ASSIGNMENT-9 — 18K41A0502

Let us consider a sample dataset have 1 input (x_i) and one output (y_i) and number of samples 4. Develop a simple linear regression model using momentum 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 1st 2 samples.

S-1 : [x, Y] m=1, c=-1, η=0.1, epochs=2, δ=0.9, $v_m = v_c = 0$, ns=2

S-2 : itr=1

S-3 : sample=1

S-4 : $g_m = \frac{\partial E}{\partial m} = -(y_i - mx_i - c)x_i$

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

$= -0.84$

$g_c = \frac{\partial E}{\partial c} = -(y_i - mx_i - c)$

$= -(3.4 - 0.2 + 1)$

$= -4.2$

S-5 : $v_m = \delta v_m - \eta g_m$

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

$= 0 - 0.084$

$= -0.084$

$v_c = \delta v_c = \eta g_c$

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

S-6: $m = m + \nu_m$

$= 1 + (-0.84)$

$= -0.916$

$c = c + \nu_c$

$= -1 - 0.42$

$= -1.42$

S-7: Sample t = 1

$1 + 1 = 2$

S-8: If (sample > ns)

$2 > 2$ goto S-9

else

goto S-4

S-4: $g_m = \frac{\partial E}{\partial m} = -(3.8 - 10.916)(0.4) + 1.12)(0.4)$

$= -1.941$

S-5: $g_c = \frac{\partial E}{\partial c} = -4.853$

$\nu_m = \gamma \nu_m - \eta g_m$

$= (0.9)(-0.084) - [-0.1 \times -1.941]$

$= -0.2697$

$\nu_c = \gamma \nu_c - \eta g_c$

$= (0.9)(-0.42) - [-0.1 \times -4.853]$

$= -0.863$

S-6: $m = m + \nu_m$

$= 0.916 + (-0.2697)$

$= 0.6463$

$c = c + \nu_c$

$= -1.42 - 0.863$

$= -2.283$.

S-7: sample = sample+1
= 2+1 = 3

S-8: If (sample >ns)
goto s-9
else
goto s-4

S-9: itr += 1
1+1 = 2

S-10: If (itr > epochs)
goto s-4
else
goto s-3

S-3: sample = 1

S-4: $gm = \frac{\partial E}{\partial M} = -(3.4 - (0.646)(0.2) + 2.283)(0.2)$
$= -1.110$

$gc = \frac{\partial E}{\partial c} = -(3.4 - (0.646)(0.2) + 2.283$
$= -5.553$

S-5: $vm = \delta vm - \eta gm$
$= (0.9)(-0.2697) - [-0.1 \times -1.110]$
$= -0.353$

$vc = \delta vc - \eta gc$
$= (0.9)(0.863) - [-0.1 \times -5.53]$
$= -1.332$

S-6: $m = m + vm$
$= 0.6463 + (-0.353)$
$= 0.293$.

$c = c + vc = -2.283 - 1.332 = -3.615$

S-7: samplet=1

1+1=2

S-8: if(sample>ns)

2>2 goto S-9

else

goto S-4

S-4: $q_m = -(3.8-(0.293)(0.4)+3.615)(-0.4)$

$= -2.919$

$q_c = -(3.8-(0.293)(0.4)+3.615)$

$= -7.297$

S-5: $v_m = (0.9)(-0.353) - [-0.1 \times -2.919]$

$= -0.6096$

$v_c = (0.9)(-1.332) - [-0.1 \times -7.297]$

$= -1.9285$

S-6: $m_t = v_m$

$0.293 - 0.609 = -0.316$

$c_t = v_c$

$-3.615 - 1.928 = -5.543$

S-7: samplet=1

2+1=3

S-8: if (sample >ns)

goto S-9

else

goto S-4

S-9: ptr+=1

2+1=3.

s-10 : if(itr > epochs)
goto s-11
else
goto s-3

s-11 : print m, c

$m = -0.316, c = -5.543$