Assignment - XI (11)

— 18K41A0562

* simple linear regression 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 two iterations with first two samples. $\left(E = \frac{1}{2}(y_i - mx_i - c)^2\right)$

Calculations:

step1: $[x, y]$, m=1, c=-1, $\eta = 0.1$, epoches = 2,

$\gamma = 0.9$, $v_m = v_c = 0$, ns = 2

step2: iter = 1

step3: sample = 1

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

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

$= -0.84$

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

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

$= -4.2$

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

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

$= +0.084$

$v_c = \gamma v_c - \eta g_c$

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

$= +0.42$

step6: $m = m + v_m = 1 + (0.084) = 1.084$

$c = c + v_c = -1 + (0.42) = -0.58$

step7: sample t = 1

step8: if (sample > ns) // 2 > 2

goto step 9

else: goto step 4

step4: $g_m = \frac{\partial E}{\partial m} = -(3.8 - (1.084 + (0.9)(0.084))(0.4)$

$- ((-0.58) + (0.9)(0.42)))(0.4)$

$= -(3.8 - (1.1596)(0.4) - (-0.202))(0.4)$

$= -(3.8 - 0.4638 + (0.202))(0.4)$

$= -1.4152$

$g_c = \frac{\partial E}{\partial c} = -(3.8 - (1.084 + (0.9)(0.084))(0.4)$

$-((-0.58) + (0.9)(0.42)))(0.4)$

$= -3.5382$

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

$= (0.9)(0.084) - (0.1)(-1.4152)$

$= 0.2171$

$v_c = \gamma v_c - \eta g_c = (0.9)(0.42) - (0.1)(-3.5382)$

$= 0.7318$

step6:- $m = m + v_m = 1.084 + 0.2171 = 1.3011$

$c = c + v_c = -0.58 + 0.7318 = 0.1518$

step7:- sample += 1

step8:- if (sample > ns) // 3 > 2

goto step 9

else

goto step 4

step9:- iter += 1

step10:- if (iter > epoches) // 2 > 2

goto step11

else

goto step 3

step3:- sample = 1

step4:- $g_m = \frac{\partial E}{\partial m} = -(3.4 - [1.3011 + (0.9)(0.2171)](0.2) - (0.1518 + (0.9)(0.7318)))(0.2)$

$= -(3.4 - (1.4964)(0.2) - 0.8104)(0.2)$

$= -(3.4 - 0.2992 - 0.8104)(0.2)$

$= -0.4580$

$g_c = \frac{\partial E}{\partial c} = -2.2904$

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

$= (0.9)(0.2171) + (0.1)(0.4580)$

$= 0.1953 + 0.0458 = 0.2411$

$v_c = \gamma v_c - \eta g_c$

$= (0.9)(0.7318) + (0.1)(2.2904)$

$= 0.6586 + 0.2290 = 0.8876$

step6: $m = m + v_m = 1.3011 + 0.2411 = 1.5422$

$c = c + v_c = 0.1518 + 0.8876 = 1.0394$

step7: sample += 1

step8:- if (sample > ns) // 2 > 2

goto step 9

else

goto step 4

step4: $g_m = \frac{\partial E}{\partial m} = -(3.8 - (1.5422 + (0.9)(0.2411)).(0.4)$

$- (1.0394 + (0.9)(0.8876))).(0.4)$

$= -0.5032$

$g_c = -1.2582$

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

$= (0.9)(0.2411) + (0.1)(0.5032)$

$= 0.2672$

$v_c = \gamma v_c - \eta g_c$

$= (0.9)(0.8876) + (0.1)(1.2582)$

$= 0.9246$

step6: $m = m + v_m = 1.5422 + 0.2672 = 1.8094$

$c = c + v_c = 1.0394 + 0.9246 = 1.964$

step7:- sample += 1

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

else: goto step 4

step9: iter += 1

step10: if (iter > epoches) // 3 > 2

goto step11

else goto step 3

step11: print(m, c)

$m = 1.8094$

$c = 1.964$