CS 539: Machine Learning
Assignment 2 Part 2

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Content

1   Introduction

In this part, the relationship between the α (learning rate) and the epoch will be investigated to obtain the minimum test loss.

On the following the first section is to investigate the α obtaining the minimum test loss with different epochs, the second section is to investigate the Epoch to obtain the minimum test loss with the α obtained in the first part.

2   The Best α

In the procedure to find the proper α for the training process, set the epoch to constant and change α in the interval $(0, 1]$ to find the α to reach the minimum test loss.

The curve of finding the best learning rate (α) is illustrated in figure 1. The Epoch is set to 500 and $\Delta\alpha = 0.001$.
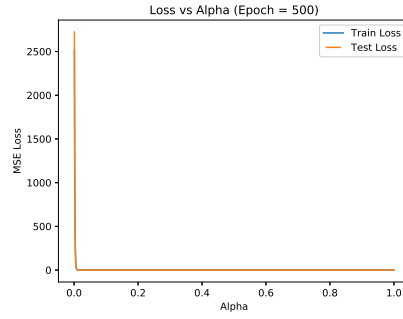

Figure 1: Test Loss vs. α

In the result of 1, the minimum test loss is 6.44×10^{-29} which is apparently smaller than **0.01** and the corresponding α is 0.689.

3   The Best Epoch

With the minimum test loss and α, the minimum epoch to achieve the convergence could be obtained easily and the curve of the test loss and epoch is illustrated in figure 2.
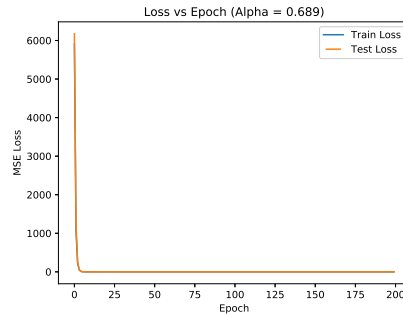

Figure 2: Test Loss vs. Epoch

1

Figure 2 illustrated the minimum epoch to obtain the minimum test loss is **62**. The test loss is $6.44 \times 10^{-29} (< 0.01)$.

4   Curve Between α and Epoch

The MSE loss curve with the change of α and epoch is illustrated in figure 3.
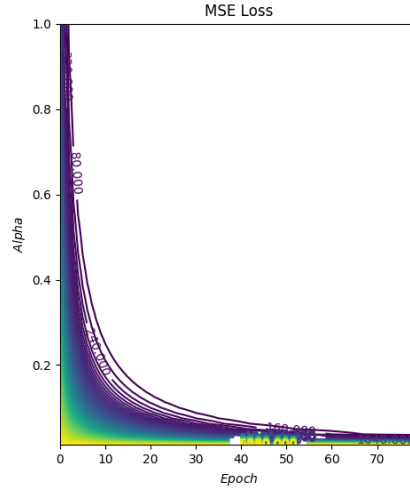

Figure 3: MSE loss with respect to α and epoch

The results of the linear regression training are illustrated in the table 1

Table 1: Linear Regression Results

Category	Numerical Value
Best α	0.689
Min Test Loss	6.44×10^{-29}
Min Epoch	62