

Assignment - 9

Manual Calc - for 2 iterations with 1st 2 samples  
(Momentum Optimizer)

Sample	X	Y
1	0.2	3.4
2	0.4	3.8

skip:  $m=1, c=-1, \eta=0.1, \text{epochs}=100, \gamma=0.9,$   
 $V_m = V_c = 0$

step 2 iter=1

step 3 sample=1

step 4  $E = \frac{1}{2}(y_i - mx_i - c)^2$

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

$$= -(3.4 - (1)(0.2) - 1)0.2 = -0.84$$

$$g_c = \frac{\partial E}{\partial c} = -(y_i - mx_i - c) = -4.2$$

step 5  $V_m = \gamma V_m - \eta \frac{\partial E}{\partial m} = 0.9 \times 0 - (0.1)(-0.84)$

$$\underline{V_m = 0.084}$$

$$V_c = \gamma V_c - \eta \frac{\partial E}{\partial c} = 0.9 \times 0 - (0.1)(-4.2)$$

$$\underline{V_c = 0.42}$$

step 6  $m = m + V_m = 1 + 0.084 = 1.084$

$$c = c + V_c = -1 + 0.42 = -0.58$$

step 7: sample + 1 = 2

step 8 if (sample > 2)

step 9

else

goto step 4

$$\text{step 4: } \frac{\partial E}{\partial m} = -0.4 (3.8 - (1.084)(0.4) + 0.59)$$

$$\frac{\partial E}{\partial m} = -1.578$$

$$\text{step 5: } V_m = \gamma V_m - \eta \frac{\partial E}{\partial m}$$

$$V_m = 0.9 \times (0.084) - (0.1)(-1.578) = 0.233$$

$$V_c = \gamma V_c - \eta \frac{\partial E}{\partial c} = 0.9 \times 0.42 - (0.1 \times (-3.94))$$

$$V_c = 0.772$$

$$\text{step 6: } m = m + V_m = 1.084 + 0.233 = 1.317$$

$$c = c + V_c = -0.53 + 0.772 = 0.192$$

step 7 Sample = 3

step 8 if (3 > 2) ✓

goto step 9 (next)

step 9 itr = 2

step 10 if (itr > epochs) x

2 > 2 X

goto step 3



S-3 sample=1

$$S-4 \quad \frac{\partial E}{\partial m} = -(3.4 - 1.317 * 0.2 - 0.192)0.2 = \underline{-0.58}$$

$$\frac{\partial E}{\partial c} = -(3.4 - 1.317 * 0.2 - 0.192) = \underline{-2.944}$$

step5  $V_m = \gamma V_m - \eta \frac{\partial E}{\partial m}$

$$V_m = 0.9 * 0.233 + (0.1)(0.58) = \underline{0.268}$$

$$V_c = \gamma V_c - \eta \frac{\partial E}{\partial c}$$

$$= 0.9 * 0.772 + 0.1(2.944) = \underline{0.9892}$$

step6  $m = m + V_m = 1.317 + 0.268 = 1.58$

$$c = c + V_c = 0.192 + 0.989 = 1.18$$

step7 : sample=2

step8 : if(2>2)

step9 X

goto step4

step4  $\frac{\partial E}{\partial m} = -(3.8 - 1.58 * 0.4 - 1.18)0.4 = -0.79$

$$\frac{\partial E}{\partial c} = -(3.8 - 1.58 * 0.4 - 1.18) = -1.98$$

step5  $V_m = \gamma V_m - \eta \frac{\partial E}{\partial m}$

$$= 0.9 * 0.26 + (0.1) * (0.79) = \underline{0.313}$$

step 6  $m = m + v_m = 1.58 + 0.313$

$m = 1.89$

step 7  $c = c + v_c = 1.58 + 1.08 = \underline{2.26}$

step 7 sample = 3

step 8 if (3 > 2) step 9

step 9 it = 3

step 10 if (3 > 2) ✓  
step 11 (next step)

step 11  $m = 1.89, c = 2.26$

⇓  
Obtained m & c values (2 iterations)  
2 samples.

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