COMPSCI 383 – Spring 2022

Homework 4 Calculations

Due Sunday, April 3rd at 9pm ET

You are encouraged to discuss the assignment in general with your classmates, and may optionally collaborate with one other student. If you choose to do so, you must indicate with whom you worked. Multiple teams (or non-partnered students) submitting the same code will be considered plagiarism.

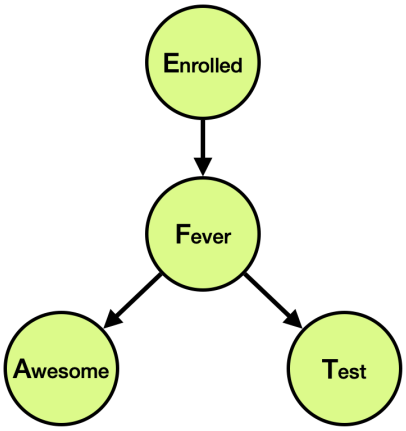
For the Homework 4 Primer, you were asked to answer "qualitative" questions about a Bayesian network that could be answered with some inspection and basic reasoning about probabilities. For this assignment, you will calculate some of those quantities precisely using the DAG and CPTs. As you're working, you should make sure your answers to the two parts of the assignment agree with each other.

What to Submit

You should submit a file named `homework4calc.pdf`, containing your answers to the questions. You can record your answers on this document (preferred) or create your own.

383 Fever Revisited (35 points)

Exposure to COMPSCI 383 is a known cause of "383 Fever", whose main symptom is excessive awesomeness. Over the years, scientists have developed a simple blood test to help confirm clinical diagnoses.



*The causal Bayesian network DAG shown on the right describes the relationships between variables **Enrolled** (whether someone is taking 383), **Fever** (whether they have 383 Fever), **Awesome** (whether they are exhibiting an excessive amount of awesomeness), and **Test** (whether their blood sample tests positive). These are abbreviated **E**, **F**, **A**, and **T**, respectively.*

Answer the following questions precisely by calculating the probabilities. ***You must show your work***. Note that you are free to use any of the probability definitions and laws covered in class, and are not required to emulate the Variable Elimination algorithm from lecture.

a. What is the marginal probability that a random student is enrolled in 383?

b. Calculate the marginal probability of a random student testing positive or 383 Fever.

c. Calculate the marginal probability of a random student being excessively awesome.

d. Calculate the joint probability of a random student being excessively awesome *and* testing positive for 383 Fever.

e. Calculate the probability of a random student being excessively awesome *or* testing positive for 383 Fever.

f. Calculate the conditional probability of a random student being enrolled in 383 given that they are excessively awesome.

g. Calculate the conditional probability of a random student being enrolled in 383 given that they are excessively awesome and tested positive.