NNDL Assignment-11

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①

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^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 1st 2 samples.

Step-1: $[X, Y]$, $m=1$, $c=-1$, $\eta=0.1$, epochs $=2$, $\gamma=0.9$, $v_m=v_c=0$, $ns=2$

step-2: itr $=1$

step-3: Sample $=1$

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

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

$= -0.84$

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

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

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

$= -4.2$

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

$1+1=2$

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: $m+ = v_m$

$= 0.916-0.2739$

$= 0.6421$

$c+ = v_c$

$= -1.42-0.8739$

$= -2.2939$

Step-7: sample + = 1

$1+1=3$

Step-8: if(sample > ns)

goto step-11

$2>2$

else

goto step-3

Step-3: sample = 1

Step-4 = $\frac{\partial E}{\partial m} = -(3.4-(0.642+(0.9\times0.273))\times0.2-(-2.293+(0.9\times-0.273)\times0.2)$

$g_m = -1.171$

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

③

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: $v_m = [0.9 \times -0.3627] - [-0.1 \times -2.985]$

$= -0.6249$

$v_c = [0.9 \times -1.3707] - [-0.1 \times 7.4645]$

$= -1.9800$

Step-6: $m + = v_m$

$= 0.2974 + (-0.6249)$

$= -0.3275$

$c + = v_c = -3.6646 - 1.9800$

$= -4.6446$

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