -2.919$

$g_c = -(3.8 - (0.293)(0.4) + 3.615 = -7.297$

step 5: $V_m = (0.9)(-0.353) - [-0.1 \times -2.919] = -0.6096$

$V_c = (0.9)(-1.332) - [-0.1 \times -7.297] = -1.9285$

step-6: m + = Vm

$0.293 - 0.609 = -0.316$

c + = Vc $\Rightarrow -3.615 - 1.928 = -5.543$

step-7: sample + = 1

2+1 = 3

step 8: if (sample > ns)

goto step-9

else goto step-4

step 9: Itr + 0 = 1

2+1 = 3

step-10: if (itr > epochs)

goto step-11

else

goto step-3

step-11: print m, c

m = -0.316, c = -5.543.