**Problem Statement**

A classic problem in the field of pattern recognition is that of handwritten digit recognition. Suppose that you have images of handwritten digits ranging from 0-9 written by various people in boxes of a specific size - similar to the application forms in banks and universities.

**The goal is to develop a model that can correctly identify the digit (between 0-9) written in an image.**

**Objective**

You are required to develop a model using Support Vector Machine which should correctly classify the handwritten digits from 0-9 based on the pixel values given as features. Thus, this is a 10-class classification problem.

**Data Description**

For this problem, we use the MNIST data which is a large database of handwritten digits. The 'pixel values' of each digit (image) comprise the features, and the actual number between 0-9 is the label.

Since each image is of 28 x 28 pixels, and each pixel forms a feature, there are 784 features. MNIST digit recognition is a well-studied problem in the ML community, and people have trained numerous models (Neural Networks, SVMs, boosted trees etc.) achieving error rates as low as 0.23% (i.e. accuracy = 99.77%, with a convolutional neural network).

Before the popularity of neural networks, though, models such as SVMs and boosted trees were the state-of-the-art in such problems.

This webpage (from the original contributors of the dataset) tabulates the accuracies achieved by various classification models.

In this assignment, try experimenting with various hyperparameters in SVMs and observe the highest accuracy you can get. With a sub-sample of 10-20% of the training data (see note below), you should expect to get an accuracy of more than 90%