EE 516

# Practice Problems on HMM

Suppose that you have trained an HMM and obtained the following model parameters:

$$a_{ij} = \begin{matrix} & \begin{matrix} H & C \end{matrix} \\ \begin{matrix} H \\ C \end{matrix} & \begin{pmatrix} 0.7 & 0.3 \\ 0.4 & 0.6 \end{pmatrix} \end{matrix}, \qquad b_{jk} = \begin{matrix} \begin{matrix} S & M & L \end{matrix} \\ \begin{pmatrix} 0.1 & 0.4 & 0.5 \\ 0.7 & 0.2 & 0.1 \end{pmatrix} \end{matrix} \begin{matrix} H \\ C \end{matrix}$$

Furthermore, suppose the hidden states correspond to H and C, respectively, and the observations are S, M, and L, respectively. Assume the initial hidden state at $t=0$ is C. The observation starts from $t=1$ and ends at $t=3$.

1. Compute the probability that the model generates the observation sequence $\underline{v}^3 = (M, S, L)$ by
   (1) direct computation,
   (2) the forward algorithm.

2. Determine the "best" hidden state sequence that led to the above observation sequence by
   (1) direct method, (consider all possible hidden state sequen
   (2) the decoding algorithm using forward variable,
   (3) the Viterbi algorithm.