18K41A0588

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

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

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

Step-5 :- $v_m = \gamma v_m - \eta \frac{dE}{\partial m} = (0.9)(0) - (0.1)(-0.84)$

$= 0.084$

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

Step-6 :- $m = 1 + 0.084 = \underline{1.084}$

$c = -1 + 0.42 = \underline{-0.58}$

step-7 :- sample = 1+1 = 2

step-8 :- if sample > ns ⇒ 2 > 2 ⇒ false
goto step 4

step-9 :- $\frac{\partial E}{\partial m} = -(3.8 - (1.084 \times 0.4) + 0.58) \times 0.4$

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

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

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 ⇒ 2 > 2 ⇒ false
goto step 3

Step-16 :- sample = 1

Step-17 :- $E = \frac{1}{2}(y - mx - c)^2$

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

$$= -(2.97411) \times 0.2 = -0.59482$$

$$\frac{\partial E}{\partial c} = -2.97411$$

Step-18 :- $V_m = (0.9) \times (0.08225) - (0.1) \times (-0.59482)$

$$\equiv 0.133507$$

$$V_c = (0.9) \times (0.77264) - (0.1) \times (-2.97411)$$

$$= 0.992787$$

Step-19 :- $m = 1.16625 + 0.133507 = 1.299757$

$C = 0.19264 + 0.992787 = 1.185427$

Step-20 :- sample = 1+1 = 2

Step-21 :- if sample > ns = 2 > 2

⇒ false

goto step 4

step-22 :- $\frac{\partial E}{\partial m} = -(3.8 - (1.299757) \times (0.4) - 1.185427) \times 0.4$

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

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

step-23 : $v_m = (0.9)(0.133507) - (0.1)(-0.83786)$

$= 0.20394$

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

$= 1.10297$

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 = true

goto step 27

Step-27 :- print (m, c)

$= 1.503697, 2.288397$

Step-28 :- Calculating mean squared error :-

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

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

$$mse = 2.7395061 //$$