ASSIGNMENT-9

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Let us consider a sample dataset, having input (x_{i0}) and one output (y_{i0}) and 4 samples. Develop a simple linear regression model using momentum optimisex.

Sample (i)	x_{i0}	y_{i0}
1	0.2	3.9
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, η = 0.1, epochs = 2, γ = 0.9.

$v_m = v_c = 0$. $g = 2$

Step 2:- iter = 1

Step3:- sample = 1

Step 4:- $g_m = \frac{\partial E}{\partial m} = -(y_1 - mx_1 - c)x_1$

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

$= -0.84$

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

$= -(3.4 - 0.2 + 1)$

$= -4.2$

Step5:- $v_m = \gamma v_m - \eta g_m$

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

$= 0 - 0.084$

$= -0.084$

$v_c = \gamma v_c - \eta g_c$

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

$= -0.42$

Step 6:- updating m and c value

$m = m + v_m = 1 + (-0.84) = -0.916$

$c = c + v_c = 1 - 0.42 = -1.42$

Step 7:- sample = sample + 1

$= 1 + 1 = 2$

Step 8:- if (sample > ns) : go to step 9

else : go to step 4.

Step 4:- $g_m = \frac{\partial E}{\partial m} = -(3.8 - (0.916)(0.4) + 1.42)(0.4)$

$= -1.941$

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

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

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

$= -0.2697$

$v_c = \gamma v_c - \eta g_c$

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

$= -0.863.$

Step 6:- Update m and c values

$m = m + v_m = 0.916 + (-0.2697)$

$= 0.6463$

$c = c + v_c = -1.42 - 0.863$

$= -2.283$

Step 7: Sample = sample + 1

= 2 + 1 = 3

Step 8: if (sample > ns) : goto step 9

else : goto step 4

Step 9: iter = iter + 1

1 + 1 ⇒ 2

Step 10: if (iter > epochs) : goto step 4

else : goto step 2:

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: $vm = \gamma vm - \eta gm$

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

$= -0.353.$

$vc = \gamma vc - \eta gc$

$= (0.9)(-0.863) - [-0.1 \times -5.5]$

$= -1.332$

Step 6: $m = m + \Delta m \Rightarrow 0.6463 + (-0.353)$

$= 0.293$

$c = c + vc \Rightarrow -2.283 - 1.332$

$= -3.615$

Step 7: Sample = Sample +1

1+1 ⇒ 2

Step 8:- if (Sample > ns) goto step 9

else : goto step 4

Step 4:- $gm = -(3.8 - (0.293)(0.4) + 3.615)(0.4)$

$= -2.919$

$gc = -(3.8 - (0.293)(0.4) + 3.615)$

$= 7.297$

Step 5:- $Vm = (0.9)(-0.353) - [-0.1 \times 2.919]$

$= -0.6096$

$Vc = (0.9)(-1.332) - [-0.1 \times -7.297)$

$= -1.9285$

Step 6:- $m = m + Vm = 0.293 - 0.609$

$= -0.316$

$c = c + Vc = -3.615 - 1.928$

$= -5.543.$

Step 7:- Sample = Sample +1

2+1 = 3.

Step 8:- if (Sample > ns) : goto step 9

else : goto step 4

Step 9:- iter = iter +1 ⇒ 2+1 = 3.

Step 10:- if (iter > epochs) : goto step 11

3 > 2

else : goto step 3.

Step 11:- print m, c

m = - 0.316 c = -5.543