GERMAN INTERNATIONAL UNIVERSITY
الجامعة الألمانية الدولية

Machine Learning project 1 ("Linear and polynomial regression report")

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Regression Analysis Report

Linear Regression

Residual Errors and RMSE Values

For the linear regression part, we implemented two different approaches: the Multi-Feature Equation and Gradient Descent. Here are the residual errors and RMSE values for both approaches:

Multi-Feature Equation:

- Average Residual Error: [`-93790.4992824463`]
- RMSE: [`478122.4168402505`]

Gradient Descent:

- Average Residual Error: [-93790.4992824463]
- RMSE: [`476681.1831978748`]

Performance Comparison

To compare the performance of the Multi-Feature Equation and Gradient Descent approaches, we analyze the RMSE values. The lower the RMSE, the better the model's performance. Based on our results:

- The [Gradient Descent] approach performed better, as it achieved a lower RMSE value compared to the [Multi-Feature] approach.

Polynomial Regression

Residual Errors and RMSE Values for Different Degrees

For the polynomial regression part, we tested various degrees of polynomial models and recorded the residual errors and RMSE values. Here is a table summarising the results:

Degree of Polynomial Model	RMSE
Degree 1	[476679.0629554619]
Degree 2	[428291.3963819987]
Degree 3	[549442.7439362907]
Degree 4	[770555.9991525976]
Degree 5	[13867272.30490688]
Degree 6	[72130888.86764802]

Degree 7	[23410651.79840165]
Degree 8	[53414961.275966786]
Degree 9	[16108724.46496092]
Degree 10	[304835050.0367627]

Optimal Degree Selection

To determine the optimal degree for the polynomial model, we consider the RMSE values. The degree with the lowest RMSE is considered the optimal choice. Based on our results:

- The optimal degree for the polynomial model is [2] because it has the lowest RMSE value.

This choice is supported by [Because it has the least RMSE].