Assignment 2 - Logistic Regression

- Miles Curry **(currymi)**, Christian Armatas **(armatasc)**
- CS434
- Dr. Xiaoli Fern
- Spring 2017

In this assignment we used Logistic Regression to determine hand written 4's or hand written 9's. We did this by implementing a Batch Gradient Decent algorithm that trained a binary logistic regression classifier.

Running the Code

The code runs a python 2 so it should be simple to run and requires pip to make sure you have the packages we use installed.

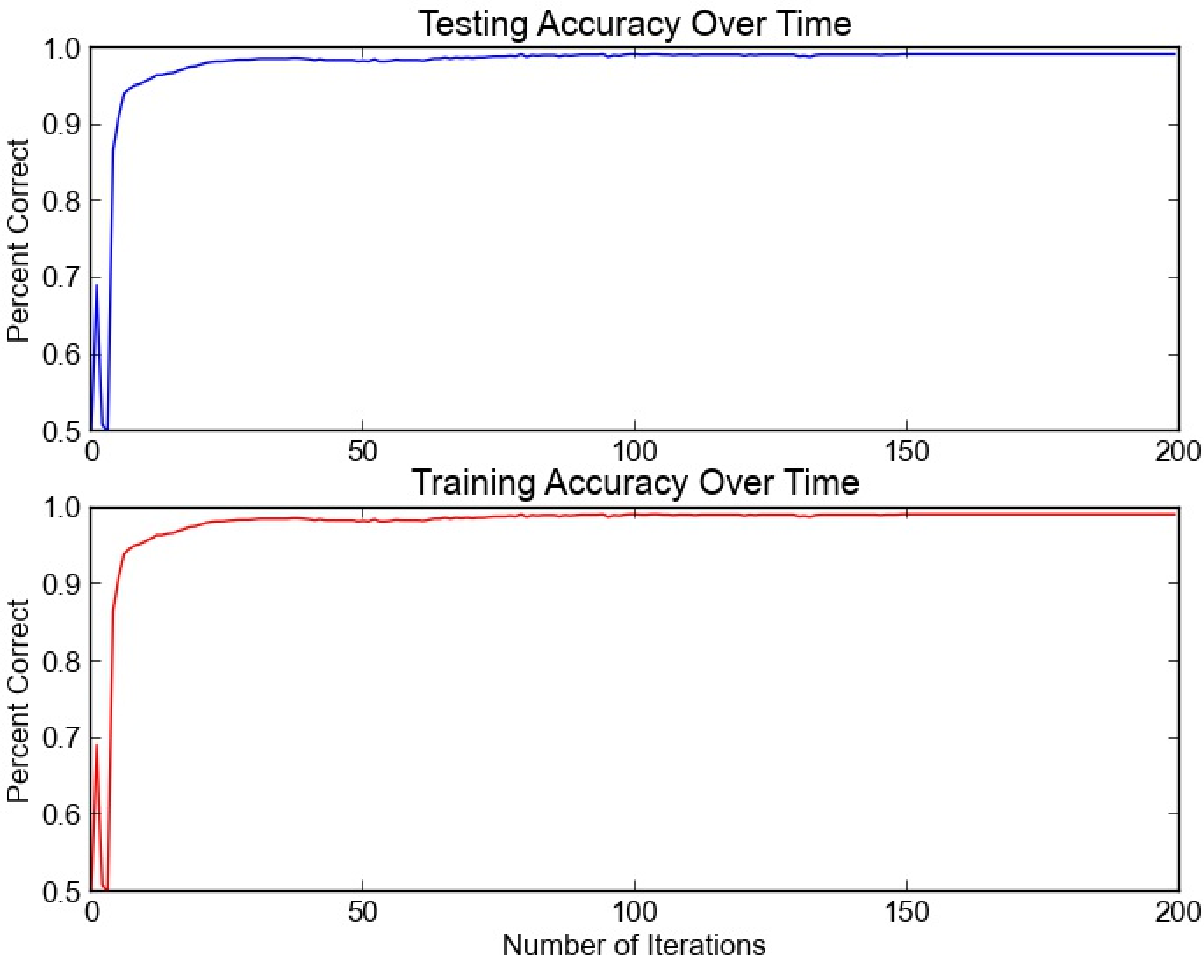
1. First install the requirements using pip ''' pip install -r requirements '''
2. Run our implementation by running the following (pass the -v or --verbose flag to produce verbose output) ''' python logRegress.py -v 2 # This will determine the learning rate! '''

If you have any questions or problems, let us know. Thanks.

1. Learning Rates And Stopping Condition

For learning rates we determined that the optimal learning rate was **.0011** which produced a loss of **621.7059**. We decided the best number of iterations to run was 170.

2. Training & Testing Accuracy Vs # of iterations



Over the majority of iterations the accuracy of our tests increased to almost 100%. At the start of the iterations we saw a sharp increase with a sharp decrease followed by the rapid increase to the max accuracy.

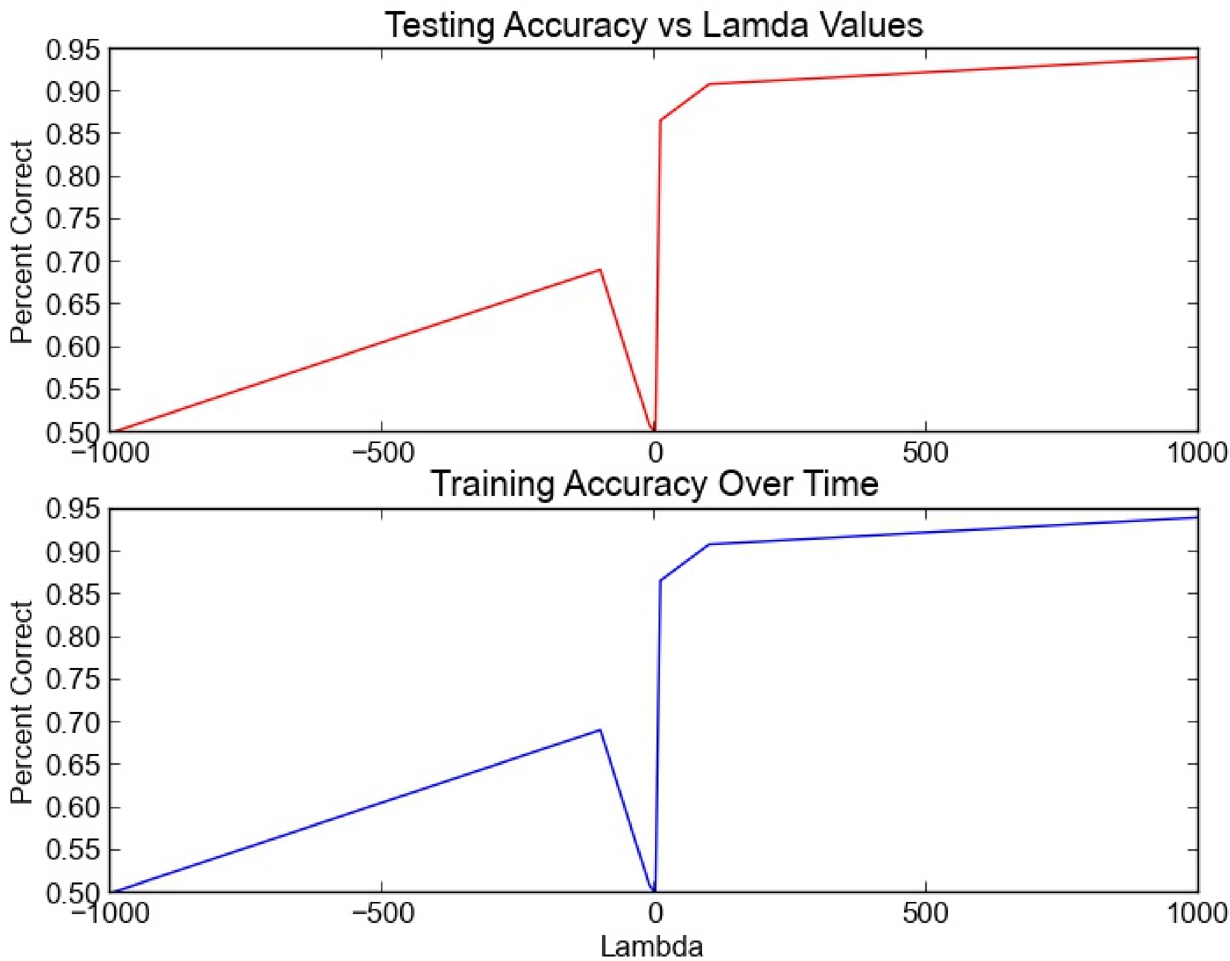
3. L2 Regulation

The pusdocode for the batch learning with L2 regulation is as follows:

```
given training examples x[0, 1, .. i] and y[0, 1, .. i]
w = [0, 0, ... 0]
while(iterations > 0):
    d = zeros(256)
    for i in n:
        Y-hat = (1/(1+e^(-w * x[i])) + 1/2 * lambda * ||w||2 Norm
        error = y - y_hat
        d = d + (error * x)

    w = w + (learning_rate * d)
```

3.a Plot



Plotting the percent correctness with the regulation function and values of lambda equalling [-10^3, -10^2, .. 10^3] we found that the percent correct increased as lambda increased towards zero the percent increased. As it got close to zero, however, the value deceased to half again. However after that the percent correct started to increase again.