Simple Regression Models Assignment

Assignment: Simple Regression Models

Objective:

The aim of this assignment is to understand and implement various regression techniques such as Linear Regression, Polynomial Regression, and Ridge Regression using Python and Scikit-learn.

1. Linear Regression

- Load a dataset of your choice (e.g., California housing prices or a custom dataset).

- Split the data into training and testing sets.

- Implement Linear Regression using Scikit-learn's LinearRegression class.

- Fit the model to the training data and predict on the testing set.

- Evaluate the performance using Mean Squared Error (MSE) and R-squared metrics.

- Task: Write code to load the data, implement Linear Regression, and evaluate the performance.

2. Polynomial Regression

- Using the same dataset as in Question 1, apply Polynomial Regression with degree 3.

- Use Scikit-learn's PolynomialFeatures to transform the input features.

- Fit a Linear Regression model on the transformed polynomial features.

- Evaluate the model's performance with MSE and R-squared.

- Task: Write code to apply Polynomial Regression and compare its performance with Linear Regression.

3. Ridge Regression

- Apply Ridge Regression to the dataset.

- Use Scikit-learn's Ridge class to implement Ridge Regression.

- Test the effect of different values of the regularization parameter (alpha).

- Plot the model's performance (MSE or R-squared) for different alpha values.

- Task: Implement Ridge Regression and plot the performance for various alpha values.

4. Comparison of Models

- Compare the performance of the Linear, Polynomial, and Ridge Regression models.

- Based on MSE and R-squared, write a brief report discussing which model performed better and why.

- Task: Compare and analyze the results of the three models in terms of accuracy and complexity.

5. Optional: Lasso Regression

- Apply Lasso Regression to the dataset using Scikit-learn's Lasso class.

- Compare the performance of Lasso with Ridge Regression.

- Task: Write code to implement Lasso Regression and evaluate its performance compared to Ridge.

Submission Instructions:

- Submit the code files along with a report discussing the performance of each regression model.

- Include plots or visualizations to support your findings.