Assignment-4

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Let us consider a sample dataset have one input (x_i) and one output (y_i) and number 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.

Step-1: [x, y], m=1, c=-1, η=0.1, epochs=2,

γ=0.9, $V_m = V_c = 0$, $n_b = 2$

Step-2: itr=1

Step-3: sample=1.

Step-4: $g_m = \frac{\partial E}{\partial m} = -(y_i - (m + r_m) x_i - (c + r v_c)$

x_i

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

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

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

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

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

$= -4.2$

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

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

$= -0.084.$

$v_c = r v_c - \eta g_c$

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

$= -0.42.$

Step-6: $m_t = v_m$

$1 - 0.084 = 0.916$

$c_t = v_c = -1 - 0.42$

$= -1.42$

Step-7: sample $t = 1$

$1 + 1 = 2$

Step-8: if (Samples ≠ ns)
goto step-9
else
goto step-4

Step-4: $gm = \frac{\partial E}{\partial m} = -(3.8 - (0.916 + (0.9 \times -0.089))$
$0.4 - (-1.42 + (0.98 - 0.034)$
$\times (0.4)$

$= -1.983$

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

Step-5: $Vm = \gamma Vm - \eta gm$

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

$= -0.2739$

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

$= 0.8739$

Step-6: $m+ = Vm$

$= 0.916 - 0.2739$

$= 0.6421$

$c+ = Vc$

$= -1.42 - 0.8739$

$= -2.2739$

Step-7: sample += 1

1+1=3

Step-8: if (sample > ns)

goto step-1)

2 > 2

else

goto step-3

Step-3: sample = 1

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

$g_m = -1.171$

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

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

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

$= -0.3627$

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

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

$= -1.3707$

Step-6: $m + = V_m$

$= 0.6421 + (-0.3627)$

$= 0.2794$

$c_t = V_c$

$= -2.2939 - 1.3707$

$= -3.6646$

Step-7: Sample t = 1

$1 + 1 = 2$

Step-6: if (sample > n s)

goto step-9.

else

goto step-4

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

$= -2.985$

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

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

$= -0.6249$

$V_c = [0.9 \times -1.3707] - [-0.1 \times 7.4645)$

$= -1.9800$

Step-6: $m += Vm$

$= 0.2974 + (-0.6249)$

$= -0.3275$

$c += Vc = -3.6646 - 1.9800$

$= -4.6446$

Step-7: Sample += 1

$2 + 1 = 3$

Step-8: if (Sample > rx)

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

$m = 0.3275$

$c = -4.6446$