Assignment-9

18K41A0587

9) Develop a simple linear regression model using momentum optimizer.

Sample (i)	x_i^a	y_i^a
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

Sol: step1 :. $[x, y]$, $m=1$, $c=-1$, $\eta=0.1$, epochs$=2$, $\gamma=0.9$,

$V_m = V_c = 0$, $ns = 2$.

step2 : itr $=1$

step3 : sample $=1$

step4 : $g_m = \frac{\partial \epsilon}{\partial m} = -(y_i - mx_i - c)x_i$

$= -(3.4 - (1)(0.2) + 1)(0.2) = -0.84$

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

step5 : $V_m = \gamma V_m - \eta g_m$.

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

$= 0 - 0.084 = -0.084$

$V_c = \gamma V_c - \eta g_c$

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

$= -0.42$

step6 : $m = m + V_m = 1 + (-0.84) = -0.916$

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

step7 : sample = sample + 1 = 1 + 1 = 2

step8 : if (sample > ns)
2 -> 2
go to step9

else

go to step4.

step4 : $g_m = \frac{\partial \epsilon}{\partial m} = -(3.8 - (0.916)(0.4) + 1.42)(0.4)$

$= -1.941$

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

step5 : $V_m = \gamma V_m - \eta g_m$

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

$= -0.2697$

$V_c = \gamma V_c - \eta g_c$

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

$= -0.863$

step6 : $m = m + V_m = 0.916 + (-0.2697) = 0.6463$

$c = c + V_c = -1.42 - 0.863 = -2.283$

step7 : sample = sample + 1 = 2 + 1 = 3.

step8 : if (sample > ns) : goto step9

else

goto step4

step9 : itr = itr + 1

= 1 + 1 = 2.

step10 : if (itr > epochs)

goto step4

else

goto step3

step3 : sample = 1

step4 : $g_m = \frac{\partial E}{\partial m} = -(3.4 - (0.646)(0.2) + 2.283)(0.2)$

$= -1.110.$

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

$= -5.553$

step5 : $V_m = \gamma V_m - \eta g_m$

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

$= -0.353$

$V_c = \gamma V_c - \eta g_c$

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

$= -1.332.$

step6 : $m = m + V_m = 0.6463 + (0.353) = 0.293$

$c = c + V_c = -2.283 - 1.332 = -3615$

step7 : sample = sample + 1 = 1 + 1 = 2

step8 : if (sample > ns) goto step 9

else : goto step 4.

step4 : $g_m = -(3.8 - (0.293)(0.4) + 3.615)(0.4) = -2.919.$

$g_c = -(3.8 - (0.293)(0.4) + 3.615) = -7.297.$

step5 : $V_m = (0.9)(-0.353) - (-0.1 \times -2.919) = -0.6096$

$V_c = (0.9)(-1.332) - (-0.1 \times -7.297) = -1.9285$

step6 : $m = m + V_m$

$= 0.293 - 0.609$

$= -0.316$

$c = c + V_c$

$= -3.615 - 1.928$

$= -5.543.$

step7 : sample = sample+1 = 2+1 = 3

step8 : if (sample > ns) : goto step9

else : goto step4.

step9 : itr = itr+1 = 2+1 = 3

step10 : if (itr > epochs)

3>2

goto step11

else

go to step3

step11 : print m and c values

$m = -0.316,$

$c = -5.543.$