Assignment-11

1) 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 calculation for two iterations with first two samples.

Sol)

Step-1: $x, y, m=1, c=-1, \eta=0.1$, epochs=2, $\gamma=0.9$,

$v_m = v_c = 0$

Step-2: iter = 1

Step-3: sample = 1

Step-4: $g_m = \frac{\partial E}{\partial m} = -(3.4-(1+(0.9)0)0.2-(-1+(0.9)0)$ $\times 0.2$

$= 0.84$

$g_c = \frac{\partial E}{\partial c} = -(3.4-(1+0.9)0)0.2-(-1+(0.9)0)$

$= -4.2$

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

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

$v_c = \gamma v_c - \eta g_c$

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

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

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

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

Step-8: if ($2 > 2$)

goto step 9

else

goto step 4

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

$-(-1.42 + (0.9 \times -0.084) \times 0.4)$

$= -1.983$

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

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

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

$v_c = \gamma v_c - \eta g_c$

$= (0.9 \times -0.42) - (-0.1 \times 4.9591) = -0.8739$

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

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

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

Step-8: if ($3 > 2$)

goto step 9

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

Step-10: if (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:
$g_m = \frac{\partial E}{\partial m} = -(3.8 - (0.279 + (0.9 \times -0.3627)) \times 0.4$
$- (-3.6646 + (0.9 \times 0.3627) \times 0.4)$
$= -2.985$

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

$= -0.6249$

$V_c = (0.9 \times -1.3704) - (-0.1 \times -7.4645)$

$= -1.98$

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: $m = 0.3275$

$c = -4.6446$