

Machine Learning Report

```
degrees = [1, 2, 3, 4]
lamdas = [0.0001, 0.001, 0.01, 0.1, 1, 10]
etas = [0.1, 0.01, 0.001, 0.0001, 0.00001]
MSEs = []
```

Above are the set of training hyperparameters that I am using for both gradient descent and closed form models. Essentially I ran 120 tests all 100,000 epochs in length. Originally I tested multiple values for epochs but ultimately decided to settle on 100,000 because more epochs is always better. I will however say based on the graph 100,000 epochs is definitely overkill. We start to see diminishing returns after a few thousand epochs. So in the future I would probably tune the amount of epochs down to not waste CPU time.

The below images are my best results with their hyperparameters. Labeled "Gradient Descent" and "Closed Form" for convenience.

Closed Form:

```
----Best Result----
MSE:      0.014593796528512483
Degree:    3
Lamda:     0.1
```

Gradient Descent:

```
----Best Result----
MSE:      0.0145606768063947
Degree:    4
Lamda:     0.1
eta:       0.01
```

I plotted some graphs of the data however I ran out of time to get them in a more readable order. Currently I have 120 graphs for gradient descent and 24 for closed form each is the result of a different test.

The below image is my graph of the best result for Gradient Descent. I did not graph the results from closed form.

Gradient Descent:

