Assignment - 9: Momentum Gradient Descent

: Manual Calculations

Step 1: Read [x,y], m=1, c=-1, η=0.1, γ=0.9, epochs=2,

V_m=0, V_c=0

Step 2: iter = 1

Step 3: Sample = 1

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

$\frac{\partial E}{\partial m} = -(3.4 - (1)(0.2) + 1)(0.2) = -(4.2)(0.2) = -0.84$

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

manoj

Step 5: $V_m = \gamma V_m - \eta \frac{\delta E}{\delta m}$ $= (0.9)(0) - (0.1)(-0.84)$
$= 0.084$

$V_c = (0.9)(0) - (0.1)(4.2) = 0.42$

Step 6: $m = 1 + 0.084 = 1.084$ | $c = -1 + 0.42 = -0.58$

Step 7: sample = 1 + 1 = 2

Step 8: if sample > ns $\Rightarrow$ 2 > 2 $\Rightarrow$ false
goto step 4

Step 9: $\frac{\delta E}{\delta m} = -\left(3.8 - (1.084 \times 0.4) + 0.58\right) \times 0.4$

$= -(3.9464) \times 0.4 = 1.57856$

$\frac{\delta E}{\delta c} = -3.9464$

Step 10: $V_m = (0.9)(0.084) - (0.1)(1.57856) = +0.08225$

$V_c = (0.9)(0.42) - (0.1)(-3.9464) = 0.77264$

Step 11: $m = 1.084 + 0.08225 = 1.16625$

$c = -0.58 + 0.77264 = 0.19264$

Step 12: sample = 2 + 1 = 3

Step 13: if sample > ns = 3 > 2 = true
goto step 14

Step 14: iter = 1 + 1 = 2

Step 15: if iter > epoch $\Rightarrow$ 2 > 2 $\Rightarrow$ false
goto step 3

Step16: sample = 1

Step17: $E = \frac{1}{2}(y - ma - c)^2$

$\frac{\partial E}{\partial m} = -(3.4 - (1.16625 \times 0.2) - 0.19264) \times 0.2$

$= -(2.974411) \times 0.2 = -0.594482$

$\frac{\partial E}{\partial c} = -2.974411$

Step18: $V_m = (0.9)(0.08225) - (0.1)(-0.594482) = 0.133507$

$V_c = (0.9)(0.772641) - (0.1)(-2.974411) = 0.992787$

Step19: $m = 1.16625 + 0.133507 = 1.299757$

$c = 0.19264 + 0.992787 = 1.185427$

Step20: Sample = 1+1 = 2

Step21: if sample > n_s = 2 > 2 = false

goto step 4

Step22: $\frac{\partial E}{\partial m} = -(3.8 - (1.299757) \times (0.4) - 1.185427) \times 0.4$

$= -(2.094670) \times 0.4 = -0.83786$

$\frac{\partial E}{\partial c} = -2.09467$

Step23: $V_m = (0.9)(0.133507) - (0.1)(-0.83786)$

$= 0.20394$

$V_c = (0.9)(0.992787) - (0.1)(-2.09467)$

$= 1.10297$

Step 24: m = 1.299757 + 0.20394 = 1.503697

c = 1.10297 + 1.185427 = 2.288397

Step 25: iter = 2+1 = 3

Step 26: if iter > epochs = 3 > 2 = false

goto step 27

Step 27: print(m, c)

= 1.503697, 2.288397

Step 28: calculating mean squared error.

$$mse = \frac{(2.5891364) + (2.889875)}{2}$$

$$= \frac{(5.4790122)}{2} = 2.7395061$$

mse = 2.7395061