Assignment - 9:- (18K41A04D0)

let consider a sample dataset have one i/p ($x_i^a$) and one o/p ($y_i^a$) and no. of samples 4. Develop a simple linear regression model using momentum optimizers.

| 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 first two samples.

step1) $[x, y]$, $m = 1$, $c = -1$, $\eta = 0.1$, epochs = 2, $\gamma = 0.9$, $v_m = v_c = 0$, $n_s = 2$

2) iters = 1

3) sample = 1

4) $g_m = \frac{\partial E}{\partial m} = -(y_i - m x_i - c) x_i$

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

$g_m = -0.84$

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

$= -(3.4 - (1)(0.2) + 1) = -4.2$

5) $v_m = \gamma v_m - \eta g_m$

$= (0.9)(0) - (-0.1)(-0.84) = -0.084$

$v_c = \gamma v_c - \eta g_c$

$= (0.9)(0) - (-0.1)(-4.2) = -0.42$

6) $m = m + v_m = 1 + (-0.084) = 0.916$

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

7) sample = sample + 1 = 1 + 1 = 2.

8) if (sample > ns)

2 > 2 false

goto step 4.

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

$= -1.941$

$g_c = \frac{\partial E}{\partial c} = -(3.8 - (0.916)(0.4) + 1.42)$

$= -4.853$

5) $V_m = \gamma V_m - \eta g_m = (0.9)(-0.084) - (-0.1)(-1.941)$

$= -0.269$

$V_c = \gamma V_c - \eta g_c$

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

$= -0.863$

6) $m = m + V_m = 0.916 + (-0.269)$

$m = 0.647$

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

7) sample = sample + 1 = 2 + 1 = 3

8) if (sample > ns)

3 > 2 true

goto next step

9) iter = iter + 1 = 1 + 1 = 2

10) if (iter > epochs)

2 > 2 false

goto step 3

3) Sample = 1

4) $g_m = \frac{\partial E}{\partial m} = -(3.4 - (0.647)(0.2) + 2.283)(0.2)$

$= -1.110$

$g_c = \frac{\partial E}{\partial c} = -(3.4 - (0.647)(0.2) + 2.283)$

$= -5.553$

5) $V_m = \gamma V_m - \eta g_m$

$= (0.9)(-0.269) - (-0.1)(-1.110)$

$= -0.353$

$V_c = \gamma V_c - \eta g_c$

$= (0.9)(-0.863) - (-0.1)(-5.553) = -1.332$

6) $m = m + V_m = 0.6463 + (-0.353) = 0.293$

$c = c + V_c = -2.283 - 1.332 = -3.615$

7) sample = sample + 1 = 1 + 1 = 2

8) if (sample > $n_s$)

2 > 2 false

goto step 4

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

$= -2.919$

$g_c = \frac{\partial E}{\partial c} = -(+3.8 - (0.293)(0.4) + 3.615)$

$= -7.297$

5) $V_m = \gamma V_m - \eta g_m = (0.9)(-0.353) - (-0.1)(2.919)$

$= -0.609$

$V_c = \gamma V_c - \eta g_c = (0.9)(-1.332) - (-0.1)(-7.297)$

$= -1.9285$

6) $m = m + V_m = 0.293 - 0.609 = -0.316$

$c = c + V_c = -3.615 - 1.9285 = -5.5435$

7) sample = sample + 1 = 2 + 1 = 3

8) if (sample > ns)

3 > 2 true

goto next step

else

goto step 4.

9) iter = iter + 1 = 2 + 1 = 3.

10) if (iter > epochs)

3 > 2 true.

goto step 11.

11) Print m, c values

m = -0.316

c = -5.543.