CSE 455/555 Spring 2013 Homework 11: Hidden Markov Model

Jason J. Corso
Computer Science and Engineering
SUNY at Buffalo
jcorso@buffalo.edu

This assignment does not need to be submitted and will not be graded, but students are advised to work through the problems to ensure they understand the material.

You are both allowed and encouraged to work in groups on this and other homework assignments in this class. These are challenging topics, and working together will both make them easier to decipher and help you ensure that you truly understand them.

Pen-Gesture Recognition with Hidden Markov Models

1. Data: This data has 5 files, one for each vowel of the alphabet. These are xml files and the format is self-explanatory. Take the odd indexed entries as training data and the even ones as testing data.
2. Using a spatial clustering algorithm that you already implemented (*e.g.* K-Means, GMM) on the 2D training data.
3. Implement the standard Hidden Markov Model. The input will be the cluster index associated with each 2D point.
4. Train a separate HMM for each vowel (do separate clustering for each and then learn the HMM independently). Quantify accuracy against the training and testing set; for each candidate datum, compute its log-likelihood against each HMM and take the label of the HMM that gives the highest log-likelihood. Compute a confusion matrix of results.
5. Vary the number of clusters in step 2 and the number of hidden nodes in step 3 and repeat the quantication. Do this for some number of variants.