

polynomial Regression model

X	Y
7.6	157
7.1	174

step 1:- Read dataset $n=0.1$, epochs=1, $m_1=1$, $m_2=1$, $c=-1$

step 2:- iter=1

step 3:- Sample $i=1$

step 4:- $Y_p^i = m_2(x_i)^2 + m_1x_i + c$

$$Y_p^i = (1)(7.6)^2 + (1)(7.6) - 1 = 64.36$$

step 5:- $E = \frac{1}{2} (y_i - y_p^i)^2$

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

$$E = 4291.08$$

step 6:- $\frac{\partial E}{\partial m_1} = - [y_i - m_2x_i^2 - m_1x_i - c] x_i$

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

$$\frac{\partial E}{\partial m_1} = -704.06$$

$$\frac{\partial E}{\partial m_2} = - [y_i - m_2x_i^2 - m_1x_i - c] x_i^2$$

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

$$\frac{\partial E}{\partial m_2} = -5350.88$$

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

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

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

$$\text{Step 7:- } \Delta m_1 = -\eta \frac{\partial E}{\partial m_1} = -(0.1)(-104.06) = 10.4$$

$$\Delta m_2 = -\eta \frac{\partial E}{\partial m_2} = -(0.1)(-5350.88) = 535.08$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.1)(-92.64) = 9.26$$

$$\text{Step 8:- } m_1 = m_1 + \Delta m_1 = 1 + 10.4 = 11.4$$

$$m_2 = m_2 + \Delta m_2 = 1 + 535.08 = 536.08$$

$$c = c + \Delta c = -1 + 9.26 = 8.26$$

$$\text{Step 9:- Sample } \Rightarrow i = i + 1 = 1 + 1 = 2 \text{ \& } i_2 \leq n_s \text{ } \rightarrow \text{step (4)}$$

$$\text{Step 4:- } y_p^i = m_2 (x_i)^2 + m_1 x_i + c$$

$$= (536.08)(7.1)^2 + (11.4)(7.1) + 8.26$$

$$= 27023.79 + 506.94 + 8.26$$

$$y_p^i = 27538.99$$

$$\text{Step 5:- } E = \frac{1}{2} (y_i - y_p^i)^2 = \frac{1}{2} (174 - 27538.99)^2$$

$$E = 374421338.9$$

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

$$= - \left[114 - (536.08)(7.1)^2 - (11.4)(7.1) - 8.26 \right] (7.1)$$

$$= - (114 - 27023.79 - 806.94 - 8.26)(7.1)$$

$$= - (-27364.99)(7.1)$$

$$\frac{\partial E}{\partial m_1} = 194291.429$$

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

$$= - (-27364.99)(7.1)^2$$

$$\frac{\partial E}{\partial m_2} = 1379469.14$$

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

$$= - (-27364.99)$$

$$\frac{\partial E}{\partial c} = 27364.99$$

$$\text{step 7: } \Delta m_1 = -\eta \frac{\partial E}{\partial m_1} = -(0.1)(194291.429) = -19429.14$$

$$\Delta m_2 = -\eta \frac{\partial E}{\partial m_2} = -(0.1)(1379469.14) = -137946.91$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.1)(27364.99) = -2736.49$$

$$\text{step 8: } m_1 = m_1 + \Delta m_1 = 11.4 - 19429.14 = -19357.74$$

$$m_2 = m_2 + \Delta m_2 = 536.08 - 137946.91 = -137410.83$$

$$c = c + \Delta c = 8.26 - 2736.49 = -2728.23$$

Step 9:- Sample: $i = i + 1 = 2 + 1 = 3$ // $i \leq n_3 : F \rightarrow$ next step
3 2

Step 10:- iter = iter + 1 = 1 + 1 = 2, iter > epochs $T \rightarrow$ next step
2 1

Step 11:- End.