

Assignment - 9

e) Develop a simple linear regression model using momentum optimizer

Sample	X	Y
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

Do manual calculations for two iterations with first two samples.

Sol) Step-1: $x, y, m=1, c=-1, \eta=0.1, \text{epochs}=2, \gamma=0.9$,
 $V_m = V_c = 0$

Step-2: iter = 1

Step-3: sample = 1

Step-4: $g_m = \frac{\partial E}{\partial m} = -(3.4 - 1(0.2) - (-1)) 0.2 = -0.84$

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

Step-5: $V_m = \gamma V_m - \eta g_m$
 $= (0.9)(0) - (0.1)(-0.84) = -0.084$

$$V_c = \gamma V_c - \eta g_c$$
$$= (0.9)(0) - (0.1)(-4.2) = -0.42$$

Step-6: $m = m + V_m = 1 + 0.084 = \cancel{1.084} - 0.916$
 $c = c + V_c = -1 + 0.42 = \cancel{-0.58} - 1.42$

Step-3: sample = 1

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

$$g_c = \frac{\partial E}{\partial c} = -(3.4 - (0.646)(0.2) + 2.283)$$
$$= -5.553$$

Step-5: $V_m = (0.9)(-0.2697) - (-0.1(-1.110))$
 $= -0.353$

$$V_c = (0.9)(-0.863) - (-0.1 \times (-5.553))$$
$$= -1.332$$

Step-6: $m = 0.6463 - (0.353) = 0.293$
 $c = -2.283 - 1.332 = -3.615$

Step-7: sample = 1 + 1 = 2

Step-8: if (2 > 2)
 goto step-9
 else
 goto step 4

Step 4: $g_m = \frac{\partial E}{\partial m} = -(3.8 - (0.293)(0.4) + 3.615)(0.4)$
 $= -2.919$

$$g_c = \frac{\partial E}{\partial c} = -7.297$$

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-7: $\text{sample} = \text{sample} + 1 = 1 + 1 = 2$

Step-8: if $(2 > 2)$
 goto step 9
else
 goto 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: $v_m = (0.9)(-0.084) - (-0.1 \times -1.941)$
 $= -0.2697$

$$v_c = (0.9)(-0.42) - (-0.1 \times -4.853) = -0.863$$

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

Step-7: $\text{sample} = 2 + 1 = 3$

Step-8: if $(3 > 2)$
 goto step 9

Step-9: $\text{iter} = 1 + 1 = 2$

Step-10: if $(2 > 3)$
 goto step-11
else
 goto step 3

Step-6: $m = 0.293 - 0.609 = -0.316$
 $c = -3.615 - 1.928 = -5.543$

Step-7: sample = $2 + 1 = 3$

Step-8: if ($3 > 2$)
goto step 9

Step-9: iter = $2 + 1 = 3$

Step-10: if ($3 > 2$)
goto step 11

Step-11: $m = -0.316$
 $c = -5.543$