Máxima Verosimilitud

Utilizando la función de Mínimos Cuadrados Ordinarios (OLS) ó de Log-Máxima Verosimilitud de la Regresión Lineal, obtener los valores θ_0 y θ_1

Posteriormente, utilizar estas fórmulas para obtener la ecuación de regresión lineal utilizando los valores dados

$$\underset{\theta_0,\theta_1 | x_i, y_i}{\operatorname{argmin}} \sum_{i=1}^{n} (y_i - (\theta_0 + \theta_1 x_i))^2$$

#1 Para θ_0 ...

$$\frac{d}{d\theta_0} \sum_{i=1}^{n} (y_i - (\theta_0 + \theta_1 x_i))^2$$

$$\frac{d}{d\theta_0} \sum_{i=1}^{n} (y_i - \theta_0 - \theta_1 x_i)^2$$

$$\sum_{i=1}^{n} 2(y_i - \theta_0 - \theta_1 x_i)(-1)$$

$$-2 \sum_{i=1}^{n} (y_i - \theta_0 - \theta_1 x_i)$$

$$\cancel{-2} \sum_{i=1}^{n} (y_i - \theta_0 - \theta_1 x_i) = 0$$

$$\sum_{i=1}^{n} y_i - n\theta_0 - \theta_1 \sum_{i=1}^{n} x_i = 0$$

$$\sum_{i=1}^{n} y_i - \theta_1 \sum_{i=1}^{n} x_i = n\theta_0$$

$$\theta_0 = \frac{\sum_{i=1}^{n} y_i - \theta_1 \sum_{i=1}^{n} x_i}{n}$$

#2 Para θ_1...

$$\frac{d}{d\theta_1} \sum_{i=1}^{n} (y_i - (\theta_0 + \theta_1 x_i))^2$$

$$\frac{d}{d\theta_1} \sum_{i=1}^{n} (y_i - \theta_0 - \theta_1 x_i)^2$$

$$\sum_{i=1}^{n} 2(y_i - \theta_0 - \theta_1 x_i)(-x_i)$$

$$-2 \sum_{i=1}^{n} (x_i)(y_i - \theta_0 - \theta_1 x_i)$$

$$\sum_{i=1}^{n} (x_i)(y_i - \theta_0 - \theta_1 x_i) = 0$$

$$\sum_{i=1}^{n} (x_i y_i - x_i \theta_0 - x_i^2 \theta_1) = 0$$

$$\sum_{i=1}^{n} x_i y_i = \theta_0 \sum_{i=1}^{n} x_i + \theta_1 \sum_{i=1} x_i^2$$

#3

$$\begin{cases} \theta_0 = \dfrac{\sum_{i=1}^{n} y_i - \theta_1 \sum_{i=1}^{n} x_i}{n} \\ \sum_{i=1}^{n} x_i y_i = \theta_0 \sum_{i=1}^{n} x_i + \theta_1 \sum_{i=1}^{n} x_i^2 \end{cases}$$

$$\sum_{i=1}^{n} x_i y_i = \sum_{i=1}^{n} x_i \left(\frac{\sum_{i=1}^{n} y_i - \theta_1 \sum_{i=1}^{n} x_i}{n} \right) + \theta_1 \sum_{i=1}^{n} x_i^2$$

$$n \sum_{i=1}^{n} x_i y_i = \sum_{i=1}^{n} x_i \left(\sum_{i=1}^{n} y_i - \theta_1 \sum_{i=1}^{n} x_i \right) + n\theta_1 \sum_{i=1}^{n} x_i^2$$

$$n \sum_{i=1}^{n} x_i y_i = \sum_{i=1}^{n} x_i y_i - \theta_1 \sum_{i=1}^{n} x_i^2 + n\theta_1 \sum_{i=1}^{n} x_i^2$$

$$\theta_1 = \frac{n \sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i y_i}{n \sum_{i=1}^{n} x_i^2 - \sum_{i=1}^{n} x_i^2}$$

$$\therefore \theta_0 = \frac{\sum_{i=1}^{n} y_i}{n} - \frac{\sum_{i=1}^{n} x_i}{n} \left(\frac{n \sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i y_i}{n \sum_{i=1}^{n} x_i^2 - \sum_{i=1}^{n} x_i^2} \right)$$

prom y − θ prom x