

CS 4375

## ASSIGNMENT Assignment 1: Linear Regression using Gradient Descent

Names of students in your group:

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**Abiola Alalade - AXA200196**

Number of free late days used: 0

Note: You are allowed a **total** of 4 free late days for the **entire semester**. You can use at most 2 for each assignment. After that, there will be a penalty of 10% for each late day.

Please list clearly all the sources/references that you have used in this assignment.

# Assignment One Report

## Are you satisfied that you have found the best solution?

- No, I am not entirely satisfied with our solution. Despite our efforts to modify and optimize the code, we only observed minimal improvements in our results. I believe there are definitely more ways to optimize our code, and this project has highlighted areas where we can enhance our approach.
- There is a lot of room for improvement, and I am confident that as we continue with the class, we will develop our machine learning skills further. This will enable us to explore more advanced optimization techniques and ultimately achieve better results.

## Snippet of Log of trials with different parameters:

| Learning_Rate | Max_Iterations | Tolerance | Alpha  | MSE         | R2           |
|---------------|----------------|-----------|--------|-------------|--------------|
| constant      | 100            | 0.00001   | 0.0001 | 2.802005051 | 0.261362776  |
| constant      | 100            | 0.0001    | 0.0001 | 2.801765418 | 0.261403731  |
| constant      | 100            | 0.001     | 0.0001 | 2.803710708 | 0.260885085  |
| constant      | 500            | 0.00001   | 0.0001 | 2.802005051 | 0.261362776  |
| constant      | 500            | 0.0001    | 0.0001 | 2.801765418 | 0.261403731  |
| constant      | 500            | 0.001     | 0.0001 | 2.803710708 | 0.260885085  |
| constant      | 1000           | 0.00001   | 0.0001 | 2.802005051 | 0.261362776  |
| constant      | 1000           | 0.0001    | 0.0001 | 2.801765418 | 0.261403731  |
| constant      | 1000           | 0.001     | 0.0001 | 2.803710708 | 0.260885085  |
| optimal       | 100            | 0.00001   | 0.0001 | 6.9069E+22  | -1.84421E+22 |
| optimal       | 100            | 0.0001    | 0.0001 | 6.9069E+22  | -1.84421E+22 |
| optimal       | 100            | 0.001     | 0.0001 | 6.9069E+22  | -1.84421E+22 |
| optimal       | 500            | 0.00001   | 0.0001 | 1.54876E+23 | -4.07093E+22 |
| optimal       | 500            | 0.0001    | 0.0001 | 1.54876E+23 | -4.07093E+22 |
| optimal       | 500            | 0.001     | 0.0001 | 1.54876E+23 | -4.07093E+22 |
| optimal       | 1000           | 0.00001   | 0.0001 | 1.54876E+23 | -4.07093E+22 |
| optimal       | 1000           | 0.0001    | 0.0001 | 1.54876E+23 | -4.07093E+22 |
| optimal       | 1000           | 0.001     | 0.0001 | 1.54876E+23 | -4.07093E+22 |

## Plots:

