

Algorithm

Let's call each point  $(x_i, y_i)$ .

Since the regression line should go through  $(\bar{x}, \bar{y})$ , the equation of the line is

$$y = m(x - \bar{x}) + \bar{y}$$

the sum of the squares of the residuals is as follows:

$$\begin{aligned} & \sum \{m(x_i - \bar{x}) - (y_i - \bar{y})\}^2 \\ &= \sum (mX_i - Y_i)^2 \quad (\text{Let } x_i - \bar{x} = X, \text{ and } y_i - \bar{y} = Y_i.) \\ &= \sum (m^2 X_i^2 - 2mX_i Y_i + Y_i^2) \\ &= m^2 \sum X_i^2 - 2m \sum X_i Y_i + \sum Y_i^2 \\ &= (\sum X_i^2)m^2 - 2(\sum X_i Y_i)m + \sum Y_i^2 \end{aligned}$$