Deep Learning: Assignment 2

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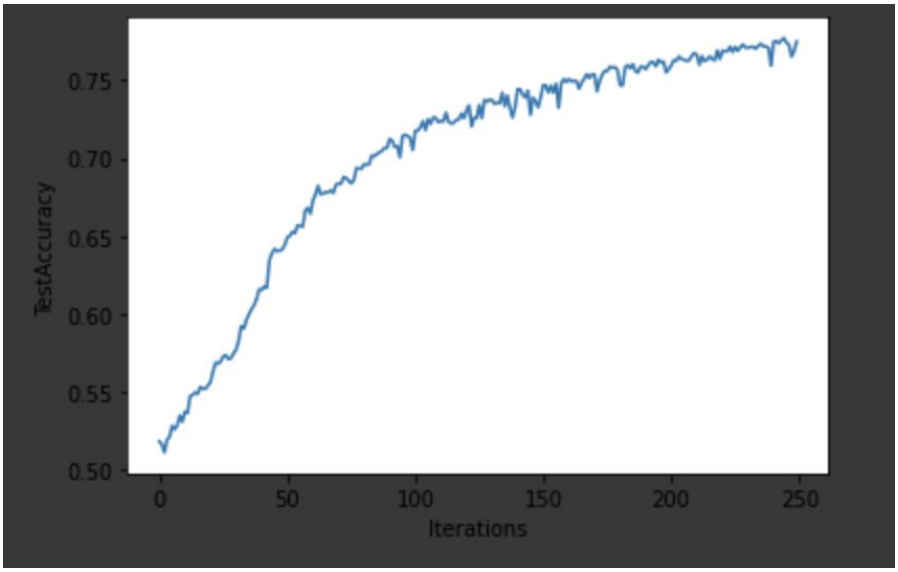
1. **Apply the normalization on the training and test data**

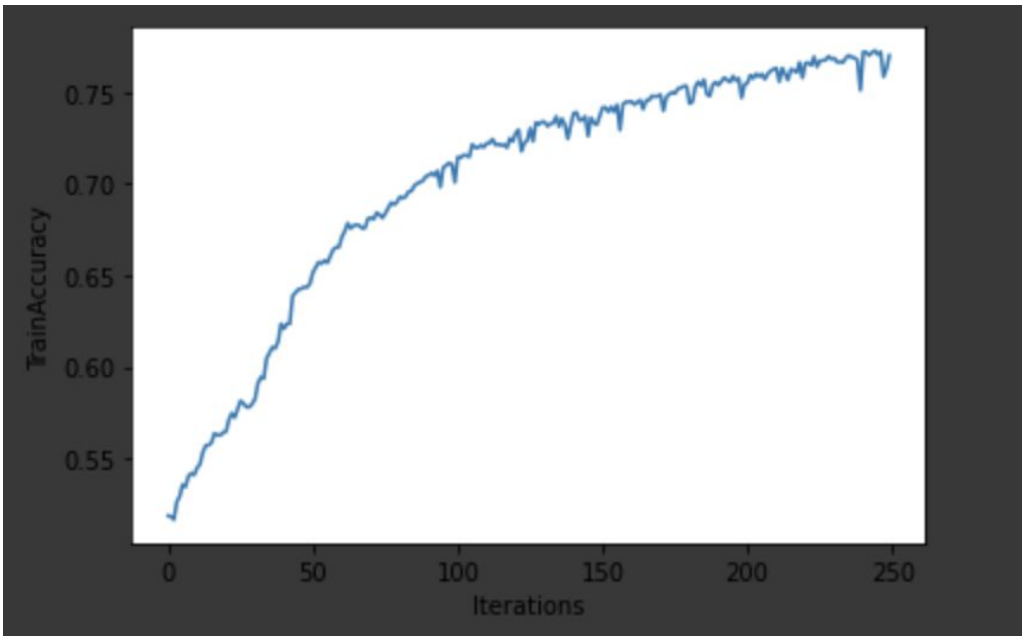
```
from scipy import stats
X = stats.zscore(X_train, axis=1)
X_T = stats.zscore(X_test, axis=1)
```

2. **As a baseline, train a linear classifier yˆ = v T x and quadratic loss. Report its test accuracy**
   Test Accuracy: 84.37%

3. **Learning rate = 0.0001**
   a. **k=5:**
      Test Accuracy:

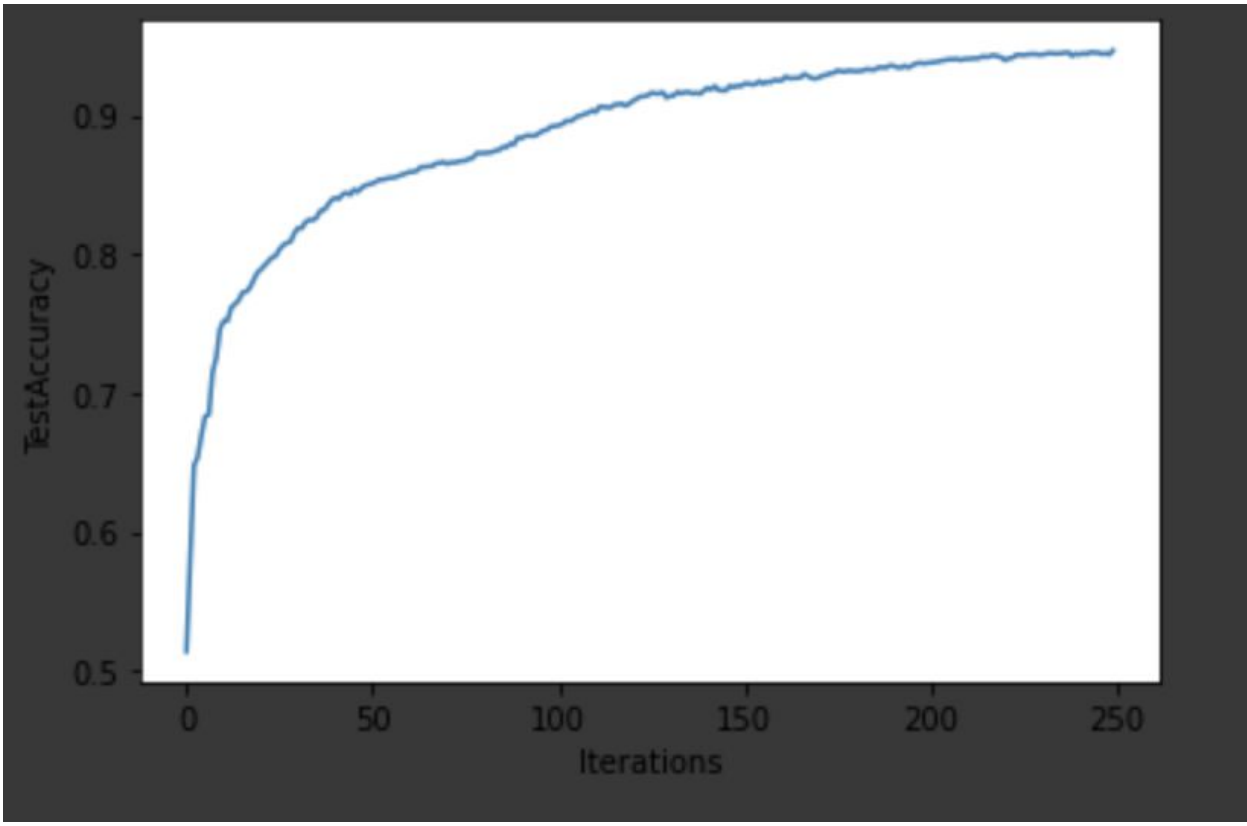


Train Accuracy:

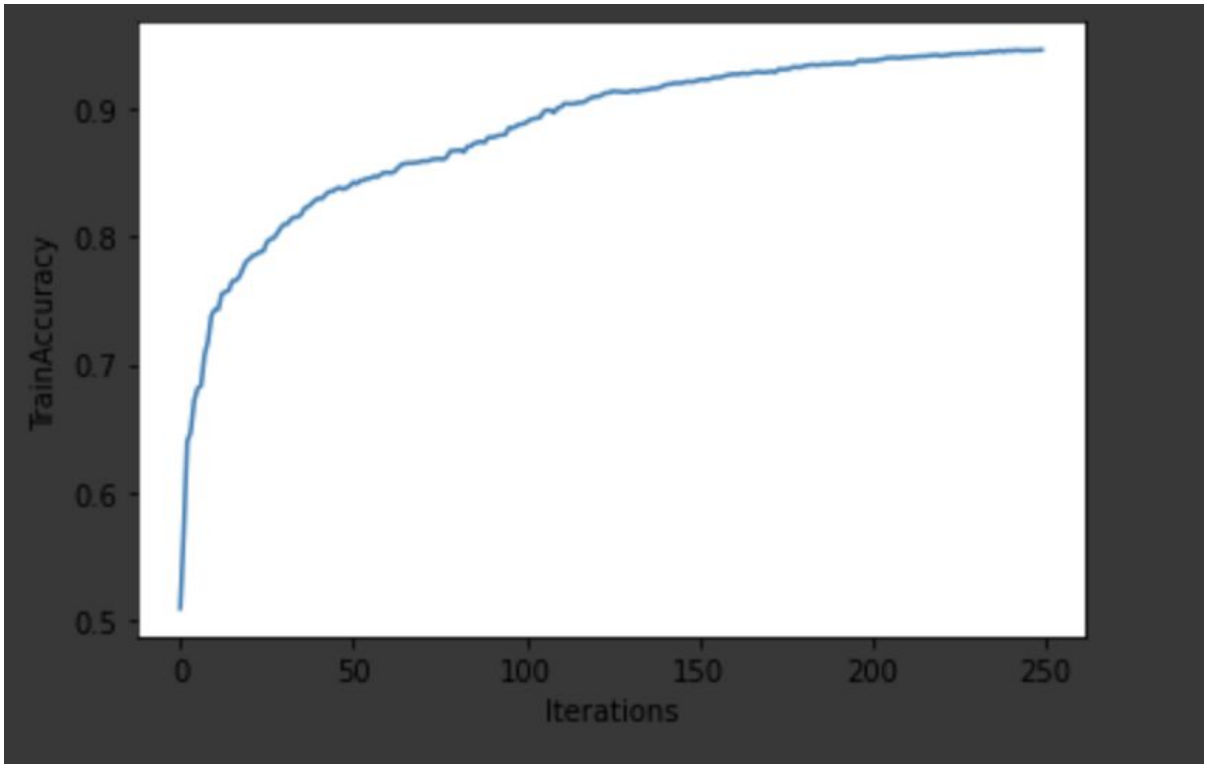


b. k=40

Test Accuracy:

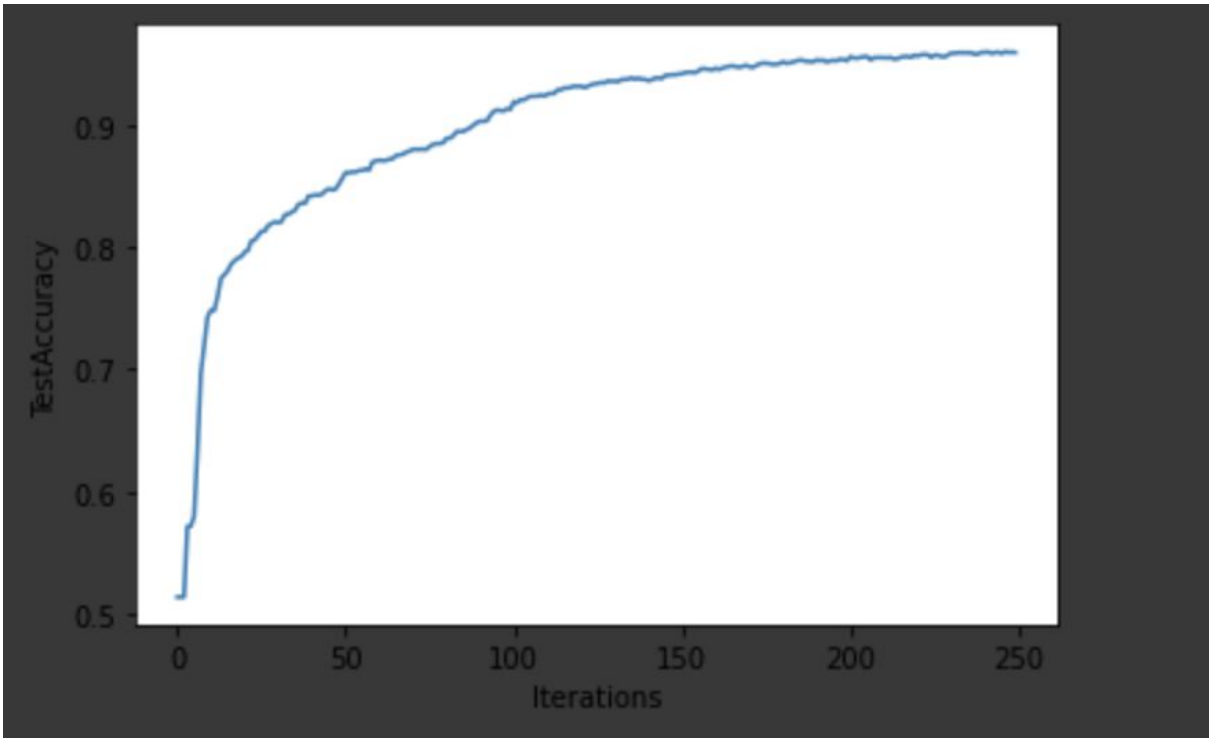


Train Accuracy:

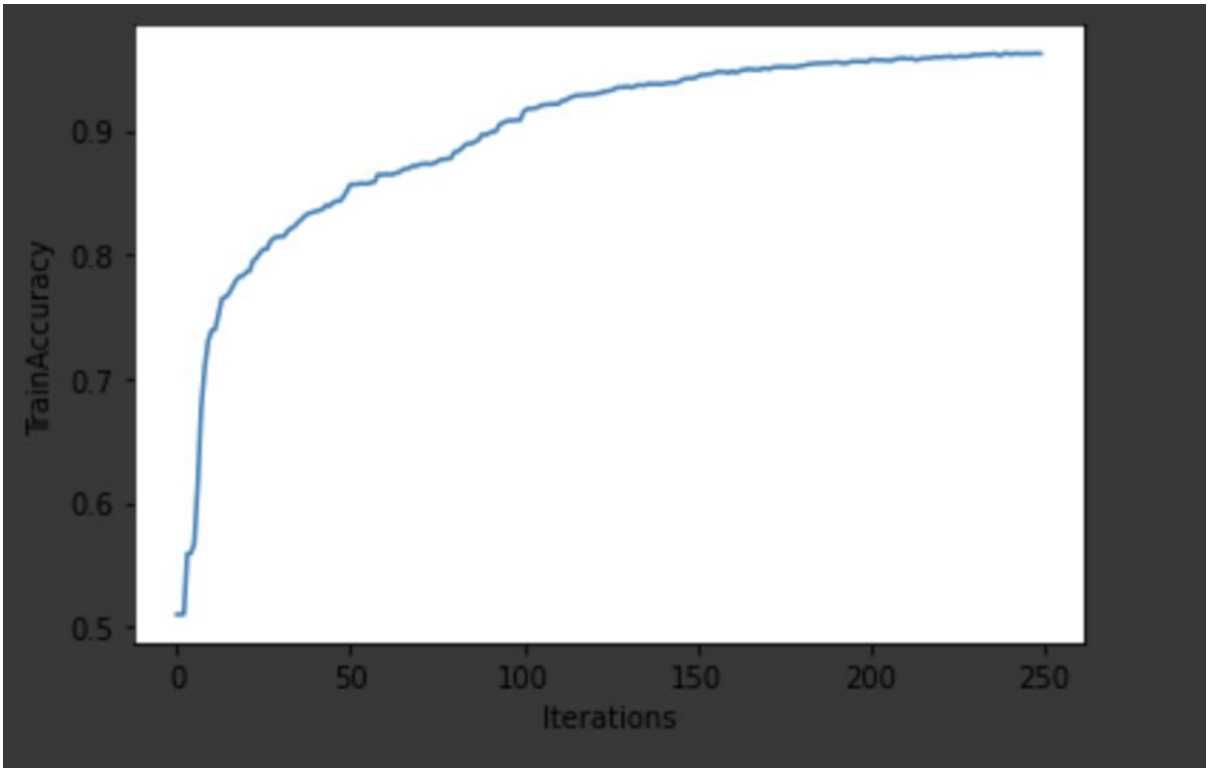


c. **k=200**

Test Accuracy:



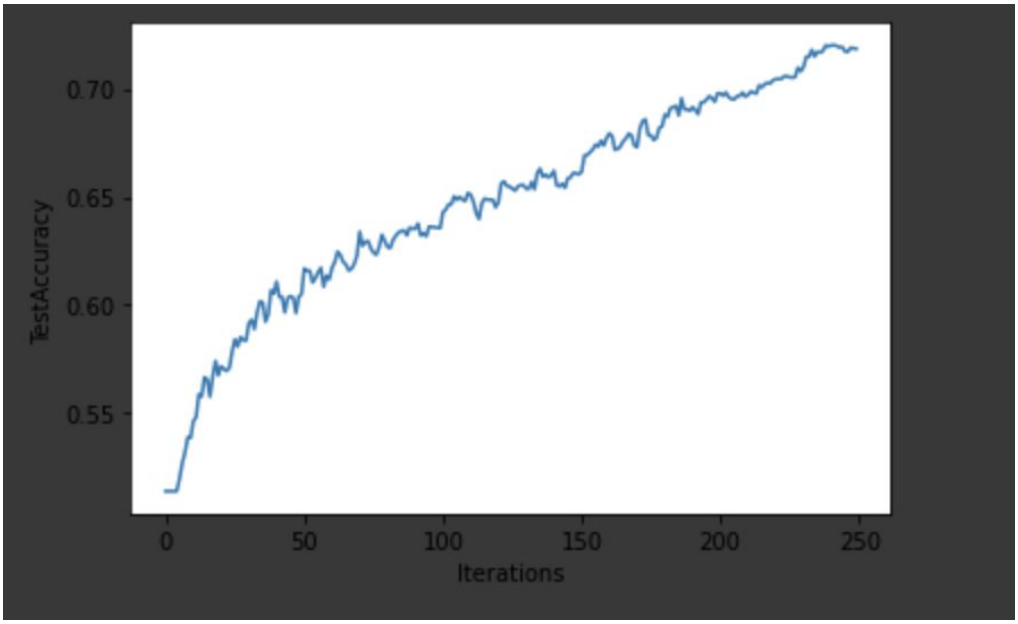
Train Accuracy:



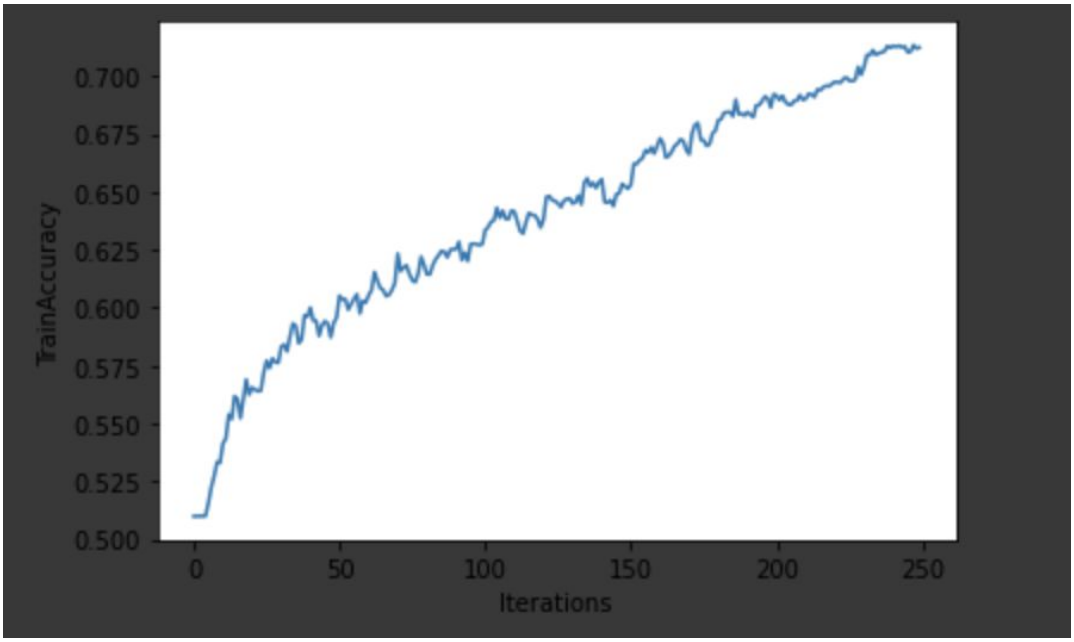
d.

4. **Learning Rate = 0.0001**
    a. **k=5:**

Test Accuracy:

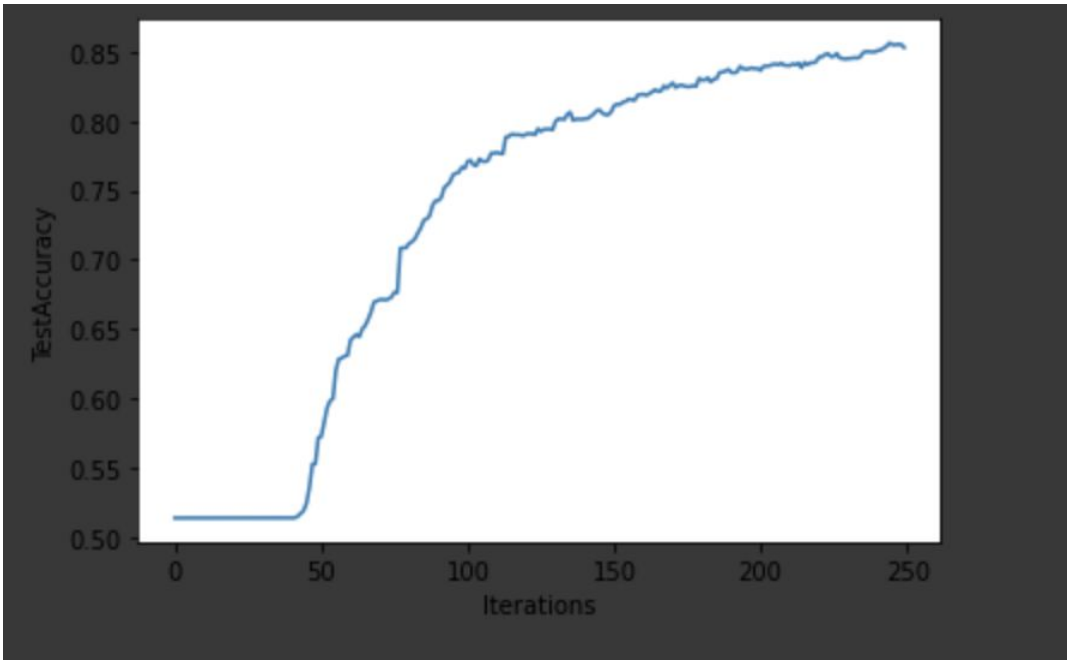


Train Accuracy:

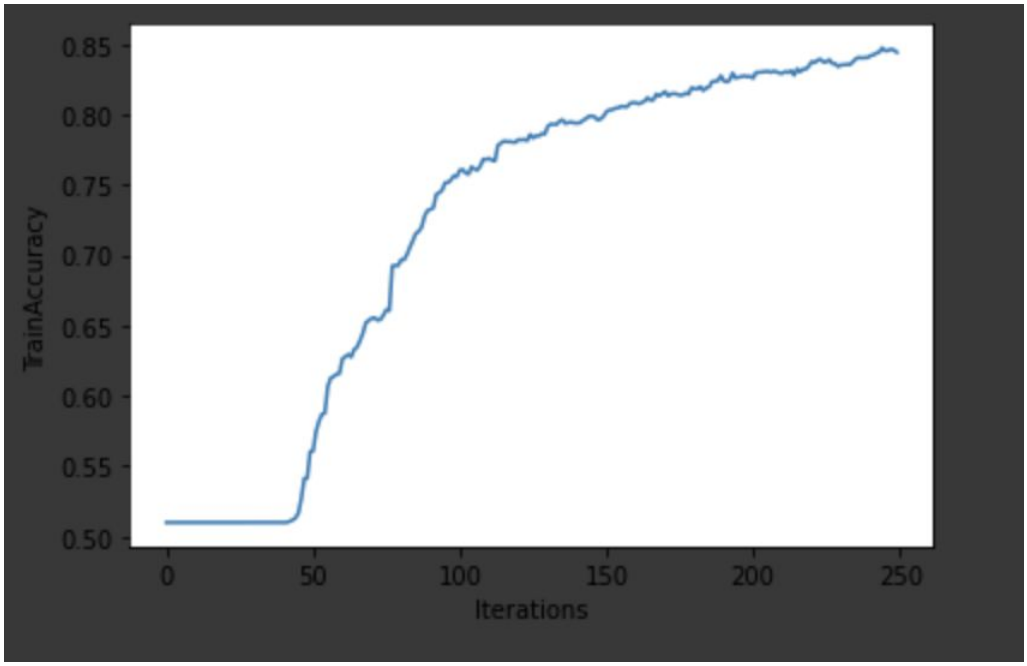


b. **k=40**

Test Accuracy:

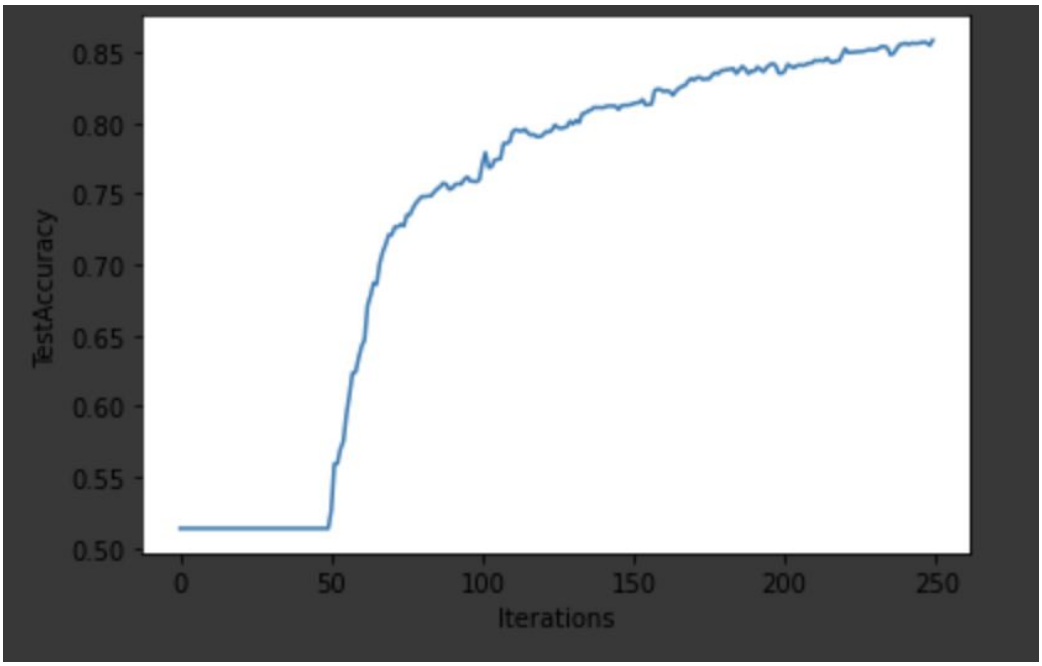


Train Accuracy:

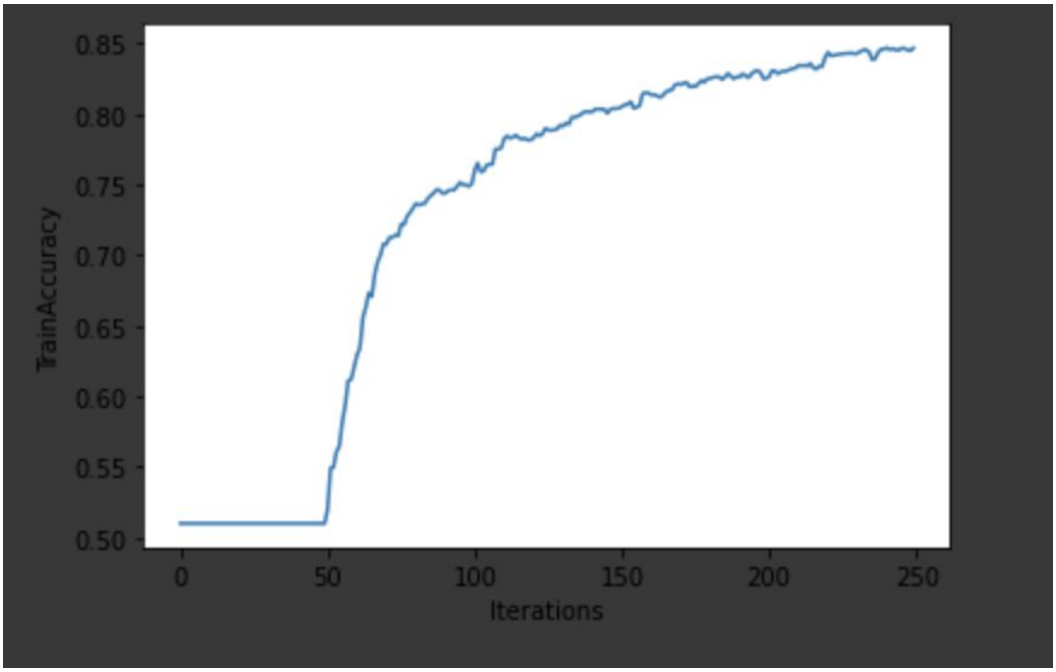


c. **k=200**

Test Accuracy:



Train Accuracy:



d. Comment on the role of hidden units k on the ease of optimization and accuracy

As k increases, the train and the test accuracy increases based on the above plots.

5. **Comment on the difference between linear model and neural net. Comment on the differences between logistic and quadratic loss in terms of optimization and test/train accuracy**

   The neural net provides a non-linear boundary while the linear model provides a linear boundary. Neural network provides better efficiency as compared to linear classifier because of its non-linear decision making.

   The logistic loss takes much less time to calculate as compared to quadratic loss. Therefore, converges faster and has a higher accuracy.