

# ASSIGNMENT-9

- 18K41A0502

Let us consider a sample dataset have 1 input ( $x_i$ ) and one output ( $y_i$ ) and number of samples 4. Develop a simple linear regression model using momentum 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 a iterations with 1st 2 Samples.

S-1:  $[x, Y]$   $m=1, c=-1, \eta=0.1, \text{epochs}=2, \delta=0.9, V_m=V_c=0, ns=2$

S-2:  $\text{itr}=1$

S-3: Sample=1

$$\begin{aligned} \text{S-4: } g_m &= \frac{\partial E}{\partial m} = -(y_i - mx_i - c)x_i \\ &= -(3.4 - (1)(0.2) + 1)(0.2) \\ &= -0.84 \end{aligned}$$

$$\begin{aligned} g_c &= \frac{\partial E}{\partial c} = -(y_i - mx_i - c) \\ &= -(3.4 - 0.2 + 1) \\ &= -4.2 \end{aligned}$$

$$\begin{aligned} \text{S-5: } V_m &= \delta V_m - \eta g_m \\ &= (0.9)0 - (-0.1)(-0.84) \\ &= 0 - 0.084 \\ &= -0.084 \end{aligned}$$

$$\begin{aligned} V_c &= \delta V_c - \eta g_c \\ &= 0.9 \times 0 - (-0.1)(-4.2) = -0.42 \end{aligned}$$



$$S-6: m = m + \dot{m}$$

$$= 1 + (-0.84)$$

$$= -0.916$$

$$c = c + \dot{c}$$

$$= -1 - 0.42$$

$$= -1.42$$

$$S-7: \text{Sample} + 1$$

$$1 + 1 = 2$$

$$S-8: \text{Pf} (\text{sample} > \text{ns})$$

goto S-9  
else  
goto S-4

$$S-4: g_m = \frac{\partial E}{\partial m} = -(3.8 - 10 \cdot 916)(0.4) + 1 \cdot (1.2)(0.4)$$

$$= -1.941(4.0)(0.4) - 0.8 = -3.6 = \text{mpf} : 142$$

$$S-5: g_c = \frac{\partial E}{\partial c} = -4.853$$

$$\dot{m} = \dot{m} - \eta g_m$$

$$= (0.9)(-0.084) - [-0.1 \times -1.941]$$

$$= -0.2697$$

$$\dot{c} = \dot{c} - \eta g_c$$

$$= (0.9)(-0.42) - [-0.1 \times -4.853]$$

$$= -0.863$$

$$S-6: m = m + \dot{m}$$

$$= 0.916 + (-0.2697)$$

$$= 0.6463$$

$$c = c + \dot{c}$$

$$= -1.42 - 0.863$$

$$= -2.283$$

$$S-7: \text{sample} = \text{sample} + 1 \\ = 2 + 1 = 3$$

$$S-8: \text{if } (\text{sample} > \text{ns}) \\ \text{goto } S-9 \\ \text{else} \\ \text{goto } S-4$$

$$S-9: \text{itr} += 1 \\ 1 + 1 = 2$$

$$S-10: \text{if } (\text{itr} > \text{epochs}) \\ \text{goto } S-4 \\ \text{else} \\ \text{goto } S-3$$

$$S-3: \text{sample} = 1$$

$$S-4: g_m = \frac{\partial E}{\partial m} = -(3.4 - (0.646)(0.2) + 2.283)(0.2) \\ = -1.110$$

$$g_c = \frac{\partial E}{\partial c} = -(3.4 - (0.646)(0.2) + 2.283)$$

$$= -5.553$$

$$S-5: v_m = \delta v_m - \eta g_m$$

$$= (0.9)(-0.2697) - [-0.1 \times -1.110]$$

$$= -0.353$$

$$v_c = \delta v_c - \eta g_c$$

$$= (0.9)(0.863) - [-0.1 \times -5.53]$$

$$= -1.332$$

$$S-6: m = m + v_m$$

$$= 0.6463 + (-0.353)$$

$$= 0.293$$

$$c = c + v_c = -2.283 - 1.332 = -3.615$$



S-7: samplet = 1  
1 + 1 = 2

S-8: if (sample > ns)

2 > 2 goto S-9

else  
goto S-4

$$S-4: g_m = -(3.8 - (0.293)(0.4) + 3.615)(-0.4)$$

$$= -2.919$$

$$g_c = -(3.8 - (0.293)(0.4) + 3.615)$$

$$= -7.297$$

$$S-5: v_m = (0.9)(-0.353) - [-0.1 \times -2.919]$$

$$= -0.6096$$

$$v_c = (0.9)(-1.332) - [-0.1 \times -7.297]$$

$$= -1.9285$$

S-6: m + = v\_m

$$0.293 - 0.609 = -0.316$$

$$c + = v_c$$

$$-3.615 - 1.928 = -5.543$$

S-7: samplet = 1

$$2 + 1 = 3$$

S-8: if (sample > ns)

goto S-9

else  
goto S-4

S-9: ptrt = 1

$$2 + 1 = 3$$

S-10: if (itr > epochs)

goto s-11

else

goto s-3

S-11: print m, c

m = -0.316, c = -5.543

$$l = \frac{1}{2} \log \frac{1}{m^2} = 1.5$$

$$e = 1 + l$$

$$(2.0 < \log m^2) \text{ if } 2.0 < 2$$

$$p = 2 \text{ if } e < 1$$

$$3/1/2$$

$$p = 2 \text{ if } 3/1/2$$

$$(p \cdot 0.1) (2.12 \cdot e + (p \cdot 0) (e p 6 \cdot 0) - 2 \cdot e) = m p: \mu = 2$$

$$p p \cdot 0 =$$

$$(2.12 \cdot e + (p \cdot 0) (e p 6 \cdot 0) - 2 \cdot e) = 2 p$$

$$p p \cdot 0 =$$

$$(p p \cdot 0 - x \cdot 0) - (e p 6 \cdot 0) (p \cdot 0) = m p: 2 = 2$$

$$2 p 0 \cdot 0 =$$

$$(p p \cdot 0 - x \cdot 0) - (e p 6 \cdot 0) (p \cdot 0) = 0$$

$$2 p 0 \cdot 0 =$$

$$m p = 1 m: 0.1$$

$$2.12 \cdot 0 = 2 p 0 \cdot 0 - e p 6 \cdot 0$$

$$0 = 1.5$$

$$e p 2 \cdot 0 = 2 p 0 \cdot 0 - 2.12 \cdot 0 =$$

$$l = \frac{1}{2} \log \frac{1}{m^2} = 1.5$$

$$e = 1 + l$$

$$(2.0 < \log m^2) \text{ if } 2.0 < 2$$

$$p = 2 \text{ if } e < 1$$

$$3/1/2$$

$$p = 2 \text{ if } 3/1/2$$

$$2 = 1.5: 0.1$$

$$0 = 1.5$$