**Bangla Handwritten Digits**

**Training Images** : 23824

**Testing Images** : 2653

Training and test data in separate CSV files

**Feature Extraction:**

1\*785 (row\*column) array for a single 28px \* 28px image where the 785th element is the label of the image. Label defines which class(digit) it belongs to. Each array element is 0 or 1.

**Classifiers:**

1. **Naive Bayes :**

* MultinomialNB of sklearn
* GaussianNB

1. **Random Forest :**

* RandomForestClassifier of sklearn
* n\_estimators=trees
* each iteration increased number of trees by 3

1. **SVM(Support Vector Machine):**

* SVM of sklearn
* Kernel= linear (the **linear kernel** does not perform any mapping, it is generally faster to train your classifier than with other**kernels**. )

1. **MLP( Multi Layer Perceptron)**:

* solver='lbfgs'
* hidden\_layer\_sizes=(20, ) , (200, ) , (200,20 )

1. **Decision tree**

* Decisiontree of sklearn

**Time Complexity**:

**SVM**: took longest time

**MLP**: took 2nd most longest time

**NB**: fastest classifer

**RandomForest**: Slower than NB (3rd most)

**Result & Accuracy:**

* **SVM:**
* 94.23294383716548% (2nd highest)
* **Naive Bayes** : 86.58122879758764%
* GaussianNB: 86.5812287976%
* Random Forset (num of trees = 3 ) : 87.29739917075008%
* Random Forset (num of trees = 6 ) : 91.36826234451564%
* Random Forset (num of trees = 9 ) : 92.83829626837542%
* Random Forset (num of trees = 12 ) : 93.9690915944214%
* Random Forset (num of trees = 15 ) : 95.06219374293254%
* Random Forset (num of trees = 18 ) : 94.94911421032793%
* Random Forset (num of trees = 21 ) : 94.9868073878628%
* Random Forset (num of trees = 24 ) : 95.77836411609498%
* Random Forset (num of trees = 27 ) : 95.70297776102525%
* Random Forset (num of trees = 30 ) : 95.92913682623445%(Highest at 30 trees , after it accuracy decreases)
* Random Forset (num of trees = 33 ) : 95.81605729362985%
* Random Forset (num of trees = 36 ) : 95.40143234074633%
* ACCURACY oF **Multi Layer Perceptron**:
* 90.71%( hidden layer= (20, )
* 96.56992084432717% hid layer=(200, )
* **DecisionTreeClassifie**r : 85.4881266490765%