DS222- Assignment 2 Report

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1 Local Logistic Regression (LR):

1.1 Constant learning rate

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 30
- Training Set Accuracy : 55.89%
- Test Set Accuracy : 67.22 %
- Train timings : 673845 ms
- Test timings : 6888 ms

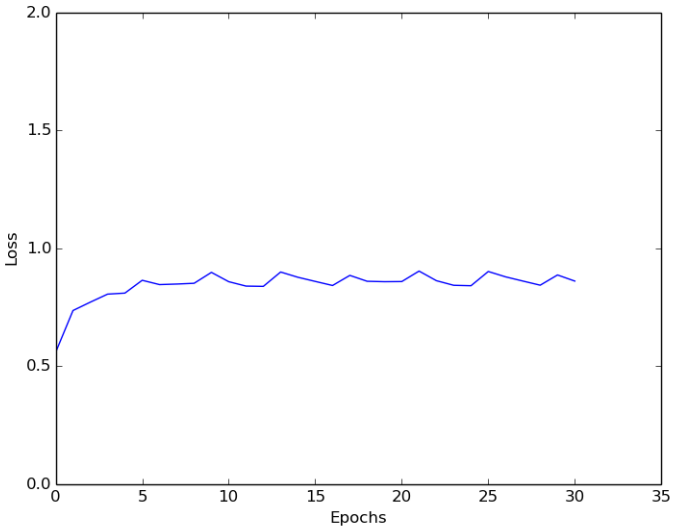

Figure 1 : Loss versus Number of Epochs

1.2 Increasing learning rate

- Decreasing function used : (1.1)*Learning rate
- Learning rate : 0.00221
- Regularization parameter : 0.00058
- Number of epochs : 30
- Training Set Accuracy : 45.62 %
- Test Set Accuracy : 58.80 %
- Train timings : 2019065.0 ms
- Test timings : 6909 ms

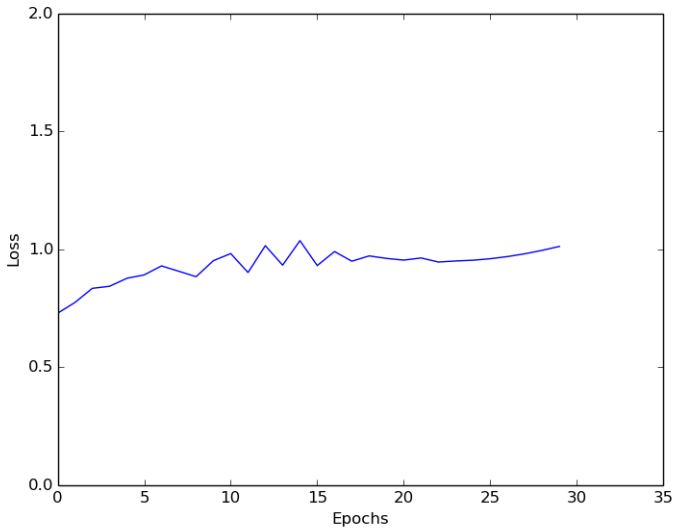

Figure 2 : Loss versus Number of Epochs

1.3 Decreasing learning rate

- Decreasing function used : Learning rate / t
- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 30
- Training Set Accuracy : 57.72 %

- Test Set Accuracy : 72.39 %
- Train timings : 1931273.0 ms
- Test timings : 6737 ms

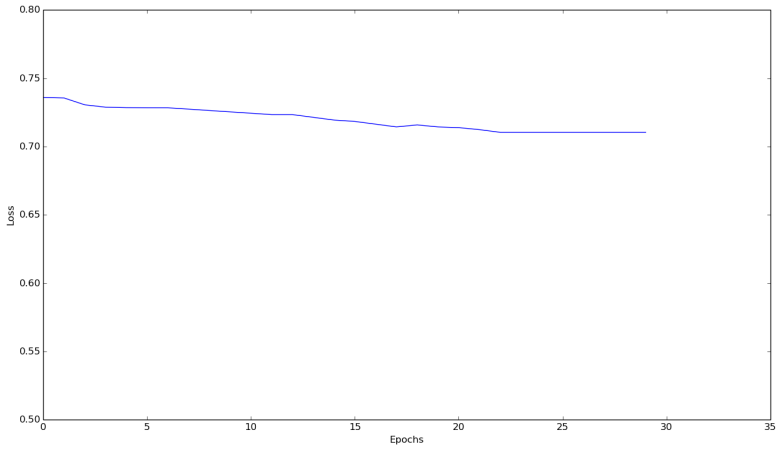

Figure 3 : Loss versus Number of Epochs

2 Distributed Logistic Regression (LR):

The learning rate was fixed at 0.0025 and the regularization parameter was fixed at 0.00058 based on the results of the experiments performed in the local setting.

We have used JBosen for the second part of the assignment. JBösen is a library for writing data-parallel machine learning applications. It provides a key-value storage interface implemented using a parameter server architecture, and fully supports the stale-synchronous parallel consistency model. It suited the requirements of the assignment.And so we used it.

2.1 BSP SGD:

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 20
- Training Set Accuracy : 53.25 %
- Test Set Accuracy : 77.42 %

- Train timings : 2955420 ms
- Test timings : 1051 ms

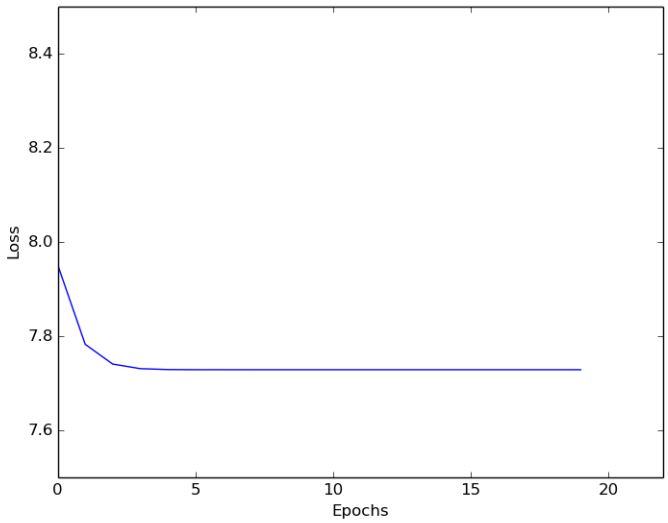

Figure 4 :Loss versus Number of Epochs

The above results are for single thread setting with staleness = 0 since in the multi-thread setting the threads were getting deadlocked.

2.2 Asynchronous SGD:

2.2.1 Number of worker threads = 4

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 20
- Training Set Accuracy : 52.08 %
- Test Set Accuracy : 76.62 %
- Train timings : 834540 ms
- Test timings : 1215 ms

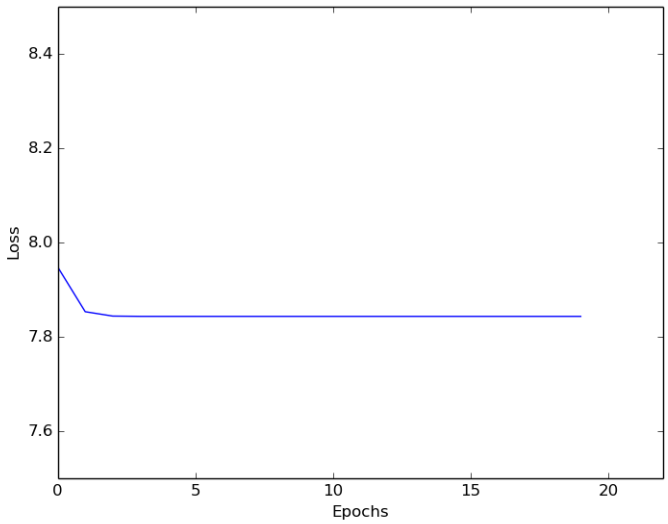

Figure 5 : Loss versus Number of Epochs

2.2.2 Number of worker threads = 8

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 20
- Training Set Accuracy : 51.23 %
- Test Set Accuracy : 74.94 %
- Train timings : 645400 ms
- Test timings : 1004 ms

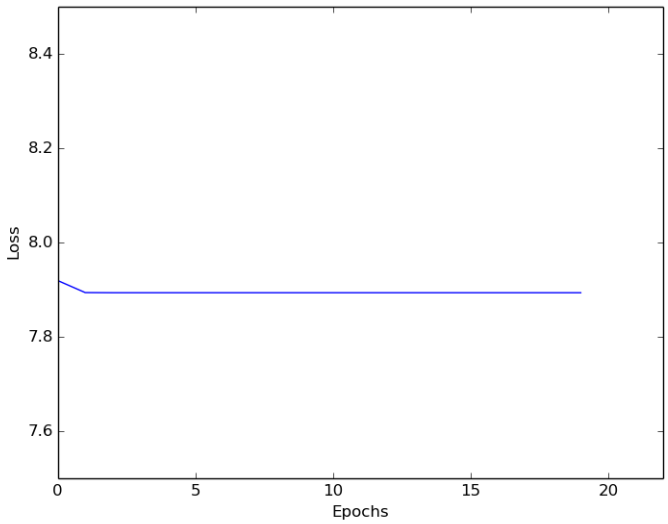

Figure 6 : Loss versus Number of Epochs

2.2.3 Number of worker threads = 14

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 20
- Training Set Accuracy : 51.03 %
- Test Set Accuracy : 74.88 %
- Train timings : 656140 ms
- Test timings : 1073 ms

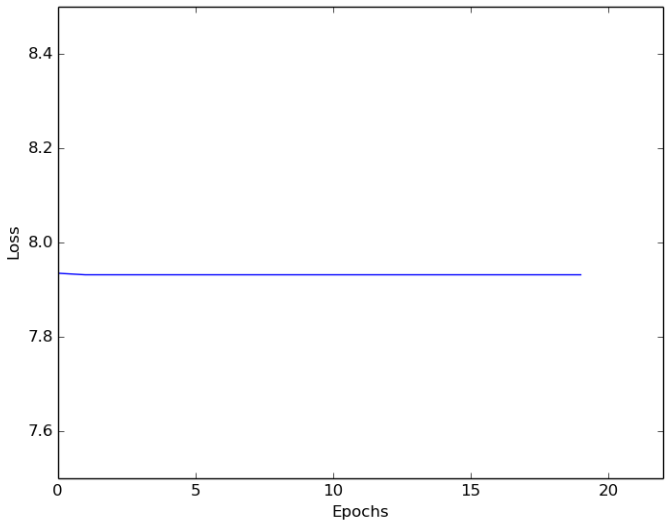

Figure 7 : Loss versus Number of Epochs

2.3 Bounded Asynchronous (SSP) SGD:

2.3.1 Staleness = 10

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 20
- Training Set Accuracy : 52.08 %
- Test Set Accuracy : 77.18 %
- Train timings : 317420 ms
- Test timings : 604 ms

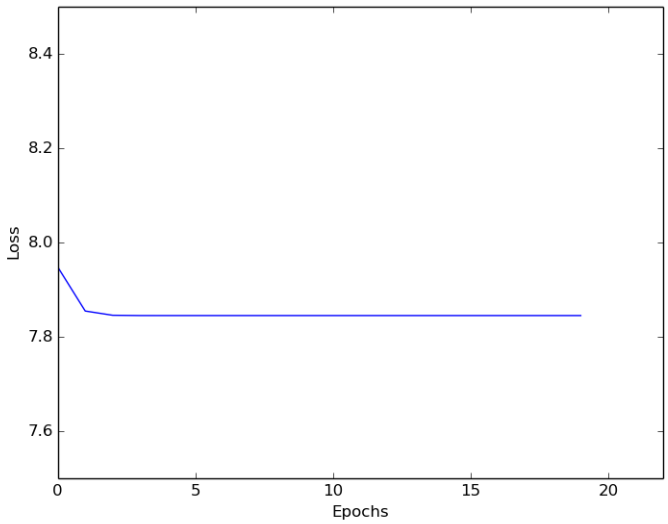

Figure 8 : Loss versus Number of Epochs

2.3.2 Staleness = 14

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 20
- Training Set Accuracy : 52.19 %
- Test Set Accuracy : 76.29 %
- Train timings : 317420 ms
- Test timings : 598 ms

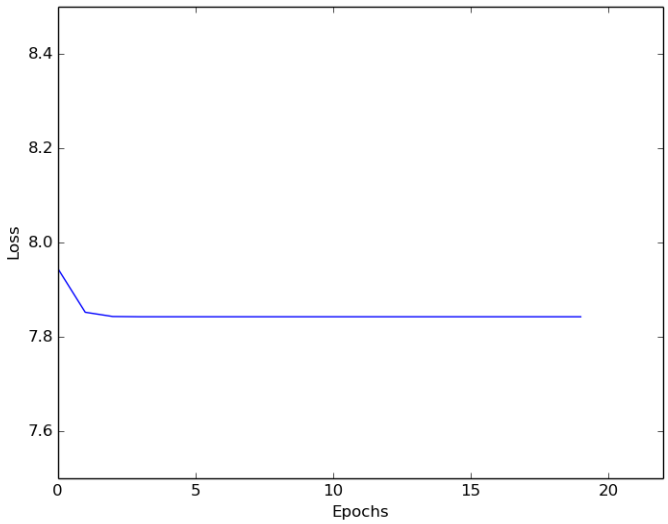

Figure 9 : Loss versus Number of Epochs

2.3.3 Staleness = 25

- Learning rate : 0.0025
- Regularization parameter : 0.00058
- Number of epochs : 20
- Training Set Accuracy : 52.12 %
- Test Set Accuracy : 76.02 %
- Train timings : 323940 ms
- Test timings : 589 ms

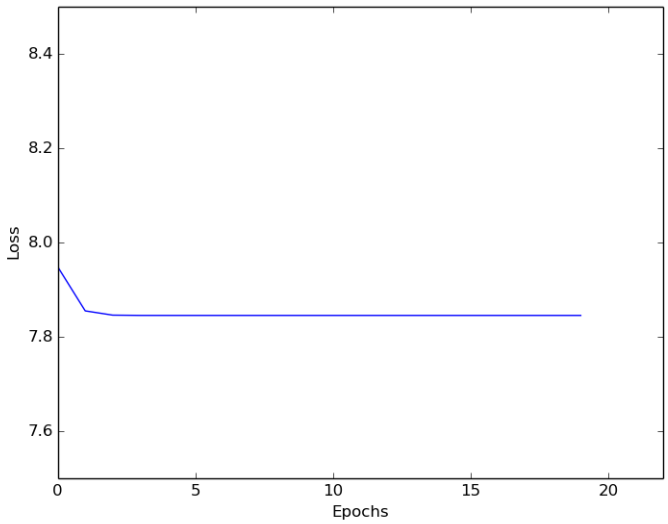

Figure 10 : Loss versus Number of Epochs

In the Asynchronous setting as the number of workers increases the accuracy goes down. For the Stale Synchronous setting as the staleness value increases the accuracy goes down.