

Assignment-11

18K41A0574

e) Develop a simple linear regression model using Nesterov Accelerated Gradient (NAG) 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

$$\begin{aligned} \text{Step-4: } g_m &= \frac{\partial E}{\partial m} = -(3.4 - (1 + (0.9)0)0.2 - (-1 + (0.9)0) \times 0.2) \\ &= 0.84 \end{aligned}$$

$$\begin{aligned} g_c &= \frac{\partial E}{\partial c} = -(3.4 - (1 + 0.9)0)0.2 - (-1 + (0.9)0) \\ &= -4.2 \end{aligned}$$

Step-5: $V_m = \gamma V_m - \eta g_m$

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

$$V_c = \gamma V_c - \eta g_c$$

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

Step-6: $m = m + v_m = 1 - 0.084 = 0.916$

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

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

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

Step-4: $g_m = \frac{\partial E}{\partial m} = -(3.8 - (0.916 + (0.9 \times -0.084)) \times 0.4$
 $\quad \quad \quad - (-1.42 + (0.9 \times -0.084) \times 0.4)$
 $\quad \quad \quad = -1.983$

$g_c = \frac{\partial E}{\partial c} = -4.954$

Step-5: $v_m = \eta v_m - \eta g_m$
 $\quad \quad \quad = (0.9 \times -0.084) - (-0.1 \times -1.983) = -0.2739$

$v_c = \eta v_c - \eta g_c$
 $\quad \quad \quad = (0.9 \times -0.42) - (-0.1 \times 4.959) = -0.8739$

Step-6: $m = m + v_m = 0.916 - 0.2739 = 0.6421$

$c = c + v_c = -1.42 - 0.8739 = -2.2939$

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

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

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

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

Step-3: sample = 1

Step-4: $\frac{\partial E}{\partial m} = -(3.4 - (0.642 + (0.9 \times 0.273)) \times 0.2 -$
 $(-2.293 + (0.9 \times -0.273) \times 0.2)$
 $= -1.171$

$\frac{\partial E}{\partial c} = -5.859$

Step-5: $V_m = 0.9 \times (-0.273) - (-0.1 \times -1.171)$
 $= -0.3627$

$V_c = (0.9)(-0.873) - (-0.1)(-5.859)$

Step-6: $m = 0.6421 + (-0.3627) = 0.2794$

$c = -2.2939 - 1.3707 = -3.6646$

Step-7: sample = 1 + 1 = 2

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

Step-4: $g_m = \frac{\partial E}{\partial m} = -(3.8 - (0.279 + (0.9 \times -0.3627)) \times 0.4 -$
 $(-3.6646 + (0.9 \times 0.3627) \times 0.4)$
 $= -2.985$

$g_c = \frac{\partial E}{\partial c} = -7.4645$

Step-5: $V_m = [0.9 \times -0.3627] - (-0.1 \times -2.985)$
 $= -0.6249$

$$V_c = [0.9 \times -1.3707] - (-0.1 \times -7.4645)$$
$$= -1.98$$

Step-6: $m = 0.2974 - 0.6249 = -0.3275$
 $c = -3.6646 - -1.98 = -4.6446$

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

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

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

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

Step-11: $m = 0.3275$
 $c = -4.6446$