

18K41A05R4

Assignment 9
Momentum Gradient Descent

Steps

1) Read $[x, y], w \leftarrow 1, c \leftarrow -1, \eta \leftarrow 0.1, \gamma \leftarrow 0.9$,
epochs $\geq 2, V_w \leftarrow 0, V_c \leftarrow 0$

2) iter $\leftarrow 1$

3) Sample $\leftarrow 1$

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

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

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

5) $V_w = \gamma V_w - \eta \frac{\partial E}{\partial w} = (0.9)(0) - (0.1)(-0.84) \\ = 0.084$

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

6) $w \leftarrow 1 + 0.084 = 1.084$

$$c \leftarrow -1 + 0.42 = -0.58$$

7) Sample $\leftarrow 1 + 1 = 2$

8) if sample $> n_s \Rightarrow 2 > 2 \Rightarrow \text{false}$
goto step 4

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

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

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

$$10) V_w = (0.9)(0.084) - (0.1)(1.57856) = 0.08225$$

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

$$11) w = 1.084 + 0.08225 = 1.16625$$

$$C = -0.58 + 0.77264 = 0.19264$$

$$12) \text{Sample} = 2 + 1 = 3$$

$$13) \text{if Sample} > n_s = 372 \Rightarrow \text{true} \rightarrow \text{goto step 1}$$

$$14) \text{iter} = 1 + 1 = 2$$

$$15) \text{if iter} > \text{epoch} = 2 > 2 \Rightarrow \text{false} \rightarrow \text{goto step 3}$$

$$16) \text{Sample} = 1$$

$$17) E = \frac{1}{2} (y - wx - C)^2$$

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

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

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

$$18) V_m = (0.9)(0.08225) - (0.1)(-0.59482) = 0.133507$$

$$V_c = (0.9)(0.77264) - (0.1)(-2.97411) = 0.992787$$

$$19) w = 1.16625 + 0.133507 = 1.299757$$

$$c = 0.19264 + 0.992787 = 1.185427$$

$$20) \text{ sample} = 1 + 1 = 2$$

$$21) \text{ if sample} > n_s = 2 > 2 = \text{false}$$

goto step 4

$$22) \frac{\partial E}{\partial w} = -(3.8 - (1.299757)(0.4) - 1.185427)(0.4)$$

$$= -(2.094676)(0.4) = -0.83786$$

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

$$23) V_m = (0.9)(0.133507) - (0.1)(-0.83786)$$

$$= 0.20394$$

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

$$= 1.10297$$

$$24) w = 1.299757 + 0.20394 = 1.503697$$

$$c = 1.10297 + 1.185427 = 2.288397$$

$$25) \text{ iter} = 2 + 1 = 3$$

$$26) \text{ if iter} > \text{epochs} = 3 > 2 = \text{false}$$

goto next step

27) Print m, c

$$m = 1.503697$$

$$c = 2.288397$$

28) MSE

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

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

$$mse = 2.7395061$$