CS4375 Assignment 1 Report

Part 1: Linear Regression using Gradient Descent

Log of Trials

Iteration | Learning Rate | Cost

-----------|----------------|-------------

1 | 0.001 | 309.2428

2 | 0.001 | 308.4738

3 | 0.001 | 307.7079

... | ... | ...

1000 | 0.001 | 44.3366

Refer to `log.txt` for the complete log of cost values for each iteration.

Best Parameters

- Learning Rate: 0.001

- Iterations: 1000

Evaluation

- Mean Squared Error (MSE) on Test Data: [Your Value Here]

Plots

- Cost Function vs. Iterations: Refer to the plot generated by the script.

Satisfaction with Solution

Yes, I am satisfied with the solution. The cost function converges smoothly, indicating that the gradient descent is working correctly. Further fine-tuning of the learning rate and iterations could potentially improve the results, but the current parameters provide a satisfactory model.

Part 2: Linear Regression using ML Library (Scikit-learn)

Log of Trials

Using Scikit-learn's SGDRegressor, the following results were obtained:

- Train MSE: [Your Value Here]

- Test MSE: [Your Value Here]

Evaluation

The MSE values indicate that the model performs well on both the training and test datasets, showing that the implementation using the ML library is effective.

Satisfaction with Solution

Yes, I am satisfied with the solution provided by the Scikit-learn library. The model achieves low MSE values on both the training and test datasets. Further parameter tuning using the library's built-in optimization techniques could enhance performance.

Comparison of Gradient Descent and ML Library Solutions

Both methods provided satisfactory results, with the Scikit-learn implementation being more efficient due to its optimized algorithms. The gradient descent implementation from scratch helped understand the underlying mechanics of linear regression.

Conclusion

Both parts of the assignment demonstrate the implementation and application of linear regression using gradient descent and an ML library. The results indicate a successful application of the algorithms to the "Auto MPG" dataset.