Assignment-11 :

let us consider a sample dataset have one input (x_i) and one output (y_i) and numbers of samples 4. Develop a SLR model using nesterov Accelarated gradient (NAG) optimiser

sample(i)	x_i	y_i
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:

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

step2: iter$=1$

step3: sample$=1$

step4: $g_m = \frac{\partial E}{\partial m} = -(y_i - (m+\gamma v_m)x_i - ((c+\gamma v_c))x_i$

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

$= -0.84$

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

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

$= -4.2$

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

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

step7: sample += 1 ⇒ 1+1 ⇒ 2

step-8: if (sample > ns) : goto step9

else : goto step4

step4: $g_m = \frac{\partial E}{\partial m}$ ⇒ -(3.8 -(0.916+(0.9x-0.084))0.4 - (-1.42+(0.9x-0.084) x0.4)

⇒ -1.983

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

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

= (0.9 x -0.084) - (-0.1 x -1.983) ⇒ -0.2739

V_c = (0.9x -0.42) -(-0.1x -4.959) ⇒ -0.8739

step6: m += V_m = 0.916-0.2739 = 0.6421

c += V_c = -1.42 - 0.8739 = -2.2939

step7: sample += 1 ⇒ 2+1 ⇒ 3

step8: if (sample > ns) : goto step9

else : goto step4

step9: ito += 1 ⇒ 1+1 ⇒ 2

step10: if (ito > epochs) : goto step11
2 > 2

else : goto step3

step3: sample = 1

step4: $\frac{\partial E}{\partial m}$ ⇒ -(3.4 - (0.642+(0.9 x0.273)) x0.2 - (-2.293 + (0.9x-0.273) x0.2)

gm ⇒ -1.171

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

step5: $V_m = \gamma v_m - \eta g_m$ ⇒ [(0.9) x (-0.273)] - (-0.1 x -1.171)

⇒ -0.3627

$V_c = V_c^{\gamma} - \eta g_c$ ⇒ (0.9)(-0.873) - (-0.1)(-5.859)

= -1.3707

step6: m += V_m ⇒ 0.6421 + (-0.3627) = 0.2794

c += V_c ⇒ -2.2939 - 1.3707 = -3.6646

step7 : sample+=1 ⇒ 1+1 = 2

step8 : if (sample > ns) : goto step9

else : goto step4

step4 : $g_m = \frac{\partial E}{\partial m} = -(3.8 - (0.2799 + (0.9 \times -0.3627)) \times 0.4 - (-3.6646 + (0.9 -$

$= -2.985$

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

step5 : $v_m = [0.9 \times -0.3627] - [-0.1 \times -2.985] \Rightarrow -0.6249$

$v_c = [0.9 \times -1.3707] - [-0.1 \times -7.4645] \Rightarrow -1.9800$

step6 : $m+=v_m = 0.2974 + (-0.6249) = -0.3275$

$c+=v_c = -3.6646 - 1.9800 = -4.6446$

step7 : sample+=1 ⇒ 2+1 = 3

step8 : if (sample > ns) : goto step9

else : goto step4

step9 : itr+=1 ⇒ 2+1 = 3

step10 : if (itr > epochs) : goto step4

else : goto step3

step11 : print m, c

m = 0.3275

c = -4.6446.