Assignment - 6

19K41A0447

polynomial Regression model:

X	Y
7.6	157
7.1	174

step 1: Read dataset, $\eta = 0.2$, epochs = 1, $m_1 = 1$, $m_2 = 1$, $c = -1$

step 2: iter = 1

step 3: sample i = 1

step 4: $Y_p^i = m_2 (x_i)^2 + m_1 x_i + c$

$Y_p' = (1)(7.6)^2 + (1)(7.6) - 1$

$= 64.36$

step 5: $\epsilon = \frac{1}{2} (y_i - y_i^p)^2$

$= \frac{1}{2} (157 - 64.36)^2$

$\epsilon = 4291.08$

step 6: $\frac{\partial \epsilon}{m_1} = -[y_i - m_2 x_i^2 - m_1 x_i - c] x_i$

$= -[157 - (1)(7.6)^2 - 1(7.6) + 1](7.6)$

$= -[157 - 57.76 - 7.6 + 1](7.6)$

$= -(92.64)(7.6)$

$= -704.06$

$\frac{\partial \epsilon}{\partial m_2} = -[y_i - m_2 x_i^2 - m_1 x_i - c] x_i^2$

$= -[157 - (1)(7.6)^2 - 1(7.6) + 1](7.6)^2$

$\frac{\partial \epsilon}{} = 5350.88$

$$\frac{\partial E}{\partial c} = -[y_i - m_2 x_i^2 - m_1 x_i - c]$$

$$= -[157 - (1)(7.6)^2 - (1)(7.6) + 1]$$

$$\frac{\partial E}{\partial c} = -92.64$$

step 7 : $\Delta m_1 = -\eta \frac{\partial E}{\partial m_1} = -(0.2)(-704.06) = 140.81$

$$\Delta m_2 = -\eta \frac{\partial E}{\partial m_2} = -(0.2)(-5350.88) = 1070.176$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.2)(-92.64) = 18.52$$

step 8 : $m_1 = m_1 + \Delta m_1 = 1 + 140.81 = 141.81$

$$m_2 = m_2 + \Delta m_2 = 1 + 1070.17 = 1071.17$$

$$c = c + \Delta c = -1 + 18.52 = 17.52$$

step 9 : sample $\Rightarrow i = i+1 = 1+1 = 2$ & $i_2 \le n_{s2}$ T $\rightarrow$ step (4)

step 4 : $y_p^i = m_2 (x_i)^2 + m_i x_i + c$

$$= 1071.17(7.1)^2 + (141.81)(7.1) + 17.52$$

$$= 53511.701$$

step 5 : $E = \frac{1}{2}(y_i - y_{iP})^2 = \frac{1}{2}(174 - 53511.70)^2$

$$E = 1422455121$$

step 6 : $\frac{\partial E}{\partial m_1} = -[y_i - m_2 x_i^2 - m_1 x_i - c] x_i$

$$= -[174 - (1071.17)(7.1)^2 - (141.81)(7.1) - 17.52](7.1)$$

$$= -[174 - 53997.67 - 1006.85 - 17.52](7.1)$$

$$= -[-54848.04][7.1]$$

$$= 389421.084$$

$\frac{dE}{m_2} = -[y_i - m_2 x_i^2 - m_1 x_i - c] x_i^2$

$= -[-54848.04](7.1)^2$

$= 2764889.69$

$\frac{dE}{dc} = -[y_i - m_2 x_i - m_1 x_i - c]$

$= -[-54848.04]$

$= 54848.04$

Step 7: $\Delta m_1 = -\eta \frac{\partial E}{\partial m_1} = -(0.2)(389421.084)$

$= -77884.21$

$\Delta m_2 = -\eta \frac{\partial E}{\partial m_2} = -(0.2)(2764889.69)$

$= -552977.93$

$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.2)(54848.04)$

$= -10969.60$

Step 8: $m_1 = m_1 + \Delta m_1 = 141.81 + 77884.21$

$= -77742.4$

$m_2 = m_2 + \Delta m_2 = 1071.17 - 552977.93$

$= -551906.76$

$c = c + \Delta c = 17.52 - 10969.60 = -10952.08$

Step 9: Sample $i = i+1 = 2+1 = 3$ & $\underset{3}{i} \le \underset{2}{ns}$ F → next step

Step 10: $iter = iter + 1 = 1+1 = 2$, $\underset{2}{inter} > \underset{1}{epochs}$ T → next step

Step 11: Stop.