Assignment 11.

Let us consider a sample dataset have 1 i/p (x_i^a) & 1 o/p (y_i^a) & number of samples 4. Develop a simple linear regression model using Nesterov Accelerated Gradient (NAG)

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 2 samples.

step 1: [x, y], m=1, c=−1, η=0.1, epochs=2, γ=0.9, $v_m = v_c = 0$, ns=2.

step 2: iter=1

step 3: sample=1

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

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

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

$g_m = -0.84$

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

$= -(8.4 - (1 + 0.9)(0))0.2 - (-1 + (0.9)(0))$

$g_c = -4.2$

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

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

$v_m = -0.084$

$v_c = \gamma v_c - \eta g_c$

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

$v_c = -0.42$

step6: $m = m + v_m = 1 + (-0.084) = 0.916$

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

step7: sample = sample + 1 = 1 + 1 = 2

step8: if (sample > ns)

2 > 2 false

goto step 4

step4: $g_m = \frac{\partial E}{\partial m} = (-3.8 - (0.916) + (0.9)(-0.084)$

0.4

$= -(-1.42 + (0.9)(-0.42))0.4$

$g_m = -2.104$

$$g_2 = \frac{\partial E}{\partial c} = -(3.8 - (0.99 + (0.9)(-0.084)(0.4)) - (-1.42 + (0.9)(-0.42)))$$

$$= -(2.914 + 1.378)$$

$$g_c = -4.712$$

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

$= (0.9)(-0.084) - (-0.1)(-2.64)$

$v_m = -0.286$

~~step~~ $v_c = \gamma v_c - \eta g_c$

$= (0.9)(0.42) - (-0.1)(-4.712)$

$v_c = -0.84$

step 6: $m = m + v_m = 0.916 - 0.286 = 0.63$

$c = c + v_c = -1.42 - 0.84 = -2.26$

step 7: sample = sample + 1 = 2 + 1 = 3

step 8: if (sample > n s)

3 > 2 True

go to next step

step 9: iter = iter + 1 = 1 + 1 = 2

step 10: if (iter > epochs)

2 > 2 False

goto step 2

step3: sample=1

step4: $g_m = \frac{\partial E}{\partial m} = -(34 - (0.63) + (0.9)(-0.286))$ 0.2)

$-(-2.269 + (0.9)(-0.84))0.2$

$g_m = -1.271$

$g_c = \frac{\partial E}{\partial c} = -(3.4 - (0.63)(0.9)(-0.28))0.2$

$-(-2.26 + (0.9)(-0.184)))$

$g_c = -6.35$

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

$= (0.9)(-0.286) - (-0.1)(-1.271)$

$v_m = -0.384$

$v_c = \gamma v_c - \eta g_c$

$= (0.9)(-0.849) - (0.1)(-6.358)$

$v_c = -1.39$

step6: $m = m + v_m = 0.63 - 0.38 = 0.24$

$c = c + v_c = -2.26 - 1.39 = -3.65$

step7: sample = sample + 1 = 1 + 1 = 2

if (sample > ns)

2 > 2 false

go to step 4.

step4: $g_m = \frac{\partial E}{\partial m} = -[3.8 - (0.246) + (0.9)(-038))$

$-(-3.66 + (0.9)(-1.399)))0.4$

$g_m = -3.506$

$g_c = \frac{\partial E}{\partial c} = -[3.8 - (0.246) + (0.9)(-3.84)$

(0.4)

$-(-3.66 + (0.9)(-139)))$

$g_c = -8.766$

step5: $v_m = \gamma v_m - \eta g_m = (0.9)(-0.384)$

$-(-0.1)(-3.586)$

$v_m = -0.696$

$v_c = \gamma v_c - \eta g_c (0.9)(-1.399) - (0.1)(-8.76)$

$v_c = -2.135$

step6: $m = m + v_m = 0.246 + (-0.696)$

$m = -0.45$

$c = c + v_c = -3.668 + (-2.135) = -5.803$

step7: sample = sample + 1 = 2 + 1 = 3

step8: if (sample > ns)

3 > 2 => True go to next step

step9: iter = iter + 1 = 2 + 1 = 3

step10: if (iter > epochs) => 3 > 2 True goto next step

step11: print m & c values => m = -0.45

c = -5.803