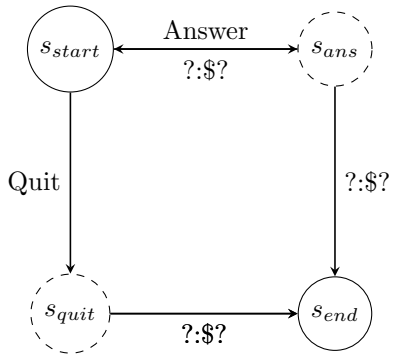
Quiz 2 - Artificial Intelligence, CS 541A

May 2, 2022

1 Markov Decision Process [10 pts]



For the MDP above (same as the one we had in class), we randomly selected a policy and generated four (4) episode.
What will be the values after each episode if we use the Model-based Monte Carlo method. You should write down all the six (6) transition probabilities and six (6) rewards for each question.

i) Policy = Quit, Data = $s_{start}; Quit, 10, s_{end}$
ii) Policy = Ans, Data = $s_{start}; Ans, 4, s_{start}; Ans, 4, s_{end}$
iii) Policy = Ans, Data = $s_{start}; Ans, 4, s_{end}$
iv) Policy = Quit, Data = $s_{start}; Quit, 10, s_{end}$
v) Policy = Ans, Data = $s_{start}; Ans, 4, s_{start}; Ans, 4, s_{start}; Ans, 4, s_{end}$

2 Bayesian Network [10 pts]

Passing the quiz (Q) depends upon only two factors. Whether the student has attended the classes (C) or the student has completed the practice quiz (P). Assume that completing the practice quiz does not depend upon attending the classes.

i) Draw a Bayesian network to show the above relationship.
iii) Show the probability a student attends the classes and also completes the practice quiz ($\mathbb{P}(C = c, Q = q)$) as a product of local conditionals.
iv) Re-draw the Bayesian network for the joint probability mentioned in part ii.
iv) Draw the corresponding factor graph.

3 Logic [10 pts]

i) What does it means for an inference rule to be sound?
ii) Give an example of how resolution inference rule is sound.
iii) Write down each of the following statements as first-order logic.
a. John likes apples but not bananas.
b. Every student who fails the quiz, fails the course.
c. There are some people who own a cat and a dog.