

Getting best fit line - slope and intercept

14 June 2025 08:08

$m \rightarrow \text{slope}$

$b \rightarrow \text{intercept}$

$$y = mx + c.$$

Best fit line
slope & intercept:

$$b = \bar{y} - m\bar{x}$$

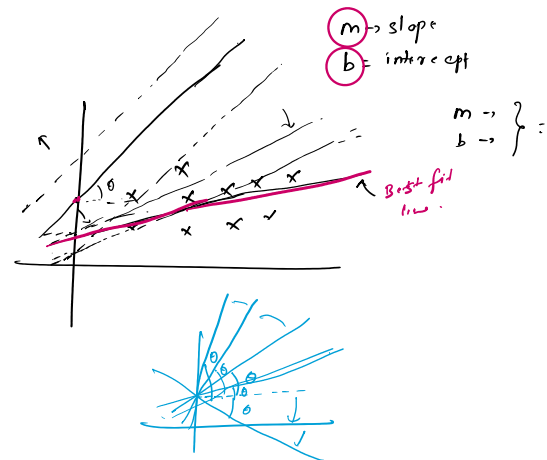
$$m = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

Loss function

Minimize the loss/error

$$E(m, b) = \sum_{i=1}^n (y_i - \hat{y}_i)^2$$

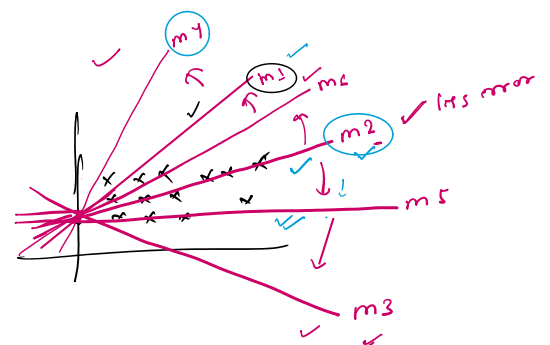
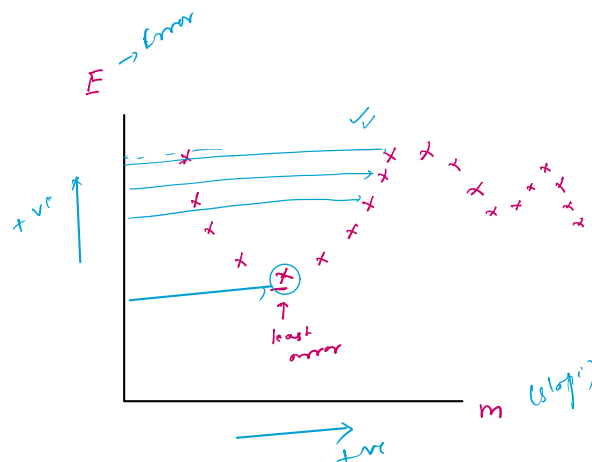
$$E(m, b) = \sum_{i=1}^n (y_i - mx_i - b)^2 \quad \text{--- (1)}$$



Case 1 \Rightarrow change the slope (m) individually.

Let $b = 0$ (constant) ✓✓

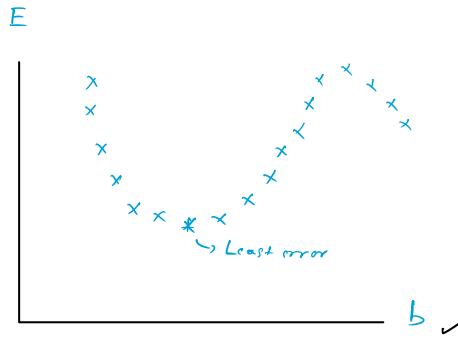
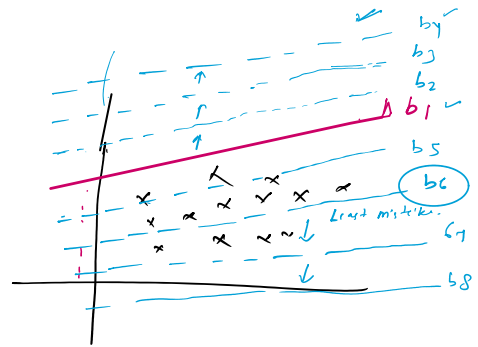
$$E(m) = \sum_{i=1}^n (y_i - mx_i)^2$$



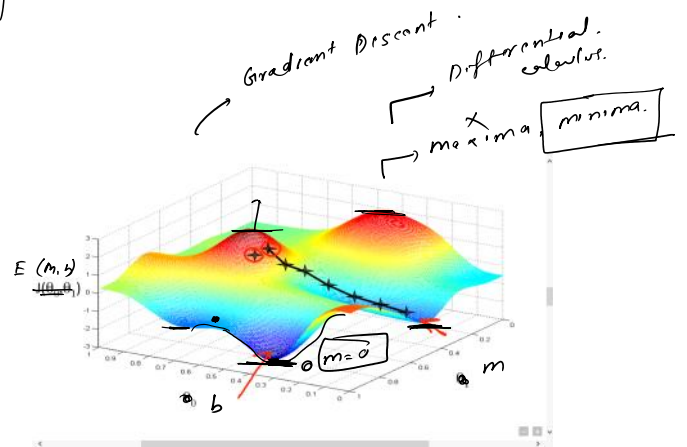
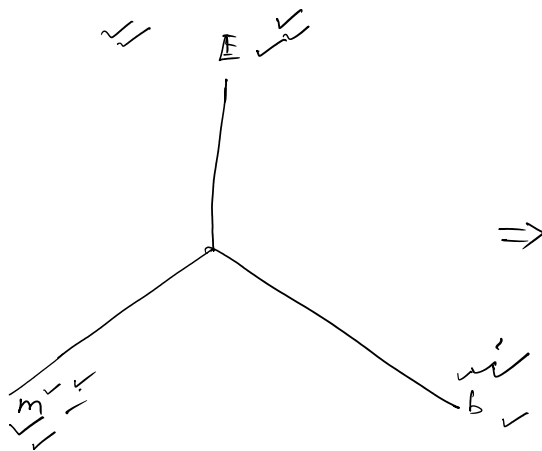
Case 2 + changing the intercept (b)

Let $m = 1$ ✓ (constant)

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



Loss function \Rightarrow "minimize"



$$E(m, b)$$

partial derivative

$$\frac{dE}{dx}$$

$$\frac{\partial E}{\partial m} = 0 \text{ --- (1) , } \frac{\partial E}{\partial b} = 0 \text{ --- (2)}$$

minimum minimum

$$b, m$$