Linear Modelling

Madiba Hudson-Quansah

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Chapter 1

Introduction

1.1 Linear Model

Definition 1.1.1: Linear Model

The equation of a simple linear model is in the form:

$$Y = b_0 + b_1 X + \epsilon$$

Where:

- Y - Dependent variable
- X - Independent variable
- b_0 - Y intercept
- b_1 - Slope
- ϵ - Error term / Residuals (unexplained variance / noise)

$$\text{Residual Sum of Squares (RSS)} = \sum \left(Y_i - \hat{Y}_i\right)^2$$

The best-fit slope (β_0) and intercept (β_1) are given by:

$$\beta_1 = \frac{\sum \left(X_i - \overline{X}\right)\left(Y_i - \overline{Y}\right)}{\sum \left(X_i - \hat{X}_i\right)^2}$$

$$\beta_0 = \overline{Y} - \beta_1 \overline{X}$$