US16: Polynomial Regression Analysis

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1 Data and Results

1.1 Dataset

The dataset used for this analysis is obtained from US14, representing the input size and execution time.

1.2 Polynomial Regression

Polynomial regression is employed to model the nonlinear relationship between input size and execution time. The polynomial of best fit will be determined using the provided data.

1.2.1 Polynomial Regression Equation

The polynomial regression equation is given by:

$$\hat{y} = \beta_0 + \beta_1 x + \beta_2 x^2 + \ldots + \beta_n x^n$$

where $\hat{y}$ is the predicted execution time, x is the input size, and $\beta_0, \beta_1, \ldots, \beta_n$ are the coefficients of the polynomial regression model.

1.3 Best-Fitting Line

The polynomial regression model will yield the coefficients for the best-fitting line, allowing us to visualize the relationship between input size and execution time.

2 Analysis and Interpretation

The analysis will focus on interpreting the results obtained from the polynomial regression model.

2.1 Visualization

A plot illustrating the best-fitting line along with the observed data points will be presented to visually assess the fit of the polynomial regression model.

2.2 Evaluation

The goodness of fit of the polynomial regression model will be evaluated using statistical metrics such as mean squared error (MSE) and coefficient of determination (R^2).

2.2.1 Mean Squared Error (MSE)

The mean squared error is calculated as:

$$\mathrm{MSE} = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2$$

where n is the number of observations, y_i is the observed execution time, and $\hat{y}_i$ is the predicted execution time.

2.3 Conclusion

The conclusions drawn from the analysis will summarize the effectiveness of the polynomial regression model in capturing the relationship between input size and execution time.