Assignment 1 Report

In the code, add the file and class **LogisticRegressionModel** for implementing the logistic regression.

Environment:

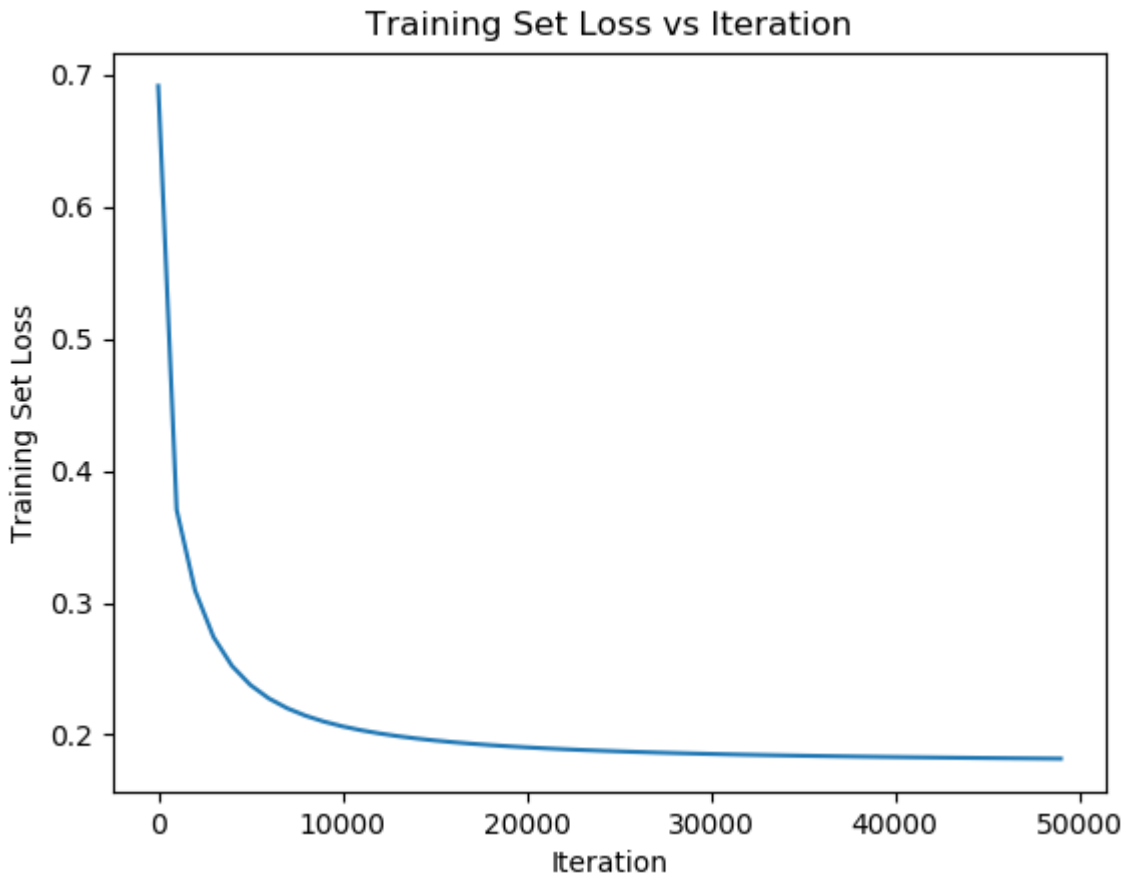
- Python: 3.6.5
- Libraries:
  - numpy: for Matrix computation
  - matplotlib: for plot the measure data

By running the following command, program will be training the data and measure the predict with 'Most Common' model, Heuristic model, and Logistic Regression model.

```
python .\StartingPoint1.py
```

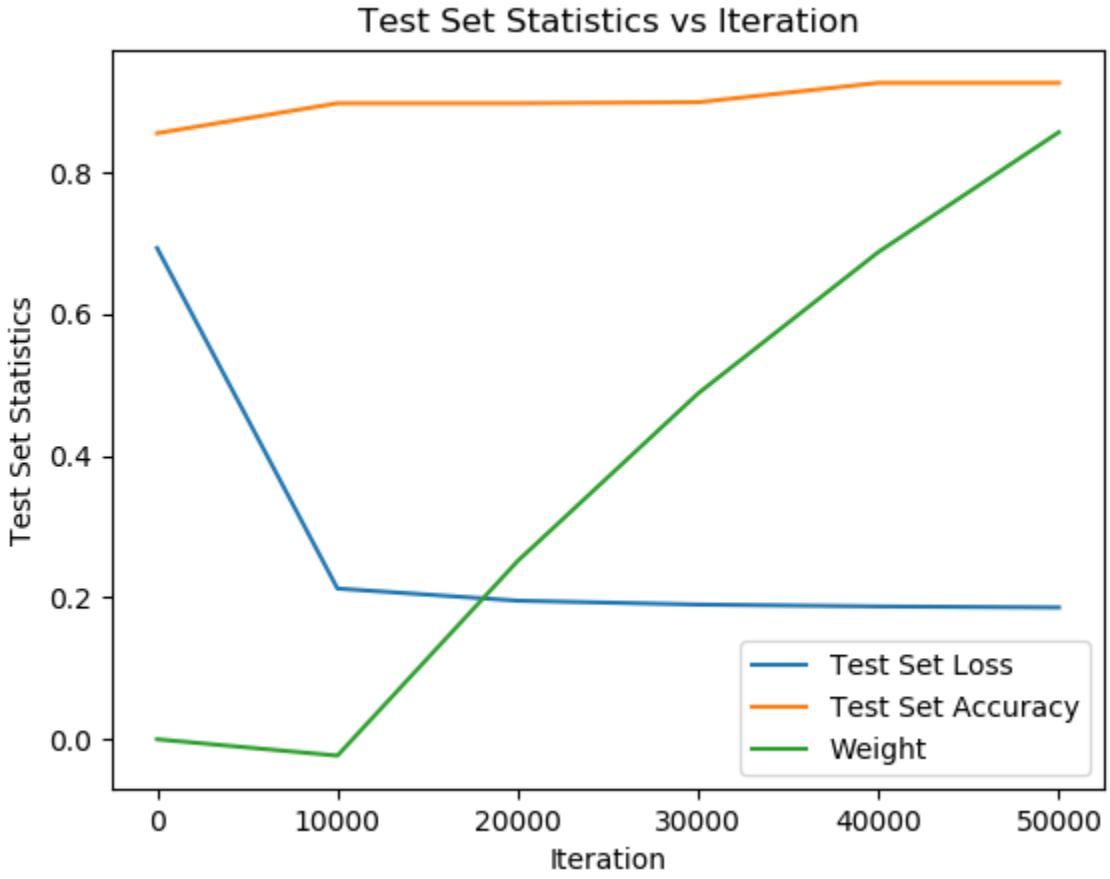
Plot Training Set loss

Here is the plot of Training Set Loss vs Iteration after running for 50,000 iterations with step size 0.01 and plot the training set loss vs iteration every 1000 iterations.



Plot Test Set measure data

Here is the plot of Test Set Statistics vs Iteration that after every 10,000 iterations.



Statistics from the evaluation framework on the 50,000-iteration run

Here is the statistics from the evaluation framework on the 50,000-iteration run

	Predict True	Predict False
Actually True	168	34
Actually False	69	1123

None
Accuracy: 0.9261119081779053
Precision: 0.7088607594936709
Recall: 0.8316831683168316
FPR: 0.057885906040268456
FNR: 0.16831683168316833

Questions

What do these measurements tell you about logistic regression compared to the straw men?

Those statistics tell us with more iteration happened, the loss value from cost function will become smaller and smaller which means we can have a better predict result and the change of accuracy from Test Set show that.

How did the gradient descent converge?

Because the we use the derivative of the cost function and this guaranteed we can find the gradient of the cost function at that point. So we can be guaranteed that the cost function can be converge to a local/global minimum if the step size is not too large.

What makes you think you implemented logistic regression correctly?

The test set loss continually become smaller and smaller, and in the end the change of this loss value is about the same. This means the gradient descent can be guaranteed converge to a local/global minimum.