CS771:Machine learning: tools, techniques, applications
Assignment #4: SVM, Neural net, k-NN, SVM, MLE, EM

Due on: 11-11-2013, 23.59 29-10-2013
MM:290

1. In this question you have to build the 3 classifiers mentioned below on the MNIST handwritten digits dataset and compare their performance.

   The dataset is available at:http://yann.lecun.com/exdb/mnist/

   This is a widely used standard dataset. The URL also lists a large number of algorithms that have been tried and the corresponding error rates.

   (a) Build a multi-layer (3 or more) neural network based classifier for the handwritten digits.

   (b) Build an SVM classifier with a Gaussian kernel.

   (c) Build a K-nearest neighbour classifier.

   Compare averaged ten-fold error rates for the above classifiers. [50,50,50]

2. Generate a 2-variate Gaussian datasets where a) the covariance matrix is a diagonal matrix and b) where each entry in the covariance matrix is non-zero. Use maximum likelihood estimation to estimate the parameters using sample sets of varying sizes. Compare with the estimated values with the actual values.

   [70]

3. Generate a univariate Gaussian mixture dataset that is a mixture of 3 Gaussians (with different means and variances) for 2 different mixture combinations (0.2, 0.3, 0.5) and (0.7, 0.2, 0.1). Use the expectation maximization algorithm to estimate the parameters and the mixture coefficients. Compare the estimated values with the actual values. [70]