Report for the programming assignment2

I have included 4 classes along with README file, requirements.txt, report, and output.txt (output file)

1. MultiVariateLinearRegression.py
2. Main.py
3. Plot.py
4. NormalEquation.py

MultiVariateLinearRegression.py includes the linear regression library which contains all the required methods like getting cost_function, initialize_parameters, update_parameters, get_gradients, fit, fit_batch, predict, cost_function(mean square error). All the parameters like learning rate, number of iterations(epochs), batch size, and the initial value of θ_0 & θ_1 can be passed as an argument for the functions. The fit function accepts both “cost_based” and “l2_norm_based” as the stopping conditions as a parameter. By default, the stopping_condition used is “cost_based” and stopping_condition_value=0.000001. I have performed **Feature Normalization** while using the gradient descent method

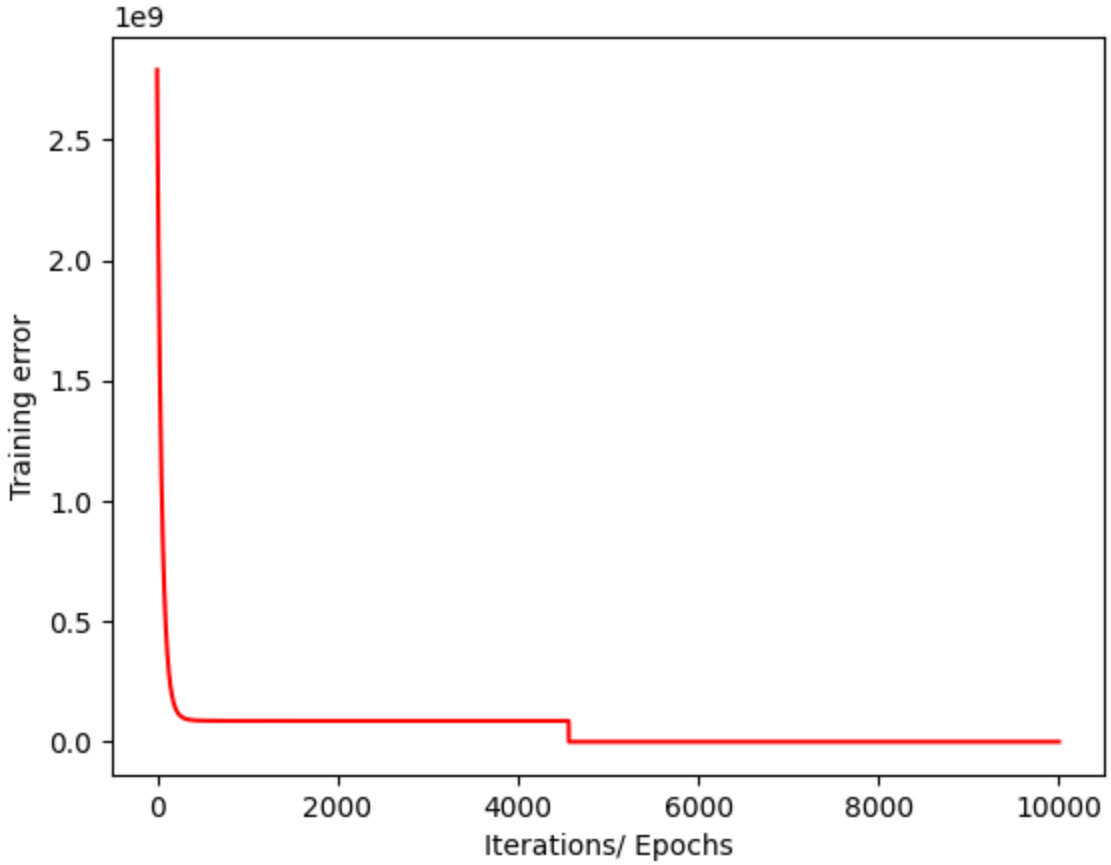
NormalEquation.py has the closed-form solution to linear regression that is $\theta = (X^T X)^{-1} X^T y$

Plot.py includes all the essential methods that we can use to plot the dataset and the error(training error).

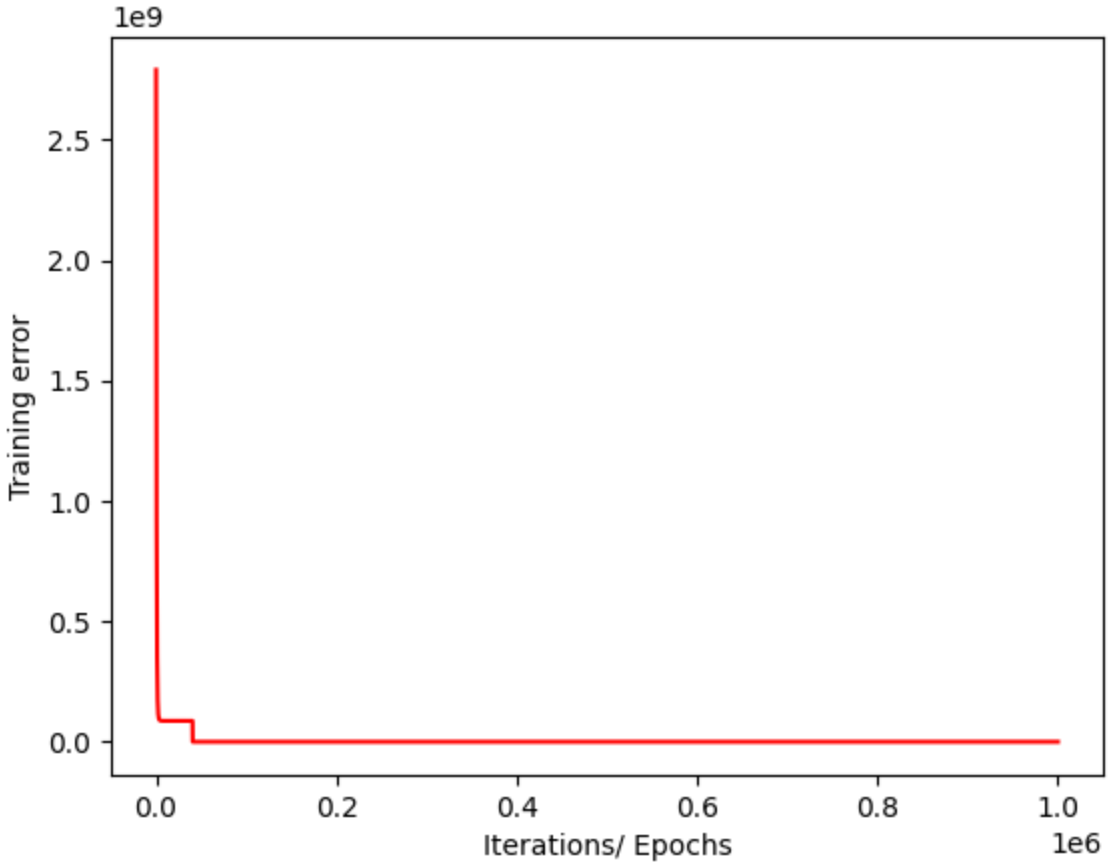
Main.py includes the main function to call the implemented MultiVariateLinearRegression library and NormalEquation.py. On running the Main.py, we get the following output:
Training_error.png and output.txt are auto-generated
The following is the output on the terminal for the values of thetas, and predictions
Stopping condition used: l2_norm_based
==========
Gradient Descent Method

==========
Values of theta using Gradient Descent Method
theta_0: 340412.65957446524
theta_1: [110631.05011541]
theta_2: [-6649.47410738]
price prediction for a 1650-square-foot house with 3 bedrooms using gradient descent: [293081.46437046]
==========
Normal Equation Method
==========
Values of theta using Normal equation in the format [[theta_0][theta_1][theta_2]]
[[89597.9095428]
 [139.21067402]
 [-8738.01911233]]
price prediction for a 1650-square-foot house with 3 bedrooms using normal equations: [293081.46433489]

requirements.txt includes all the required libraries



The above is the plot of the training error for 10000 iterations or epochs and learning_rate=0.01



The above is the plot of the training error for 1000000 iterations or epochs and learning_rate=0.001

Please refer **README.txt** to run the program

I have tested the program on my local machine and the Computer Science department servers.