COMP5212: Machine Learning Programming Homework 1 Report

LIANG, Yuchen Eric 20582717 | yuchen.liang@connect.ust.hk

Oct 2022

Average loss after training each epoch

- Logistic Regression Model

```
Number of epochs : 10
learning rate    : 0.0001
Momentum         : 0
Total step 198, Epoch 1/10, Average Loss: 0.5669
Total step 396, Epoch 2/10, Average Loss: 0.2951
Total step 594, Epoch 3/10, Average Loss: 0.1976
Total step 792, Epoch 4/10, Average Loss: 0.1500
Total step 990, Epoch 5/10, Average Loss: 0.1220
Total step 1188, Epoch 6/10, Average Loss: 0.1035
Total step 1386, Epoch 7/10, Average Loss: 0.0904
Total step 1584, Epoch 8/10, Average Loss: 0.0806
Total step 1782, Epoch 9/10, Average Loss: 0.0730
Total step 1980, Epoch 10/10, Average Loss: 0.0669
```

- Support-Vector Machine

```
Numbers of epochs: 10
learning rate    : 0.0001
Momentum         : 0
Total step 198, Epoch 1/10, Average Loss: 0.2413
Total step 396, Epoch 2/10, Average Loss: 0.0346
Total step 594, Epoch 3/10, Average Loss: 0.0250
Total step 792, Epoch 4/10, Average Loss: 0.0208
Total step 990, Epoch 5/10, Average Loss: 0.0183
Total step 1188, Epoch 6/10, Average Loss: 0.0166
Total step 1386, Epoch 7/10, Average Loss: 0.0153
Total step 1584, Epoch 8/10, Average Loss: 0.0143
Total step 1782, Epoch 9/10, Average Loss: 0.0135
Total step 1980, Epoch 10/10, Average Loss: 0.0129
```

Final accuracy of trained model

- Logistic Regression Model

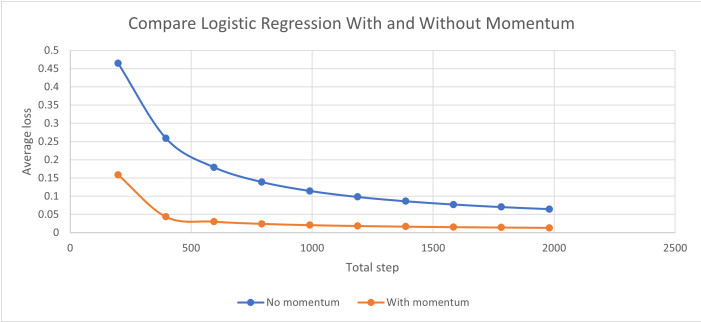
```
Accuracy of the model on the test images  : 99.810875 %
Number of epochs : 10
learning rate    : 0.0001
Momentum         : 0
```

- Support-Vector Machine

```
Accuracy of the model on the test images: 99.810875 %
Numbers of epochs: 10
learning rate    : 0.0001
Momentum         : 0
```

Compare result for 2 optimizer

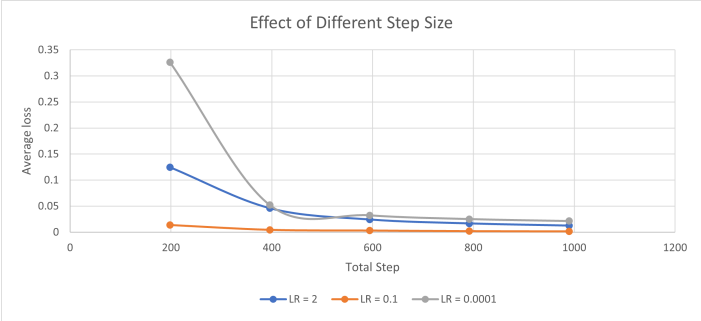
This report will compare the logistic regression model with and without momentum.



From the above two result we can see that with momentum involved, the loss start at the a smaller initial value and converge more quickly. It can be observed that with momentum involved, the optimization process is accelerated.

Effect of different step size (learning rate)

This report will use the Support-Vector Machine with different step size to illustrate its effect.



The graph shows that with the decrease of step size, the initial value of the loss decrease first and increase afterwards. This show that the step size need to be at a suitable value (cannot be too large nor too small) in order to reached a optimized situation.