d85eba7e

Homework Report 2

CS1420 – Spring 2019
February 15, 2019

Problem 1

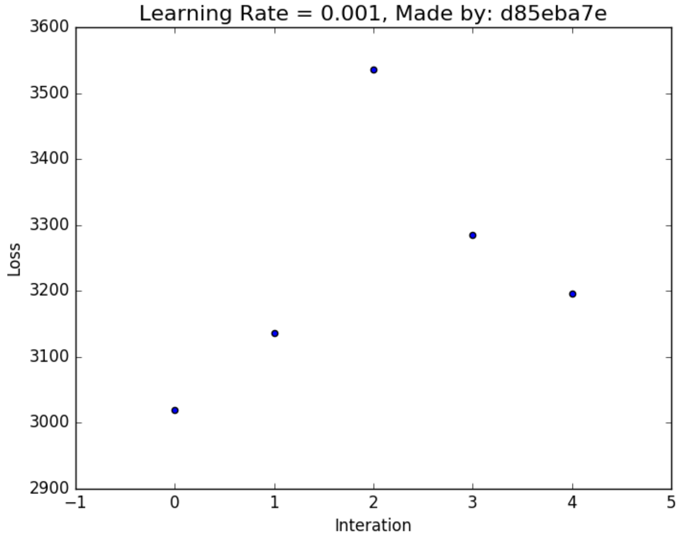
I did not deviate from the pseudocode. I used the differences in weights as an indicator of convergence. Specifically, I measured the differences of the old and updated weights across all components. I then found the maximum of all of the weights and specified that the repetition continue until that value reached a predetermined value. This predetermined value was one of my two hyperparameters. My other was the alpha value // learning rate. I played with both of these after my code was working to ensure that my analyses would reach the specified accuracy values provided by the handout.

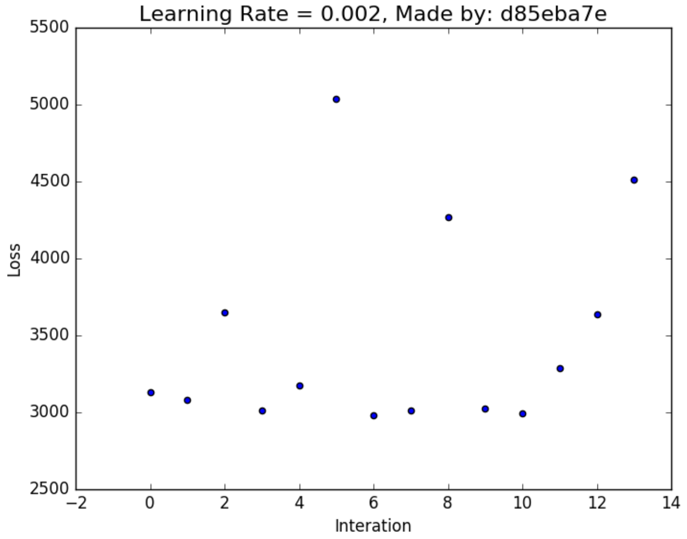
Problem 2

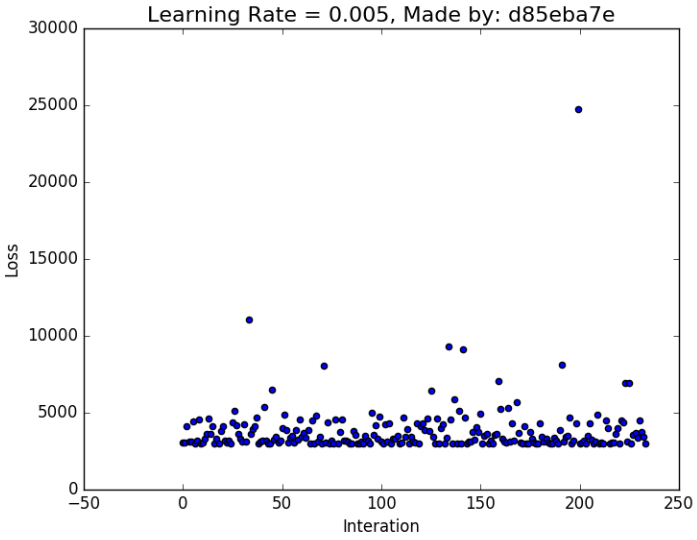
Graphs are attached at the end of the document. They reveal that as you increase your learning rate, you end up going through more interations. I also noticed that most of the losses hover around 3000 except for occasional jumps. As we increase the learning rate the opportunity for these jumps increase. Lastly, I wrote my matrix inversion algorithm to update all of the weights simultaneously so there is only one weight update and therefore only one loss! It is much smaller than the other losses, but worth noting the scale.

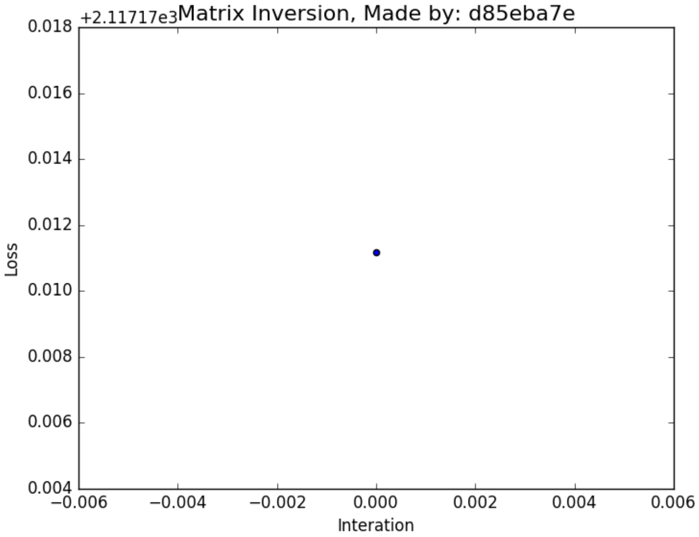
Problem 3

You could indeed use the Logistic Regression on the wine dataset to predict wine quality. We can set a threshold on the probability and produce a classifier as the Linear Regression does. However, you would not be able to use a Linear Regression on the MNIST data set. The Linear Regression will not be able to update the hypothesis each time we shift to analyzing a new sample, instead it will only learn a new hypothesis and attempt to predict using it and all previous ones. This makes it difficult to use for classification problems.


Learning Rate = 0.001, Made by: d85eba7e
Loss
3600
3500
3400
3300
3200
3100
3000
2900
−1
0
1
2
3
4
5
Interation


Learning Rate = 0.002, Made by: d85eba7e
Loss
5500
5000
4500
4000
3500
3000
2500
−2
0
2
4
6
8
10
12
14
Interation


Learning Rate = 0.005, Made by: d85eba7e
Loss
30000
25000
20000
15000
10000
5000
0
−50
0
50
100
150
200
250
Interation


Matrix Inversion, Made by: d85eba7e
+2.11717e3
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
Loss
−0.006
−0.004
−0.002
0.000
0.002
0.004
0.006
Interation