CS594: Artificial Intelligence, Fall 2004
Due: 12:00 PM, Friday, October 29, via email to parker@cs.utk.edu (no hard copies accepted)

Exam #2 Extra Credit Homework (Not required)

You must work alone on this extra credit homework. You may use your textbook and your class notes (and a calculator), but you may not use any other source or person for help on this extra credit.
Only emailed answers to parker@cs.utk.edu by noon Friday will be accepted. No hard copies.

This extra credit homework is worth up to 15 points added to your Exam #2 grade. Incorrect answers will not count against you. You may answer any part of any problem. Only fully correct answers that show how the answer was derived will receive credit. Your exam #2 grade + extra credit homework may exceed 100 points (if you did well enough on Exam #2 to begin with).

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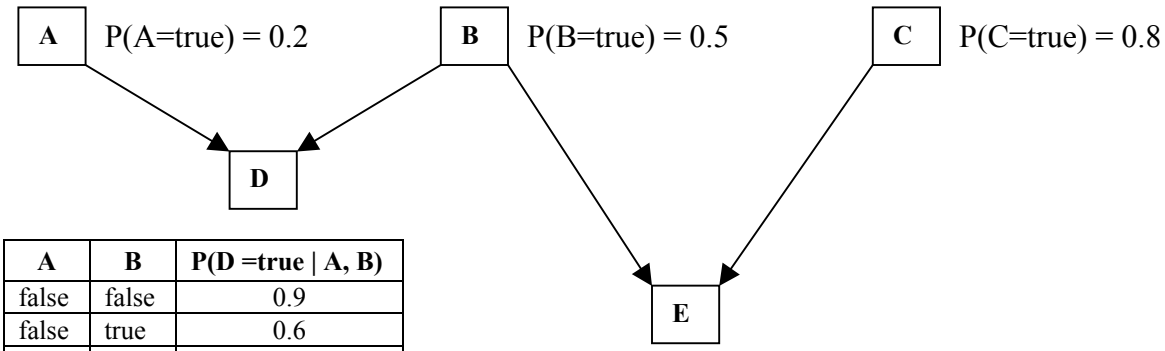
1. Consider the following Bayesian Network, where variables **A-E** are all Boolean-valued:



A	B	P(D =true | A, B)
false	false	0.9
false	true	0.6
true	false	0.5
true	true	0.1

B	C	P(E=true | B, C)
false	false	0.2
false	true	0.4
true	false	0.8
true	true	0.3

(a) (1 point) What is the probability that all five of these Boolean variables are simultaneously true? (Show your work.)

(b) (2 points) What is the probability that **A** is false given that the four other variables are all known to be true? (Show your work.)

(c) (2 points) What is the probability that **E** is true given that **A** is true and **B** is false? (Show your work.)

2. (5 points) First-grader Maggie has divided her books into two groups, those she likes and those she doesn't.

The five (5) books that Maggie likes contain (only) the following words:
animal (5 times), *mineral* (15 times), *vegetable* (1 time), *see*(1 time)

The ten (10) books that Maggie does *not* like contain (only) the following words:
animal (5 times), *mineral* (10 times), *vegetable* (30 times), *spot*(1 time)

Using the Naïve Bayes assumption, determine whether it is more probable that Maggie likes the following book than that she dislikes it. Show and explain your work.

see mineral vegetable // These three words are the entire contents of this new book.

3. You've got a touch of the plague and wonder if it is fatal. The Centers for Disease Control (CDC) informs you that there is a test that indicates "fatal" with probability 0.9 if you are actually going to die. The CDC also says that the test indicates "nonfatal" with probability 0.6 if in fact you have a non-fatal strain. Last, luckly the fatal strain is only found in one tenth of the cases.

(a) (1 point) What is the probability that the test will give a false alarm (i.e., tells you your plague is fatal when it isn't)?

(b) (4 points) Your test comes back "fatal". What is the probability you will survive?