Linear Regression and High-Demensional Data Analysis

Part 1 Linear Regression:

1.1 Implementing Linear Regression with Least Squares (Normal Equation):

- Exercise 1: Implement Linear Regression using Normal Equation.
- Exercise 2: Use the dataset (fetch_california_housing (X =MedInc, y = MedHouseVal) to solve for (theta) using matrix operations.

1.2 Using Singular Value Decomposition for LR:

- Exercise 3: Implement linear regression using the SVD decomposition of the matrix (X).

1.3 Shortcut (Scikit-learn)

- Exercise 4: Use sklearn to solve the regression problem and compare the results.

Part 2: High-Demensional Linear Regression

2.1 Real-World Dataset with Many Features:

- Exercise 1: Download Arcane dataset and apply linear regression to solve for (theta).

2.2 Ridge Regression for High-Dimensional Data:

- Exercise 2: Implement Ridge Regression.

Summary
1. Linear Regression using different methods: You implemented Linear Regression using the **Normal Equation**, **SVD**, and **Gradient Descent**.
2. Comparison: You compared the manual implementations with **scikit-learn's** linear regression.
3. High-Dimensional Data: You applied linear regression techniques to a real-world high-dimensional dataset (Arcene) and explored how **Ridge Regression** can handle overfitting.