Assignment -9

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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 $=2$, $\gamma=0.9$,
$v_m = v_c = 0$, $n_s = 2$

step 2: itr = 1

step 3: sample = 1

step 4: $g_m = \frac{\partial E}{\partial m} = -(y_i - mx_i - c)x_i$
$= -(3.4 - (1)(0.2) + 1)(0.2) = -0.84$

$g_c = \frac{\partial E}{\partial c} = -(y_i - mx_i - c) = -(3.4 - 0.2 + 1) = -4.2$

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: $m = m + v_m = 1 + (-0.84) = -0.916$
$c = c + v_c = -1 - 0.42 = -1.42$

step 7:- Sample += 1 , 1+1=2.

step 8:- if (sample > ns)
goto step-9
else goto step-4.

step 4:- $gm = \frac{\partial E}{\partial m} = -(3.8 - 10.916)(0.4) + 1.12)(0.4)$
$= -1.9411$

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

$vm = \delta vm - \eta gm$
$= (0.9)(-0.084) - [-0.1 \times -1.941]$
$= -0.2697$

$vc = \delta vc - \eta gc$
$= (0.9)(-0.42) - [-0.1 \times -4.853] = -0.863.$

step 6:- $m = m + vm$
$= 0.916 + (-0.2697)$
$= 0.6463$
$c = c + vc$
$= -1.42 - 0.863 = -2.283$

step 7:- sample = sample + 1 = 2 + 1 = 3

step 8:- if (sample > ns)
goto step-9
else goto step-4

step 9:- itr += 1
1+1=2

step 10:- if (itr > epochs)
goto step-4
else goto step-3

step-3:- sample = 1

step 4:- $gm = \frac{\partial E}{\partial m} = -(3.4 - (0.646)(0.2) + 2.283)(0.2)$
$= -1.110$

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

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

$= -0.353$

$V_c = \gamma V_c - \eta g_c = (0.9)(-0.863) - [-0.1 \times -5.53]$

$= -1.332$

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)

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

$V_c = (0.9)(-1.332) - [-01 \times -7.297]$

$= -1.9285$

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 > epochs)
goto step-11
else
goto step 3

Step 11: print m, c
m = -0.316, c = -5.543