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Assignment 3 Report

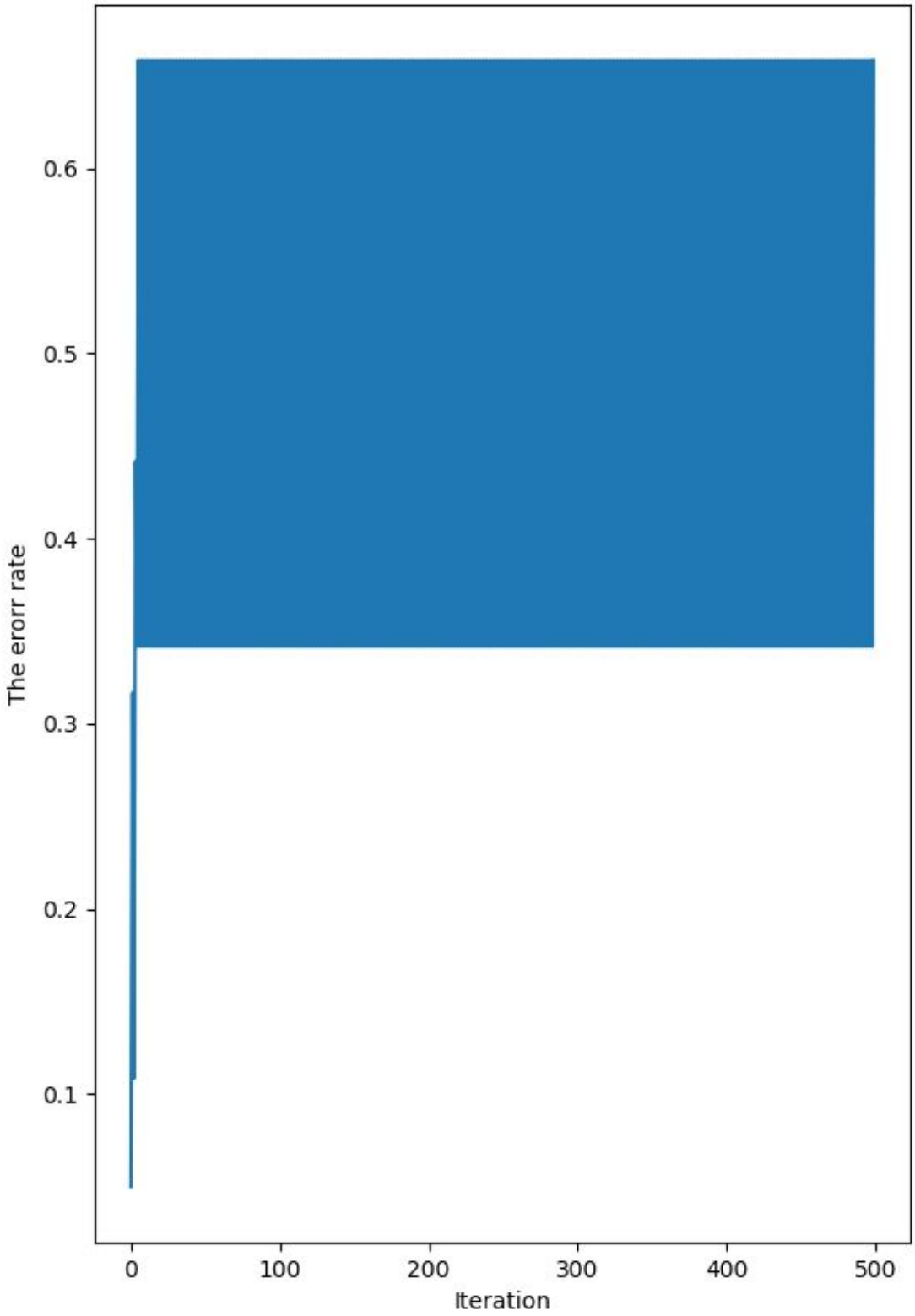
Our version of multiclass adaboost is based on “Multi-class AdaBoost” by Zhu, Rosset, Zuo, and Hastie. We ran the experiments on the MNIST dataset and also the Iris classification one provided by scikitlearn. We tried decision trees, restricted to have a depth of 2 so they would not be too strong, and support vector classifiers. In all experiments we used 500 weak learners.

This screenshot shows all experiments and the table below reports the results more clearly.

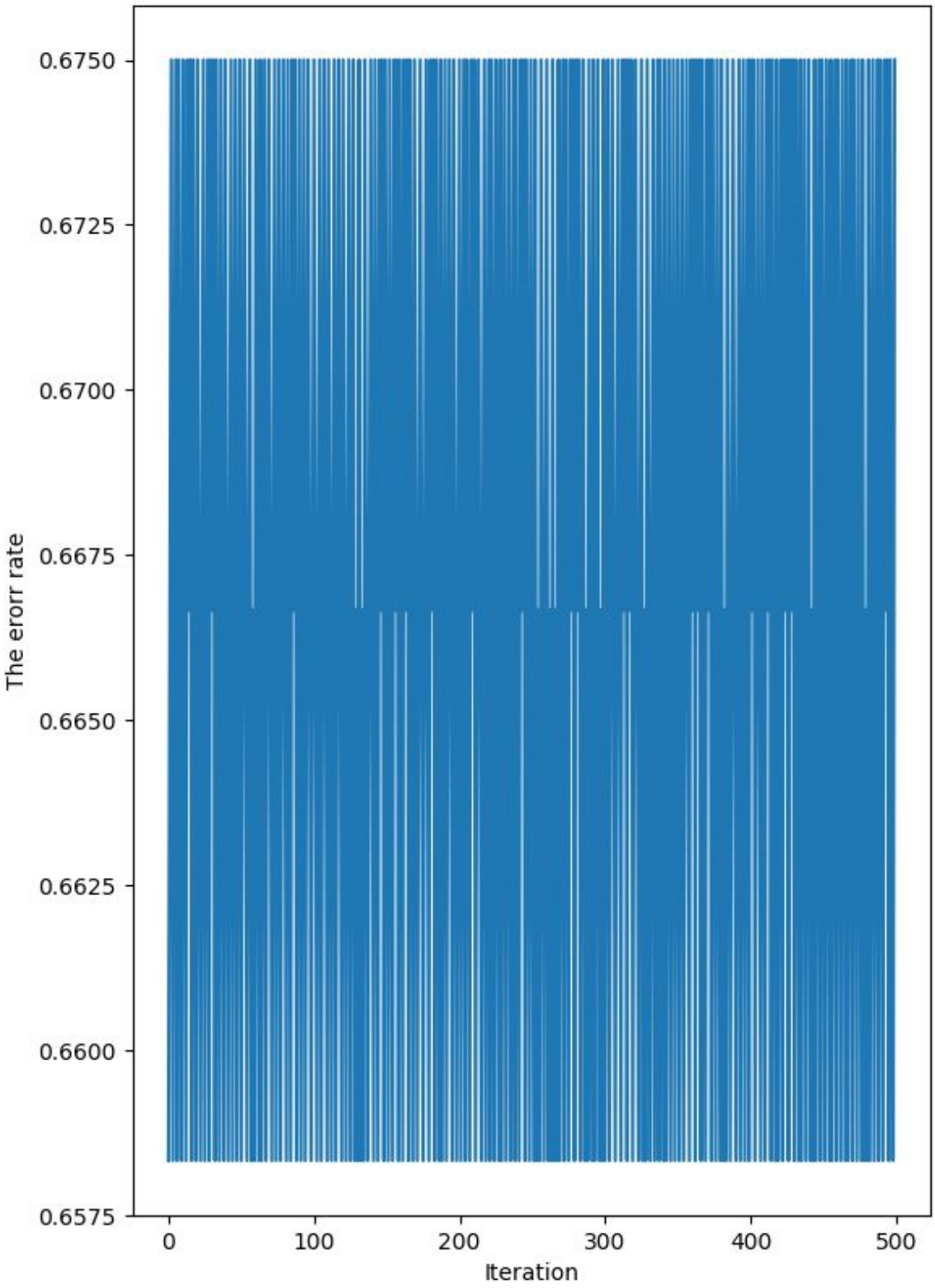
```
(base) ~/d/C/Assignment3 ››› python assignment3.py
Doing experiments for the digits dataset

Decision tree tests for digits
Boosting complete
figure written to digitsDecisionTreeErrorRate.png
Our implementation's accuracy was : 0.9472222222222222 on 360 samples
Accuracy for scikit learn: 0.7333333333333333

SVC tests for digits
Boosting complete
figure written to digitsSVCErrorRate.png
Our implementation's accuracy was : 0.55 on 360 samples
Accuracy for scikit learn: 0.33611111111111114
Doing experiments for the iris dataset

Decision tree tests for iris
Boosting complete
figure written to irisDecisionTreeErrorRate.png
Our implementation's accuracy was : 0.7333333333333333 on 30 samples
Accuracy for scikit learn: 1.0

SVC tests for iris
Boosting complete
figure written to irisSVCErrorRate.png
Our implementation's accuracy was : 0.3 on 30 samples
Accuracy for scikit learn: 0.6666666666666666
(base) ~/d/C/Assignment3 ›››
```

	Ours	SciKit Learn
Iris, decision tree	**0.947**	0.733
Iris, SVC	**0.55**	0.336
MNIST, decision tree	0.733	**1.0**
MNIST, SVC	0.3	**0.666**

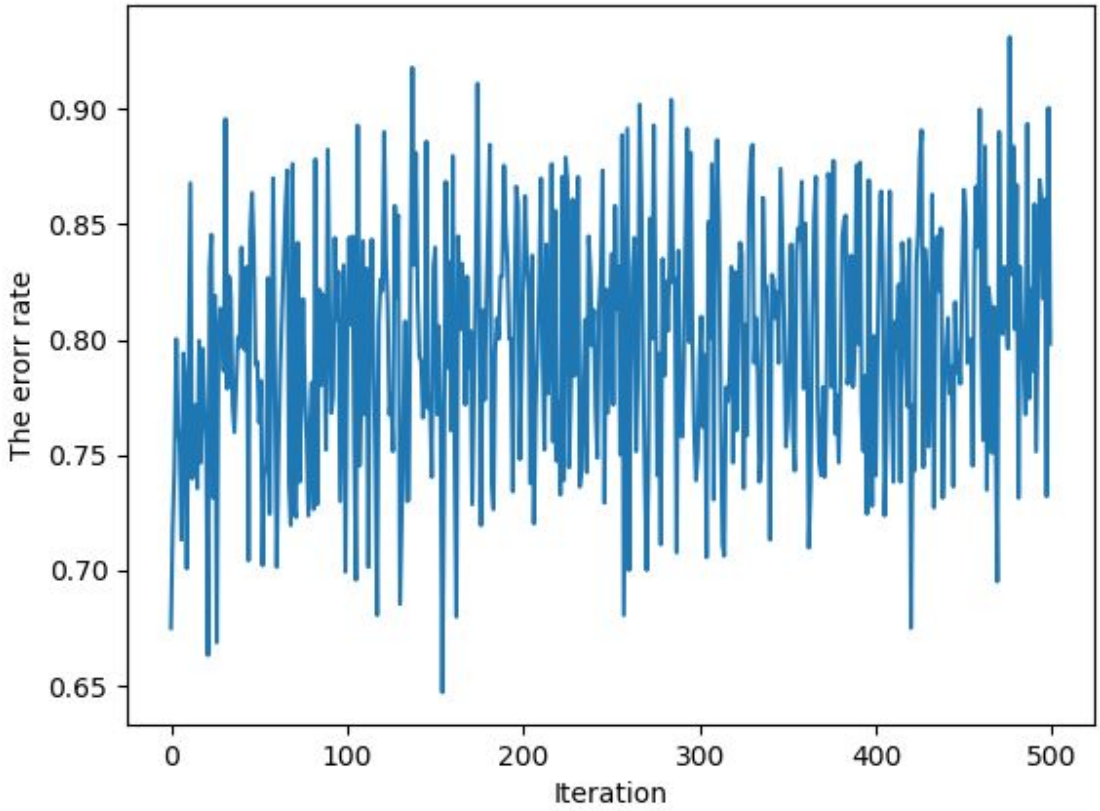
Interestingly, our approach did better on the Iris dataset and worse on MNIST.



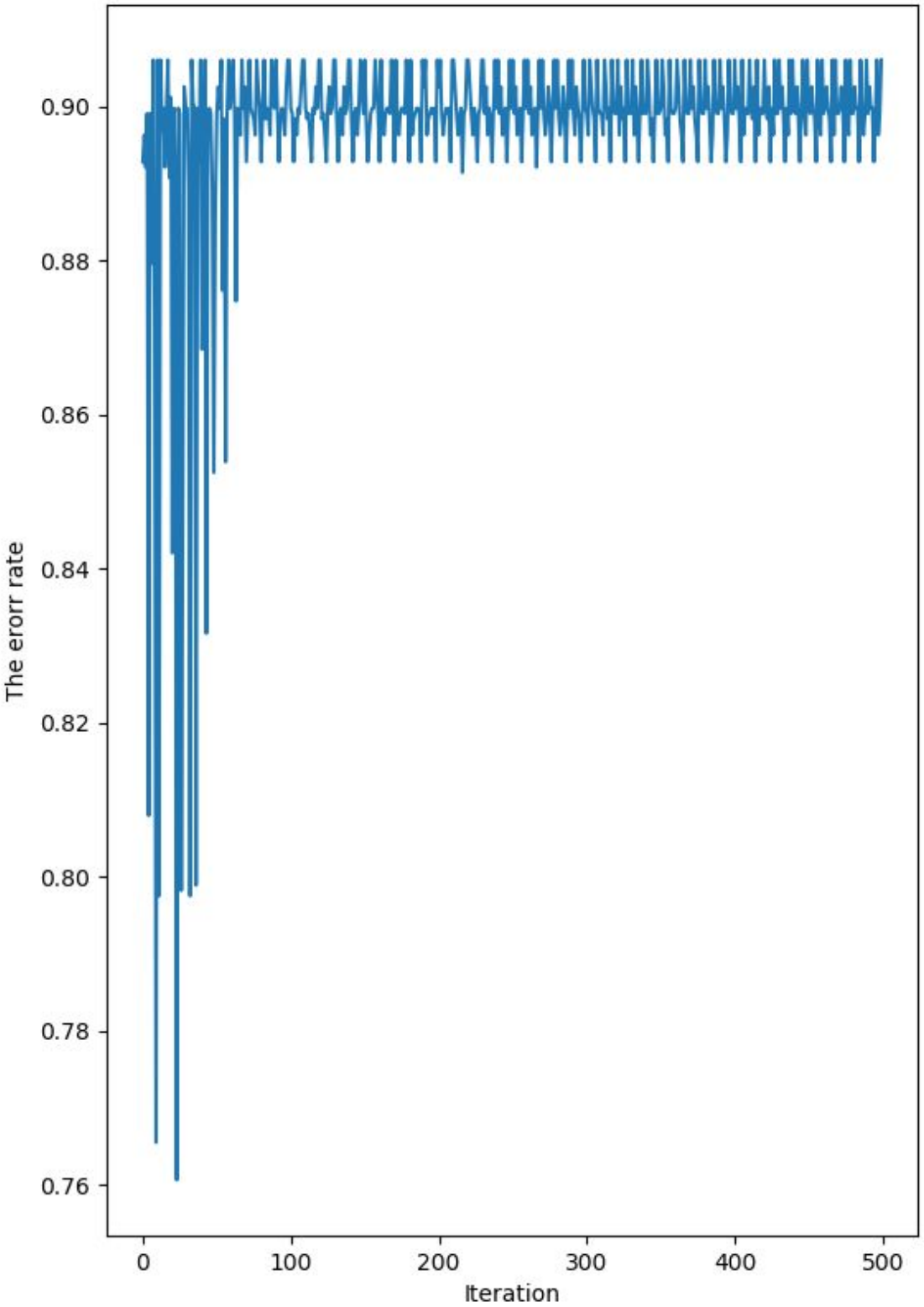
The error rate over training for the iris dataset with decision trees



The error rate over training for the iris dataset with SVCs



The error rate over training for the MNIST dataset decision trees



The error rate over training for the MNIST dataset with SVCs

An interesting feature of several of these plots is that they seem to oscillate in the band of error values. Perhaps this suggests an implementation error or a quirk in the dataset.