Assignment - 9

Q) 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: $x, y, m=1, c=-1, \eta=0.1$, epochs $=2, \gamma=0.9$,

$$V_m = V_c = 0$$

Step-2: iter = 1

Step-3: sample = 1

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

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

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: $m = m + V_m = 1 + 0.084 = 1.084 - 0.916$

$c = c + V_c = -1 + 0.42 = -0.58 - 1.42$

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

Step-8: if (2 > 2)

    goto step 9

  else

    goto step 4

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

$$= -1.941$$

$$gc = \dfrac{\partial E}{\partial c} = -4.853$$

Step-5: $Vm = (0.9)(-0.084) - (-0.1 \times -1.941)$

$$= -0.2697$$

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

Step-6: $m = 0.916 + (-0.2697) = 0.6463$

$c = -1.42 - 0.863 = -2.283$

Step-7: Sample = 2+1 = 3

Step-8: if (3 > 2)

    goto step 9

Step-9: iter = 1+1 = 2

Step-10: if (2 > 3)

    goto step-11

  else

    goto step 3

step-3: sample = 1

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

$$= -1.110$$

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

$$= -5.553$$

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

$$= -0.353$$

$V_c = (0.9)(-0.863) - (-0.1 \times (-5.53))$

$$= -1.332$$

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: $g_m = \dfrac{\partial E}{\partial m} = -(-3.8 - (0.293)(0.4) + 3.615)(0.4)$

$$= -2.919$$

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

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-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: $m = -0.316$

$c = -5.543$