Assignment - II

☆ Let us consider a sample dataset have one input (x_i) and one output (y_i) and number of samples 4. Develop a SLR model using Nestrov Accelerated gradient descent (NAG) optimiser

Sample (i)	x_i a	y_i a
1	0.2	3.4
2	0.4	2.8
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; η = 0.1; epoches = 2

γ = 0.9; $V_m = V_c = 0$, ns = 2

step 2 : iter = 1

step 3 : sample = 1

step 4 : $g_m = \frac{\partial E}{\partial m} = -(y_i - (m + \gamma v_m)x_i - (c + \gamma v_c))x_i$

$= -(3.4 - (1 + (0.9)0)0.2 - [-1 + (0.9)0)0.2$

$= -0.84$

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

$= -(3.4 - (1 + 0.9 \times 0)0.2) - (-1 + (0.9)0)$

$= -4.2$

step 5 : $v_m = \gamma v_m - \eta g_m$

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

$v_c = \gamma v_c - \eta g_c$

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

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

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

step 7 : sample $+ = 1 \Rightarrow 0 + 1 = 2$

step 8 : if (sample > ns) & goto step 9

else : goto step 4

step 4 : $g_m = \frac{\partial E}{\partial m} = (+3.8 - (0.0916 + (0.9 \times -0.084)) 0.4 -$

$(-1.42 + (0.9 - 0.036) * 0.4)$

$= 1.983$

$g_c = \frac{\partial E}{\partial c} = -4.959$

step 5 : $v_m = \gamma v_m - \eta g_m$

$= (0.9 \times -0.084) - (-0.1 \times -1.983) \Rightarrow -0.2739$

$v_c = (0.9 \times -0.42) - (-0.1 \times -4.959) \Rightarrow 0.8739$

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

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

step 7 : sample $+ = 1 \Rightarrow 2 + 1 = 3$

step 8 :- if (sample > ns) ; go to step 9

else; go to step 4

step 9 : iter $+ = 1 \Rightarrow 1 + 1 \Rightarrow 2$

step 10 : if (itr > epochs) : goto step 11

2 > 2

else : goto step 3

step 3 : sample = 1

step 4 : $\frac{\partial E}{\partial m} = -(3.4 - 10.642 + (0.9 \times 0.273)) \times 0.2 - (-2.293 +$

$(0.9 \times -0.273) \times 0.2$

$g_m = -1.71$

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

step 5 : $v_m = \gamma v_m - \eta g_m \Rightarrow [(0.9) \times (-0.273)] - (-0.1 \times -1.51)$

$\Rightarrow -0.3627$

$v_c = v_c \gamma - \eta g_c = (0.9)(-0.873) - (-0.1)(-5.859)$

$= -1.3707$

step 6 : $m + = v_m \Rightarrow 0.6421 + (0.3627) = 0.2794$

$c + = v_c \Rightarrow -2.2939 - 1.3707 = -3.6646$

step 7 : sample + = 1 $\Rightarrow$ 1 + 1 > 2

step 8 : if (sample > nc) : goto step 9

else : goto step 4

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

$- (-3.6646 + 10.9 -)$

$= -2.965$

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

step 5 : $v_m = [0.9 \times -0.36277] - [-0.1 \times -2.985] \Rightarrow -0.6249$

$v_c = [0.9 \times -1.3707] - [-1 \times -7.4645] \Rightarrow 7.9800$

step 6 : $m_t = v_m = 0.2974 + (-0.6249) = -0.3275$

$c_t = v_c = -3.6646 - 1.9800 = -4.6446$

step 7 : sample += 1 $\Rightarrow 2+1 = 3$

step 8 : if (sample > ns) ; go to step 9

else : goto step 4

step 9 : iter += 1 $\Rightarrow 2+1 = 3$

step 10 : if (iter > epoches) ; goto step 4

else ; goto step 3

step 11 : print m, c

m = 0.3275
c = -4.6446

#