

# Assignment - V

- 18K41A0562

\* simple linear regression model using MBGD.

sample (i)	$x_i$	$y_i$	
1	0.2	3.4	} Batch 1
2	0.4	3.8	
3	0.6	4.2	} Batch 2
4	0.8	4.6	

with Batch  
size = 2

calculations:

step 1:  $[X, Y]$ ,  $m=1$ ,  $c=-1$ ,  $\eta=0.1$ .

epochs = 2, bs = 2

step 3: iter = 1

step 2:  $nb = \frac{ns}{bs} = \frac{4}{2} = 2$

step 4: Batch = 1

step 5: 
$$\frac{\partial E}{\partial m} = \frac{-1}{bs} \sum_{i=1}^{bs} (y_i - mx_i - c) x_i$$

$$= -\frac{1}{2} \left[ (3.4 - 1)(0.2) + 1(0.2) + \right.$$

$$\left. ((3.8 - 0.4 + 1) 0.4) \right]$$

$$= -1.34$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2} \left[ (3.4 - 0.2 + 1) + (3.8 - 0.4 + 1) \right]$$

$$= -4.3$$

step 6:  $\Delta m = -(0.1) (-1.34) = 0.134$   
 $\Delta c = -(0.1) (-4.3) = 0.43$

step 7:  $m = m + \Delta m = 1 + 0.134 = 1.134$   
 $c = c + \Delta c = -1 + 0.43 = -0.57$

step 8: Batch  $t = 1$

step 9: if (Batch  $> n_b$ ) //  $2 > n$   
 goto step 10

else  
 goto step 5

step 5:  $\frac{\partial E}{\partial m} = -\frac{1}{2} \left[ (4.2 - (1.134)(0.6) + 0.57) 0.6 \right.$   
 $\left. + (4.6 - (1.134)(0.8) + 0.57) 0.8 \right]$   
 $= -2.932$

$\frac{\partial E}{\partial c} = -\frac{1}{2} \left[ (4.2 - (1.134)(0.6) + 0.57) \right.$   
 $\left. (4.6 - (1.134)(0.8) + 0.57) \right]$   
 $= -4.1762$

step 6:  $\Delta m = -(0.1) (-2.932) = 0.2932$   
 $\Delta c = -(0.1) (-4.1762) = 0.41762$

step 7:  $m = m + \Delta m = 1.134 + 0.2932 = 1.4272$   
 $c = c + \Delta c = -0.57 + 0.4176 = -0.1523$

step 8: Batch  $t = 1$

step 9: if (Batch  $> n_b$ ) //  $3 > 2$   
 goto step 10

else  
 goto step 5

step 10:

iter  $t = 1$

step 11: if (iter > epochs) // 2 > 2  
                   goto step 12  
           else  
             goto step 4

step 4: Batch = 1

step 5:  $\frac{\partial E}{\partial m} = -\frac{1}{2} \left[ (3.4 - (1.4222)(0.2) + 0.1523)0.2 + (3.8 - (1.4222)(0.4) + 0.1523)0.4 \right]$   
 $= -1.0029$

$\frac{\partial E}{\partial c} = -\frac{1}{2} \left[ ((3.4) - (1.4222)(0.2) + 0.1523) + (3.8 - (1.4222)(0.4) + 0.1523) \right]$   
 $= -3.3241$

step 6:  $\Delta m = (-0.1)(-1.0029) \Rightarrow 0.1002$

$\Delta c = (-0.1)(-3.3241) = 0.332$

step 7:  $m = m + \Delta m = 1.4222 + 0.1002 = 1.5224$

$c = c + \Delta c = -0.1523 + 0.332 = 0.1797$

step 8: Batch + 1

step 9: if (Batch > nb) // 2 > 2  
                   goto step 10  
           else  
             goto step 5

step 5:  $\frac{\partial E}{\partial m} = -2.21$   
 $\frac{\partial E}{\partial c} = -3.151$

step 6:  $\Delta m = (-0.1)(-2.21)$

$\Delta m = 0.221$

$\Delta c = -(-0.1)(-3.151) = 0.315$

step 7:  $m = m + \Delta m = 1.8224 + 0.221 = 1.748$

$c = c + \Delta c = 0.1797 + 0.315 = 0.494$

step 8:  $Batch + 1$

step 9: if (Batch > nb) //  $3 > 2$   
goto step 10

else  
goto step 5

step 10:  $iter + 1$

step 11: if (iter > epochs) //  $3 > 2$   
goto step 12

else  
goto step 4

step 12: print(m, c)

$m = 1.748$

$c = 0.494$