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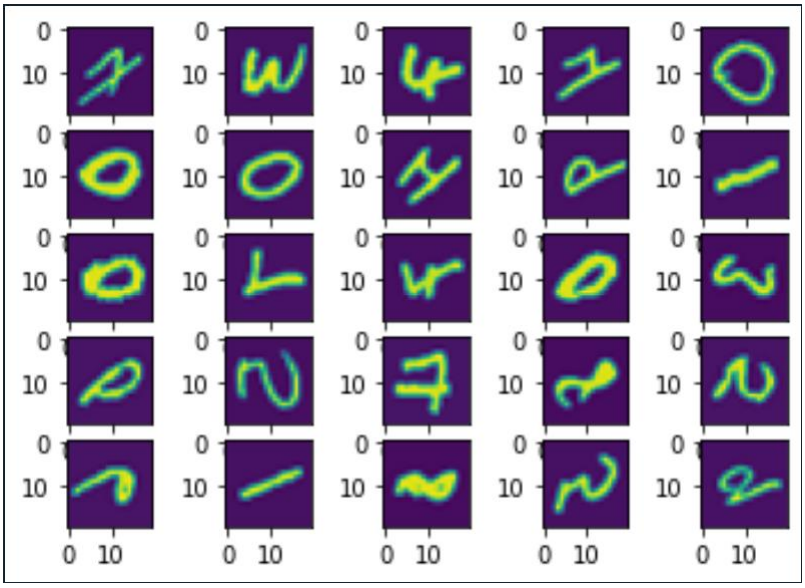
ECE 1395 – Homework 8 – report

Figure obtained in Part a (ps8-1-a.png)



Accuracies using SVM

```
In [13]: runfile('C:/Users/RAYAN/OneDrive/Desktop/ps8.py',
wdir='C:/Users/RAYAN/OneDrive/Desktop')
Accuracy on training set X1 (trained) using SVM: 98.5
Accuracy on training set X2 using SVM: 92.30000000000001
Accuracy on training set X3 using SVM: 93.7
Accuracy on training set X4 using SVM: 93.10000000000001
Accuracy on training set X5 using SVM: 93.60000000000001
Accuracy on testing set using SVM: 92.80000000000001
```

Accuracies using KNN

```
Accuracy on training set X2 (trained) using KNN:
94.69999999999999
Accuracy on training set X1 using KNN: 89.9
Accuracy on training set X3 using KNN: 88.8
```

```
Accuracy on training set X4 using KNN: 88.0
Accuracy on training set X5 using KNN: 88.7
Accuracy on testing set using KNN: 89.8
```

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Accuracies using Logistic Regression

```
Accuracy on training set X3 using (trained) Logistic Regression:
99.5
Accuracy on training set X1 using Logistic Regression: 90.4
Accuracy on training set X2 using Logistic Regression: 89.3
Accuracy on training set X4 using Logistic Regression: 89.5
Accuracy on training set X5 using Logistic Regression: 91.3
Accuracy on testing set using Logistic Regression: 88.6
```

Accuracies using Decision Tree

```
Accuracy on training set X4 (trained) using Decision Tree: 100.0
Accuracy on training set X1 using Decision Tree: 74.3
Accuracy on training set X2 using Decision Tree: 75.9
Accuracy on training set X3 using Decision Tree: 73.1
Accuracy on training set X5 using Decision Tree: 79.4
Accuracy on testing set using Decision Tree: 68.4
```

Accuracies using Random Forest

```
Accuracy on training set X5 (trained) using Random Forest: 100.0
Accuracy on training set X1 using Random Forest: 91.3
Accuracy on training set X2 using Random Forest: 90.0
Accuracy on training set X3 using Random Forest: 92.2
Accuracy on training set X4 using Random Forest: 90.7
Accuracy on testing set using Random Forest: 90.8
```

Accuracy using majority vote

```
Final accuracy on testing set: 92.2
```

Discussion

As we can see, support vector machine gave us higher accuracies than any other classifier. Decision tree gave us the lowest, which is expected since it overfits the training data. However, when we combine multiple trees together, we get higher accuracies which is exactly what we got using random forest classifier (helps in avoiding overfitting also).

We can also notice that bagging does in fact work and gave us a very high accuracy of 92.2%. And that's because it reduces the variance in the results since we use high-variance learners (the 5 algorithms used).