Assignment - 11

18KH1A0315

Let us consider a sample dataset have one input (x_i) and one output (y_i) and number of samples 11.
Develop a SLR model using Nesterov accelerated gradient (NAG) optimizer.

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 2nd 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:- itr=1

step 3:- sample=1

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

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

$= -0.84$

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

$= -(3.4 - (1+0.9)x0)0.2$

$= -4.2$

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 c:- $m_t = v_m$

$1 - 0.084 = 0.916$

$c_t = v_c = -1 - 0.42$

$= -1.42$

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

step 8:- if (sample > ns)

goto step-9

else

goto step-4

step 4:- $g_m = \frac{\partial E}{\partial m} = -(3.8 - (0.916 + (0.9 \times -0.089)))$

$0.4 - (-1.42 + (0.98 - 0.034) \times 0.4)$

$= -1.983$

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

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

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

$= -0.2739.$

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

$= 0.8739.$

step 6:- $m_t = v_m$

$= 0.916 - 0.2739 = 0.6421$

$c_t = v_c$

$= -1.42 - 0.8739 = -2.2939.$

step 7:- sample += 1

$1+1 = 3$

step 8:- if (sample > ns)

$2 > 2$ goto step-11

else

goto step-3

step 3:- sample = 1

step-4: $\frac{\partial E}{\partial m} = -(3.4 - (0.642 + (0.9 \times 0.273)) \times 0.2 - (-2.293 + (0.9 \times 0.293) \times 0.2)$

$g_m = -1.171$

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

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

$= [(0.9) \times (0.273)] - (-0.1 \times -1.81)$

$= -0.3627$

$V_c = V_c \gamma - \eta g_c$

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

$= -1.3707$

step 6: $m+ = V_m$

$= 0.6421 + (-0.3627)$

$= 0.2794$

$C+ = V_c$

$= -2.2939 - 1.3707 = -3.6646$

step 7: sample+ = 1

$1+1 = 2$

step 8: if (sample > ns)

goto step-9

else

goto step 4

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

$= -2.985$

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

step 5: $V_m = [0.9 \times 0.3627] - [-0.1 \times -2.985]$

$= -0.6249$

$V_c = [0.9 \times -1.3707] - [0.1 \times 7.4643]$

$= -1.9800$

step 6 :- $m += V_m$

$= 0.2974 + (-0.6249) = -0.3275$

$C += V_c = -3.6446 - 1.9800$

$= -4.6446$.

step 7 : sample += 1

$2+1 = 3$

step 8 :- if (sample > ns)

goto step-9

else goto step-4

step 9 :- itr += 1

$2+1 = 3$

step 10 :- if (itr > epochs)

goto step-4

else

goto step-3

step 11 :- print m, c

$m = 0.3275$

$c = -4.6446$.