On the class web site are four data sets, each containing fifty examples of a spoken words/phrases (Hitme, Hello, Hitman and Hungarian).

1. For each word specify the number of states and the graph structure of the HMM. Justify your answers (10 points).

2. For each of the three problems covered in class:
   a. Calculating the probability a HMM generated a string
   b. Calculating the order of a set of states visited given a particular string
   c. Calculating the parameters of a HMM using Baum Welch

   Specify a) The objective function (be careful this is not straight forward), b) Whether the algorithms covered in class provide an approximate answer or the exact answer.

3. Train a HMM (using the Baum Welch algorithm) for each word so as to identify it. Present diagrams representing the fully trained HMM’s be sure to present both transition probabilities and symbol generating probabilities (35 points)

4. On the web site are two hundred examples of unlabeled words, provide the posterior probabilities for each word for each of the HMM’s. (35 points)

5. Suppose you extended your above work to recognize all possible words. How could you use priors to improve the correct parsing of a sentence of words (10 points)?