
MA722 - Foundations of Machine Learning Algorithms

Lab Problems - 4

1. Implement Simple Linear regression by using the Least Squares method without using any machine learning libraries. Calculate the slope and intercept.
2.
 - (a) Implement a Simple Linear regression model using scikit-learn on synthetic data. Generate 150 data points where $y = 2.5x + 3 + \text{noise}$, split the data into train/test sets (80/20), train the model, and print the coefficients and intercept.
 - (b) Using the same model, calculate and display the following evaluation metrics: Mean Squared Error, Root Mean Squared Error, Mean Absolute Error, and R-squared score for both training and test sets.
 - (c) Load the diabetes dataset from scikit-learn, select only the BMI feature (column index 2), and perform simple linear regression to predict disease progression. Evaluate the model and interpret the results.
3.
 - (a) Implement Multiple Linear regression manually using matrix operations without using scikit-learn's LinearRegression class. Use the normal equation: $\beta = (X^T X)^{-1} X^T y$.
 - (a) Implement multiple linear regression using gradient descent. Create a class with fit and predict methods, including learning rate and iteration parameters.
 - (b) Load the California housing dataset, prepare the data, and implement multiple linear regression using scikit-learn. Evaluate the model using MSE and R^2 score.
