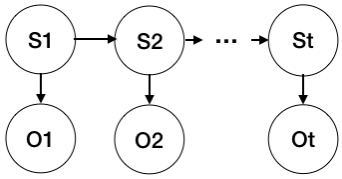
Hidden Markov Model (HMM) Project

Week 8 - Session 1

1 HMM Exercise

Infection is a common condition among patients in ICU settings and can have various roots, which makes it challenging to be determined. Assume that we want to model infection using an HMM, while *infection* is the hidden state and the only available observation is *blood pressure* (0 for normal and 1 for abnormal). When patients entering ICU, the probability of being infected is 0.75. At any given time, infected patients have 40% chance of improving to be uninfected and uninfected patients have 20% chance of becoming infected. There is 80% chance of observing an abnormal blood pressure for infected patients while only 10% chance of observing abnormal observation for uninfected patients.



(a)

(b) (3 points) Create initial, transition, and emission probability tables based on the problem statement given above.

(c) (6 points) Using the described HMM and the generated probability tables, apply the forward algorithm to compute the probability that we observe the sequence $\{0, 1, 1\}$ blood pressure. Show your work (i.e., show each of your αs).

(d) (6 points) Using the backward algorithm, compute the probability that we observe the aforementioned sequence ($\{0, 1, 1\}$). Again, show your work (i.e., show each of your βs).

(e) (4 points) Using the forward-backward algorithm, compute the most likely setting for each state. Show your work.

(f) (6 points) Use the Viterbi algorithm to compute the most likely sequence of states. Show your work.