CECS 451
Assignment 12
Total: 25 Points

General Instruction

- I recommend you can write your answer using LaTeX.
- Submit your work in the Dropbox folder via BeachBoard (Not email or in class).

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1. (8 points) Exercise 15.2.
2. A professor wants to know if students are getting enough sleep. Each day, the professor observes whether the students sleep in class, and whether they have red eyes. The professor has the following domain theory:
   - The prior probability of getting enough sleep, with no observations, is 0.7.
   - The probability of getting enough sleep on night t is 0.8 given that the student got enough sleep the previous night, and 0.3 if not.
   - The probability of having red eyes is 0.2 if the student got enough sleep, and 0.7 if not.
   - The probability of sleeping in class is 0.1 if the student got enough sleep, and 0.3 if not.

   (a) (7 points) Formulate this information as a hidden Markov model that has only a single observation variable. Give a Bayesian network and conditional distributions.

   (b) (10 points) Consider the following evidence values, and compute $\vec{P}(EnoughSleep_2|\vec{e}_{1:2})$ and $\vec{P}(EnoughSleep_1|\vec{e}_{1:3})$.
   - $\vec{e}_1$ = not red eyes, not sleeping in class
   - $\vec{e}_2$ = red eyes, not sleeping in class
   - $\vec{e}_3$ = red eyes, sleeping in class