EN.520.650 Homework 3 Spring 2021

1. Aliens can be friendly or not; 75% are friendly. Friendly aliens arrive during the day 90% of the time, while unfriendly ones always arrive at night. If an alien arrives at night, how likely is it to be friendly?
2. After your yearly checkup, the doctor has bad news and good news. The bad news is that you tested positive for a serious disease and that the test is 99% accurate (i.e., the probability of testing positive when you do have the disease is 0.99, as is the probability of testing negative when you don’t have the disease). The good news is that this is a rare disease, striking only 1 in 10,000 people of your age. Why is it good news that the disease is rare? What are the chances that you actually have the disease?
3. Consider the Bayesian alarm network discussed in the class.
4. If no evidence is observed, are Burglary and Earthquake independent? Prove this from the numerical semantics and from the topological semantics.
5. If we observe Alarmtrue, are Burglary and Earthquake independent? Justify your answer by calculating whether the probabilities involved satisfy the definition of conditional independence.
6. For the HMM example discussed in the class, consider the output sequence O1= Red, O2= Blue, O3 = Yellow. Calculate the probability of P (O1, O2, O3/ HMM parameters). Also calculate the sequence of state transitions that gave rise to the observed sequence given above.

Due on 03/11/2022