OBJECT RECOGNITION

PROBLEM STATEMENT

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1. Recognize handwritten digits (0-9) using machine learning methods.

2. Accuracy: $\frac{\# \ of \ correct \ predictions}{\# \ of \ testing \ data \ points}$

3. Database: MNIST
   - http://yann.lecun.com/exdb/mnist/
   - 60,000 training and 10,000 testing images

METHOD 1

1. SVM
2. Use scikit-learn
3. Framework
   - Load the data
   - Reduce the feature dimension to 10 (try other values 20, 30, ...)
     - decomposition.PCA(); .fit(); .transform()
   - Train a SVM classification model
     - SVC(); .fit()
   - Report the accuracy on the testing data
     - .score()

METHOD 2

1. NN
2. Use Keras and scikit-learn
3. Framework
   - Load the data
   - Reduce the feature dimension to 10 (try other values 20, 30, ..., even the original dimension)
     - decomposition.PCA(); .fit(); .transform()
   - Train a NN classification model
     - Two hidden layers and one output layer
     - Dense(); keras.utils.to_categorical(); .compile(); .fit()
   - Report the accuracy on the testing data
     - .evaluate()

METHOD 3

1. CNN
2. Use Keras
3. Framework
   - Load the data
   - Train a CNN based classification model
     - Tow convolutional, one max pooling, two hidden and one output layer
     - Conv2D(); MaxPooling2D(); Flatten(); Dense(); keras.utils.to_categorical(); .compile(); .fit()
   - Report the accuracy on the testing data
     - .evaluate()