AI Assignment - 4

19K41A0538

Simple linear regression

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

step 1: Read dataset, $\lambda = 0.1$, epochs = 1, $m = 1$, $c = -1$

step 2: Set iteration = 1

step 3: Set sample = 1

step 4: $y = mx + c$

$y = (1)(7.6) - 1 = 6.6$

step 5: $E = \frac{1}{2}(y_i^{(a)} - mx_i^{(a)} - c)^2$

$E = \frac{1}{2}(157 - (1)(7.6) - (-1))^2 = \frac{22620.16}{2} = 11310.08$

step 6: $\frac{\partial E}{\partial m} = -(y_i^{(a)} - mx_i^{(a)} - c)x_i^{(a)} = -(157 - 6.6)(7.6) = -1143.04$

$\frac{\partial E}{\partial c} = -(y_i^{(a)} - mx_i^{(a)} - c) = -(157 - 6.6) = -150.4$

step 7: $\Delta m = -\eta \frac{\partial E}{\partial m} = -(0.1)(-1143.04) = 114.304$

$\Delta c = -\eta \frac{\partial c}{\partial c} = -(0.1)(-150.4) = 15.04$

step 8: $m = m + \Delta m = 1 + 114.304 = 115.304$

$c = c + \Delta c = -1 + 15.04 = 14.04$

step 9: Sample $i = i + 1 = 2$ & if $i \leq n$ → step (4)

step 4: $y = (115.304)(7.1) + 14.04 = 832.69$

Step 5: $\epsilon = \frac{1}{2}(174 - 832.69)^2 = \frac{433872.5}{2} = 216936.25$

Step 6: $\frac{\partial \epsilon}{\partial m} = -(174 - (115.304)(7.1) - 14.04)(7.1)$

$= -(174 - 832.69)(7.1)$

$= (658.69)(7.1) = 4676.69$

$\frac{\partial \epsilon}{\partial c} = -(174 - 832.69) = 658.69$

Step 7: $\Delta m = -\eta \frac{\partial \epsilon}{\partial m} = -(0.1)(4676.69) = -467.669$

$\Delta c = -\eta \frac{\partial \epsilon}{\partial c} = -(0.1)(658.69) = -65.869$

Step 8: $m = 115.304 + (-467.669) = -352.36$

$c = 14.04 + (-65.869) = -51.829$

Step 9: Sample $i = i+1 = 2+1 = 3$; $i \leq ns$, F → next step

Step 10: iter = iter + 1 = 1 + 1 = 2 ; iter > epochs, F → next step

Step 11: Stop