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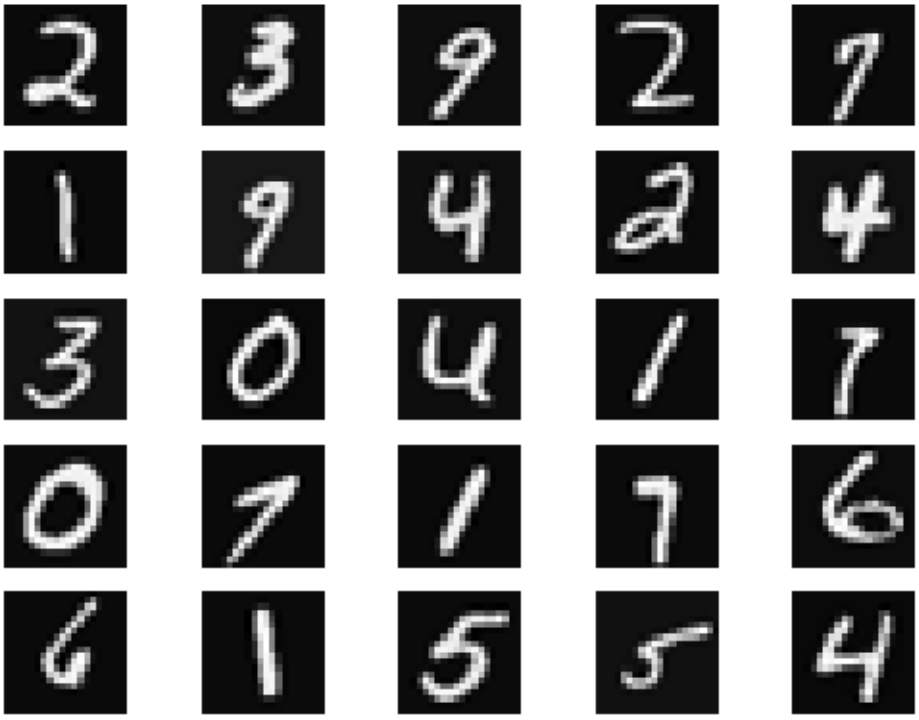
ECE 1395 – Dr. Dallal

Assignment 8

4/14/23

Question 1

Part a



Part c

- Subsets saved as .mat files in the input folder

Part d

```
SVM classification error for training subset 1: 0.01100000000000001
SVM classification error for training subset 2: 0.06000000000000005
SVM classification error for training subset 3: 0.07999999999999996
SVM classification error for training subset 4: 0.07499999999999996
SVM classification error for training subset 5: 0.07099999999999995
```

```
SVM classification error for testing data: 0.09199999999999997
```

Part e

```
KNN classification error for training subset 1: 0.11699999999999999
KNN classification error for training subset 2: 0.07299999999999995
KNN classification error for training subset 3: 0.135
KNN classification error for training subset 4: 0.124
KNN classification error for training subset 5: 0.10699999999999998
KNN classification error for testing data: 0.14200000000000002
```

Part f

```
Logistic Regression classification error for training subset 1: 0.09399999999999997
Logistic Regression classification error for training subset 2: 0.08899999999999997
Logistic Regression classification error for training subset 3: 0.007000000000000006
Logistic Regression classification error for training subset 4: 0.10599999999999998
Logistic Regression classification error for training subset 5: 0.09999999999999998
Logistic Regression classification error for testing data: 0.15600000000000003
```

Part g

```
Decision Tree classification error for training subset 1: 0.272
Decision Tree classification error for training subset 2: 0.258
Decision Tree classification error for training subset 3: 0.22099999999999997
Decision Tree classification error for training subset 4: 0.0
Decision Tree classification error for training subset 5: 0.247
Decision Tree classification error for testing data: 0.31999999999999995
```

Part h

```
Random forest classification error for training subset 1: 0.09599999999999997
Random forest classification error for training subset 2: 0.06799999999999995
Random forest classification error for training subset 3: 0.08199999999999996
Random forest classification error for training subset 4: 0.08999999999999997
Random forest classification error for training subset 5: 0.0
Random forest classification error for testing data: 0.126
```

Part i

```
Majority voting classification error for testing data: 0.09799999999999998
```

Part j

- Summarize results

Classifier	Classification Error on Testing set

One-vs-All SVM	0.091
KNN (K = 7)	0.142
Logistic Regression	0.156
Decision Tree	0.319
Random Forest	0.126
Majority Voting	0.097

- Discussion and comparison of results

According to these results, the One-vs-All SVM classifier performed the best, however it was followed closely by the Majority Voting method. This makes sense because the SVM is very capable of handling a larger number of features, and the majority voting method is very versatile because it combines the predictions from several classifiers which makes it more likely to select the correct one. The poorest classifier was the decision tree with an error of about 30%, this make sense because decision trees can begin to overfit data with lots of features. However, this classifier still contributes to the majority voting classifier because its prediction accuracy is still above 50%. Overall, the process of bagging did help some of the classifiers as well as the majority voting method in order to reduce error in our predictions.