

# ASSIGNMENT – 4a

Estimate the bicarbonates of well water based on its pH value using simple regression model. Consider SGD optimizer. Dataset: Union Carbide Technical Report

- Do the manual calculation for two iteration by taking only first two samples in the dataset

Sample (i)	$x_i^a$	$y_i^a$
1	7.6	157
2	7.1	174

Step 1:  $\eta = 0.01$ , epochs=1,  $m=-1$  and  $c=-1$

Step 2: Set Iteration = 1

Step 3: Set Sample  $i = 1$

Step 4:  $Y = 1(7.6) - 1 = 6.6$

Step 5:  $E = 0.5 * (157 + 6.6)^2 = 13382.48$

Step 6:  $dE/dm = -(157 + 6.6) * 7.6 = -1243.36$  and  $dE/dc = -(157 + 6.6) = -163.6$

Step 7:  $\Delta m = -(0.01) (-1243.36) = 12.4336$  and  $\Delta c = -(0.01) (-163.6) = 1.636$

Step 8:  $m = -1 + 12.4336 = 11.4336$  and  $c = -1 + 1.636 = 0.636$

Step 9: Sample  $i = i + 1 = 2$  and  $2 < n, = 4$

Step 10:  $Y = (11.4336) (7.1) - 15.36 = 74.74256$

Step 11:  $E = 0.5 * (174 + 74.74256)^2 = 134.37128$

Step 12:  $dE/dm = -(174 + 74.74256) * 7.1 = -1908.072176$  and  $dE/dc = -(174 + 74.74256) = -268.74256$

Step 13:  $\Delta m = -(0.01) (-1908.072176) = 19.08072176$  and  $\Delta c = -(0.01) (-268.74256) = 2.68$

Step 14:  $m = 11.4336 + 1.636 = 13.0696$  and  $c = 0.636 + 2.68 = 3.316$

Step 15: Sample  $i = i + 1 = 2$  and  $2 \text{ not } < n, = 2$

Step 16: iteration = iteration + 1 = 2 and iteration not < epochs

Step 17: Stop