

CSc 74010 Fall 2011, Homework 6

The first few questions make use of the Bayesian network in Figure 1.

1. How many numbers do we need to specify all the necessary probability values for the network in Figure 1? How many would we need if there were no conditional independencies (if we didn't have the network)? (10 points)

2. Compute the joint probability:

$$P(m, \neg t, h, s, \neg c)$$

(10 points)

3. Use the enumeration algorithm to compute the probability of

$$P(m|h, s)$$

(20 points)

4. Use stochastic simulation to compute the full joint probabilities. I want to see the results of the first 5 samples only.

(20 points)

5. Use rejection sampling to compute:

$$P(m|h, s)$$

Again, I only want to see the results of 5 samples, but I want to see 5 samples that aren't rejected.

Comment on the difference between your answer and that for Question 3.

(20 points)

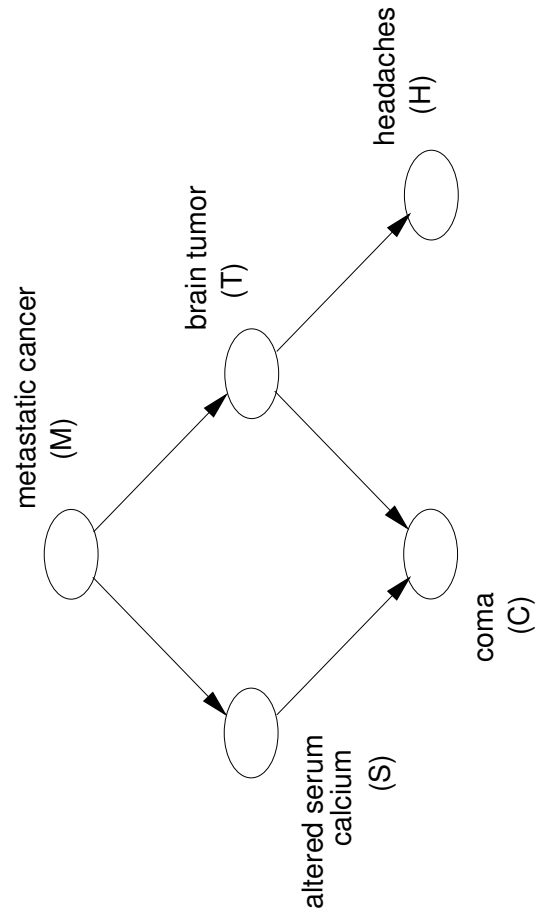
6. Here is a decision problem facing some recent graduates in computer science. Having finished their undergraduate degree, they have a choice between looking for a job, and going to graduate school to get a masters degree.

If they choose to look for a job, they have a one in 10 chance of not finding a job using their degree, and a 90% chance of finding a job using their degree. If they don't find a job using their degree, they will have an average income of \$20,000 for the next five years. If they find a job using their degree, they will have an average income of \$70,000 for the next five years.

If they choose to go to graduate school, they will have no income for 2 years, and it will cost them \$50,000 (total) to be a student for those two years. At the end of their masters, they have a 5% chance of not finding a job using their degree(s) and thus have an average income of \$20,000 for the next three years. They will have a 20% chance of finding a job that will pay them \$120,000 on average for the three years, and a 75% chance of finding a job that will pay them \$90,000 for the next three years.

- (a) What are the expected values of looking for a job right out their undergraduate degree and of going to graduate school?
- (b) What is the rational choice? Why?
- (c) If a student is very risk averse, what should they do?

(20 points)



$P(M)$
0.1

M	$P(S M)$
T	0.8
F	0.2

M	$P(T M)$
T	0.7
F	0.1

S	T	$P(C S, T)$
T	T	0.95
T	F	0.85
F	T	0.85
F	F	0.01

T	$P(H T)$
T	0.9
F	0.7

Figure 1: The example Bayesian network.