Assignment-9

18K41A0508

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	y_i
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 iterations with 1st 2 samples

step 1: [x, y] $m=1$, $c=-1$, $\eta=0.1$, epoches = 2, $\gamma=0.9$,
$v_m = v_c = 0$, $ns = 2$

step 2: itr = 1

step 3: sample = 1

step 4: $g_m = \frac{\partial \epsilon}{\partial m} = -(y_i - mx_i - c)x_i$

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

$= -0.84$

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

$= -(3.4 - 0.2 + 1)$

$= -4.2$

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

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

$= 0 - 0.084$

$= -0.084$

$v_c = \delta v_c - \eta g_c$

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

$= -0.42$

step 6 : $m = m + v_m$

$= 1 + (-0.84)$

$= -0.916$

$c = c + v_c$

$= -1 - 0.42$

$= -1.42$

step 7 : Sample + = 1

1 + 1 = 2

step 8 : if (sample > ns)

goto step 9

2 > 2

else

goto step 4

step 4 : $g_m = \frac{\partial \epsilon}{\partial m} = -(3.8 - 10.916)(0.4) + 1.12)(0.4)$

$= -1.941$

Step 5 $g_c = \frac{\partial \epsilon}{\partial c} = -4.853$

step 5 : $v_m = \delta v_m - \eta g_m$

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

$= -0.2697$

$v_c = \delta v_c - \eta g_c$

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

$= -0.863$

step 6 : $m = m + v_m$

$= 0.916 + (-0.2697)$

$= 0.6463$

$c = c + v_c$

$= -1.42 - 0.863 \Rightarrow -2.283$

step 7 : sample = sample + 1

= 2 + 1 = 3

step 8 : if (sample > ns)

goto step-9

else

goto step 4

step 9 : itr + = 1

1 + 1 = 2

step 10 : if (itr > epoches)

goto step 4

else

goto step 3

step 3 : sample = 1

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

$= -1.110$

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

$= -5.553$

step 5 : $v_m = \delta v_m - \eta g_m$

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

$= -0.353$

$v_c = v v_c - \eta g_c$

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

$= -1.332$

step 6 : $m = m + v_m$

$= 0.6463 + (-0.353)$

$= 0.293$

$c = c + v_c$

$= -2.283 - 1.332$

$= -3.615$

step 7 : sample + = 1

1 + 1 = 2

step 8 : if (sample > ns)

goto step 9

2 > 2

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 : $m_+ = V_m$

$0.293 - 0.609 = -0.316$

$c_+ = V_c$

$-3.615 - 1.928 = -5.543$

step 7 : Sample + = 1

2 + 1 = 3

step 8 : if (sample > ns)

goto step 9

else

goto step 4

step 9 : itr + = 1

2 + 1 = 3

step 10 : if (itr > epoches)

goto step 11

else

goto step 3 .

step 11 : print m, c

$m = -0.316$, $c = -5.543$