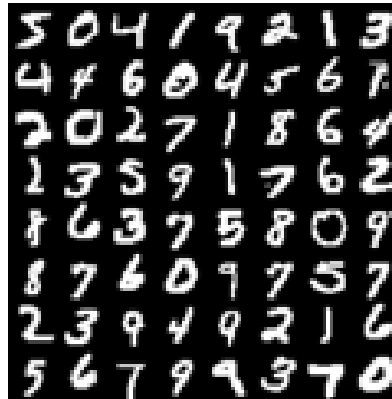


Lab 3: MNIST Digit Classification with KNN and SVMs

The goal of this lab is to perform classification using KNN and SVM on images of handwritten digits. The input is an image of a handwritten digit, and your prediction is a number between 0 to 9. We will use MNIST Dataset, which can be downloaded from <https://data.deepai.org/mnist.zip>. The MNIST Dataset is a set of black and white photos of handwritten digits with their corresponding labels from 0 to 9.



There are four files in the dataset -

- **train-images-idx3-ubyte.gz**: training set images (9912422 bytes)
- **train-labels-idx1-ubyte.gz**: training set labels (28881 bytes)
- **t10k-images-idx3-ubyte.gz** : test set images (1648877 bytes)
- **t10k-labels-idx1-ubyte.gz** : test set labels (4542 bytes)

Use the files [loadMNISTImages.m](#) and [loadMNISTLabels.m](#) to load these into MATLAB arrays.

The basic method for this lab is as follows -

1. Train and find the PCA dimensions for the training data.
2. Project both the training and testing datasets using these PCA bases.
3. Explore the performance of KNN and SVMs by varying the number of PCA bases being projected on.

KNN

Implement the K-nearest neighbor algorithm for the 10 classes that you have. Classify the test data using your KNN implementation on the training projections and calculate the accuracy. In your report, include your accuracies for the different values of K and different number of PCA bases being projected on.

SVM

Use MATLAB's SVM implementation to do 10-class classification of the MNIST Data. Examples and more information can be found [here](#). Figure out which class/function you should use in this lab. Play with different C values and kernel functions and report how they influence your result. Also report your best accuracy and settings including the dimension, C value, and kernel function you used.

Submission instructions:

Deliverables:

- All of your MATLAB (.m) files (All .m files needed to run your code)
- A report in PDF format (Include everything according to the instructions above)

Compress the deliverables into one zip file and name it 'lab6_<your JHED id>'. Submit the zip file on Canvas.