

Linear Regression Explained

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Subject: Machine Learning

Difficulty: Beginner

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Introduction

Linear regression is one of the most fundamental techniques in machine learning and statistics for modeling relationships between variables.

What is Linear Regression?

Linear regression is a method for modeling the relationship between a dependent variable and one or more independent variables by finding the best-fitting straight line through data points.

Mathematical Expressions:

- $y = mx + b$
- $\hat{y} = \beta_0 + \beta_1 x$

Mathematical Foundation

The method of least squares finds the line that minimizes the sum of squared differences between actual and predicted values.

Mathematical Expressions:

- $\min \sum_{i=1}^n (y_i - \hat{y}_i)^2$
- $RSS = \sum_{i=1}^n (y_i - \hat{y}_i)^2$

Real-World Example

Consider predicting house prices based on size. We can use linear regression to find the relationship between square footage and price.

Mathematical Expressions:

- $\text{Price} = \beta_0 + \beta_1 \times \text{Size}$

Summary

Linear regression provides a simple yet powerful way to model relationships between variables and make predictions, forming the foundation for many advanced machine learning techniques.

Keywords

linear regression, machine learning, statistics, least squares, prediction