Assignment - 9

Ht no: 18K41A05A5

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 a	y_i a
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], $m = 1$, $c = -1$, $\eta = 0.1$, epochs = 3,

$\gamma = 0.9$, $V_m = V_c = 0$, $n_s = 2$.

Step-2: itr = 1

Step-3: sample = 1

Step-4: $g_m = \frac{\partial G}{\partial m} = -(y_i - mx_i - c)x_i$

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

$= -0.84$

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

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

$$= -4.2$$

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 $t = 1$

$1 + 1 = 2$.

step-8: if (sample > ns)

goto step-9

2 > 2

else

goto step-4

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

$= -1.941$

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

$\rightarrow v_m = rv_m - \eta g_m$

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

$= -0.2697$

$v_c = rv_c - \eta g_c$

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

$= -0.863$

step-6: $m = m + v_m$

$= 0.916 + (-0.2697)$

$= 0.6463$

$c = c + v_c$

$= -1.42 - 0.863$

$= -2.283$

Step-7! Sample = Sample + 1

= 2+1 = 3.

Step-8! If (sample > n's)

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! $gm = \frac{\partial \epsilon}{\partial m} = -(3.4 - (0.646)(0.2) + 2.283)(0.2)$

$= -1.110$

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

$= -5.553.$

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)

$2 > 2$ goto step-9

else

goto step-4

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

(0.4)

$= -2.911.$

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

$$= -7.297$$

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

$$= -0.6076$$

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

$$= -1.9285$$

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

$m = -0.316$, $c = -5.543$