CSE 573 Problem Set 3

Due Mon 11/10/08 4:40pm

Preferably, turn in by email to both **daipeng@cs** & **weld@cs**

If any problem doesn't contain enough information for you to answer it, feel free to make any assumptions necessary to find the answer, but state the assumptions clearly. You will be graded on your choice of assumptions as well as the clarity of your written answers.

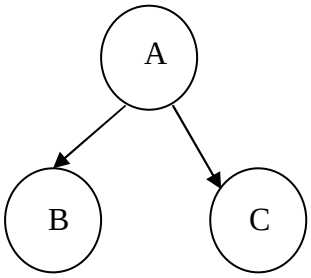
You are allowed to discuss problems with your classmates to the extent of formulating ideas. When it comes to writing up solutions, I expect each person to do their own work. I'll also request that you wait an hour between discussions of a problem and the subsequent writeup.

On the homework you submit, please include a list of all the people with whom you discussed the problem. If you consult written materials other than the course materials, please list these resources as well. (Normally, this should be unnecessary). On programming assignments, I expect you to write the code from scratch given the materials we have listed. (E.g., on PS2, please don't search for a unification routine on the Web - I'm sure that there are many out there). If you wish to write your PDDL domain by modifying an existing domain, that can be fine, but list the domain(s) you started from and include a listing.

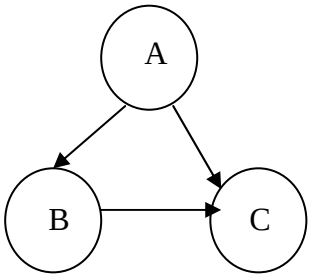
We'll accept late problem sets under the following conditions:

- Up to 1 hour late - no penalty
- Up to one day late - 25% penalty
- Up to two day late - 50% penalty
- More than 2 days - no credit (please plan ahead!)

1. (5 points) R&N problem 13.1
2. (5 points) R&N problem 13.8
3. (15 points) R&N problem 13.11
4. (5 points) R&N problem 13.16
5. (25 points) R&N problem 14.2
6. (20 points) R&N problem 14.7 parts a (10 points), b (5 points) and c (5 points)
7. (6 points) R&N problem 20.4
8. (30 points) Consider a Bayesian network that has three Boolean-valued nodes, A, B, and C. Assume that we have little knowledge about this network and so decide to use a Beta prior with both α and β equal to 5 for all random variables. We then observed the system, recording data about its behavior, which is stored in the following file: (http://www.cs.washington.edu/education/courses/573/08au/problems/ps3/data.txt) Note that 0 denotes false and 1 denotes true.
   a) (5 points) Consider the two network structures shown on the next page. Use the data to update the prior to compute the conditional probability tables for the nodes in structure 1.
   b) (5 points) Do likewise for structure 2.
   c) (5 points) What is the probability of observing the data given structure 1 and the learned CPT values?
   d) (5 points) Likewise, what's the probability of observing the data for structure 2?



Structure 1



Structure 2

e) (5 points) Which structure better models the data?

f) (5 points) Suppose that you are using the following utility function, U, to evaluate the two structures. Which structure do you prefer then?

U = log(P(D|BN))-penalty, where
Penalty = 1/2 * (# of parameters) * log(#data points).