

CPS 570: Artificial Intelligence - Practice
Midterm 2

Your name:

Please read instructions carefully. Do not write down disorganized answers in the hope of getting partial credit; it's better to do a few questions completely right. Please write your answers down clearly. You can use extra pages. Good luck!

-Vince

Problem 1: Bayes nets (65 points).

In this question, you will construct your own Bayes net, and do some inference on it.

You go to a casino to play the following game.

- You flip two coins, Coin 1 and Coin 2.
- If both coins come up heads, then you win.
- If at least one coin comes up tails, then you lose.
- With probability .4, the casino is fair.
- If the casino is fair, then each coin has a probability of .5 of coming up heads.
- If the casino is not fair, then each coin has a probability of .3 of coming up heads.
- With probability .1, the casino is bankrupt.
- If you win, and the casino is not bankrupt, the probability that you get paid is .8.
- If you win, and the casino is bankrupt, the probability that you get paid is .2.
- If you lose, the probability that you get paid is 0.

Part a (30 points). Draw a Bayes net for this. You should assume independence unless a dependence is explicitly given above. Your Bayes net should contain at least the following (binary) variables: CasinoFair, Coin1Heads, Coin2Heads, CasinoBankrupt, GetPaid. (You can add Win if you like.) **Give** the conditional probability tables.

Part b (35 points). Both of your coins came up heads! **What is** the probability that you will get paid? That is, what is $P(\text{GetPaid} = \text{true} | \text{Coin1Heads} = \text{true} \wedge \text{Coin2Heads} = \text{true})$?

Problem 2: Partial-order planning (35 points).

You are currently Asleep, but not Fed. Your goal is to be Asleep and Fed. You can Eat, which makes you Fed, but that requires that you are Awake. You can also WakeUp, which makes you Awake and not Asleep; and you can GoToSleep, which makes you Asleep and not Awake.

Part a (10 points). Write the actions formally, with their preconditions and effects. Give a plan for achieving the goal.

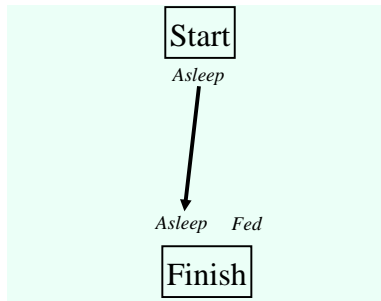


Figure 1: The search algorithm starts out with a bad decision.

Part b (25 points). We can search for a partial-order plan for this problem. **Show** how the search algorithm finds a partial-order plan, by **drawing** the sequence of partially completed partial-order plans as the search continues (and you should **add** some comments next to these pictures to describe what is going on, how conflicts are getting resolved, etc.). Of course, the algorithm has to make choices at some points; you can make these choices in whichever way you like, except the algorithm **must** start by linking the “Asleep” from the start to the “Asleep” from the finish, as indicated in Figure 1 (which must be your first picture): you must show how the algorithm recovers from this bad initial decision, and then finds the correct plan.