Simple Linear Regression Model

$$Y = \beta_0 + \beta_1 X + \varepsilon$$

β_0: Intercept

Value when X = 0

β_1 : Slope

Change in Y per unit change in X

ε: Error Term

Random error, $\varepsilon \sim N(0, \sigma^2)$

Fitted Line

$$\hat{y} = \hat{\beta_0} + \hat{\beta_1} x$$

Estimated parameters

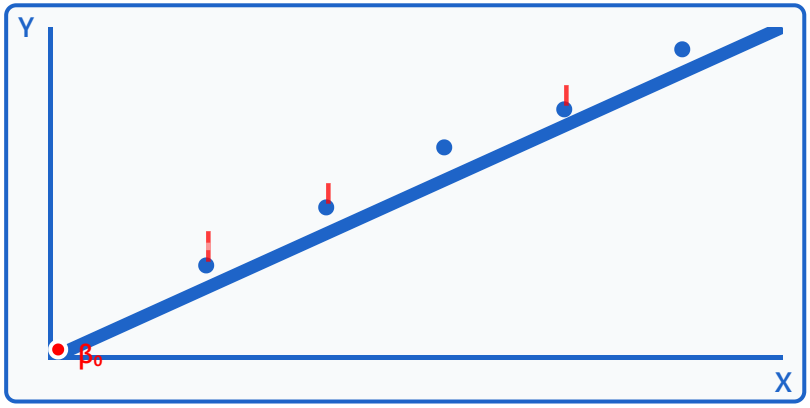
Residual: $e_i = y_i - \hat{y}_i$

Prediction error

Objective

Minimize total prediction error

Visual Representation



Blue line: fitted regression | Dashed red: residuals

Real-World Example

$$\text{Salary} = \beta_0 + \beta_1 \times (\text{Years of Experience}) + \varepsilon$$

📊 2D Interactive Simulator

Explore simple linear regression with an interactive 2D simulator!

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🎯 3D Interactive Simulator

Visualize multiple regression in 3D space with interactive controls!

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