Assignment - 11

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Let us consider a sample dataset have one input (x_i) and one output (y_i) & no of samples 4. Develop a SLR model using nestrov Accelerated 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, η=0.1, epochs = 2, γ=0.9,

$v_m = v_c = 0$, ns=2.

step2: iter=1

step3: sample=1

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

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

$= 0.84$

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

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

$= -4.2$

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

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

$v_c = \gamma v_c - \eta g_c$

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

step6: $m_t = v_m = 1 - 0.084 = 0.916$

$c_t = v_c = -1 - 0.42 = -1.42$

step7: sample $t = 1 \Rightarrow 1+1 = 2$

step8: if (sample > ns) : goto step9

else: goto step4.

step4: $g_m = \frac{\partial \epsilon}{\partial m} \Rightarrow -(3.8 - (0.916 + (0.9\times - 0.084)0.4 - (-1.42 + (0.9\times - 0.034)0.4)$

$= -1.983.$

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

step5: $m_t = v_m = 0.916 - 0.2739 = 0.6421$

$c_t = v_c = -1.42 - 0.8739 = -2.2939$

step7: sample $t = 1 \Rightarrow 2+1 = 3$

step8: if (sample > ns) : goto step9

else: goto step4

step9: itr $t = 1 \Rightarrow 1+1 \Rightarrow 2$

step10: if (itr > epochs) : goto step11

$2 > 2$

else: goto step3

step 3: sample = 1

step 4: $\frac{\partial \epsilon}{\partial m} \Rightarrow -(3.4 - (0.642 + (0.9 \times 0.273)) \times 0.2 -$
$(-2.273 + (0.9 \times -0.273) \times 0.2)$

$g_m \Rightarrow -1.171$

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

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

$= [(0.7) \times (-0.273)] - (-0.1 \times -1.81)$

$= -0.3627$

$v_c = \gamma_c \gamma - \eta g_c$

$= (0.7)(-0.873) - (-0.1)(-5.859)$

$= -1.3707$

step 6: $m_t = v_m \Rightarrow 0.6421 + (-0.3627)$

$= 0.2794$

$c_t = v_c \Rightarrow -2.2939 - 1.3707$

$= -3.6646$

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

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

else: goto step 4.

step 4: $g_m = \frac{\partial \epsilon}{\partial m} = -(3.8 - (0.279 + (0.9 \times -0.3627)) \times 0.4$
$-(-3.6646 + (0.9 - 0)) \cdot$

$= -2.985$

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

step 5: $v_m = [0.9x - 0.3627] - [-0.1x - 2.985]$

$= -0.6249$

$v_c = [0.7x - 1.3707] - [-0.1x - 7.4645]$

$= -1.9800$

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

$= -0.3275$

$c_t = v_c = -3.6646 - 1.7800$

$= -4.6446$

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

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

else: goto step 4

step 9: itr += 1 => 3+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