

6.034 Quiz 1

September 26, 2007

Name	
EMail	

Circle your TA and recitation time, if any, so that we can enter your score in our records and return your quiz to you promptly.

TAs
Mike Klein
Tom Kollar
Akua Nti
Mark Seifter
Grace Lestier

Thu	
Time	Instructor
11-12	Kimberle Koile
12-1	Kimberle Koile
1-2	Kimberle Koile

Fri	
Time	Instructor
12-1	Howard Shrobe
1-2	Howard Shrobe
2-3	Howard Shrobe

Problem number	Maximum	Score	Grader
1	50		
2	50		
Total	100		

There are 10 pages in this quiz, including this one. A tear-off sheet is provided at the end with duplicate drawings and data.

1 Question 1: Rule Systems (50 pts)

Josh Lim has been working with the police department for a while. After a few months of doing boring fact-checking work, he decides to get smart and write a computer program that will do his job for him. Through careful introspection he has come up with the following rules to determine whether or not his suspects are likely to be guilty of a crime.

- P1: (IF ((? x) is a businessman)
THEN ((? x) makes millions))
- P2: (IF ((? x) is in the mob)
THEN ((? x) has low taxes))
- P3: (IF (AND ((? x) has low taxes)
((? x) makes millions))
THEN ((? x) embezzles money))
- P4: (IF ((? x) embezzles money)
THEN ((? x) is a criminal))
- P5: (IF (AND ((? x) knows (? y))
((? x) makes millions)
((? y) is in the mob))
THEN ((? x) has low taxes)
((? x) gets out of jail))

One day, a fellow officer, Woody Hoburg, approaches Josh with a few striking facts. Josh tells Woody to give him the list and says he'll get back to him. These are the facts:

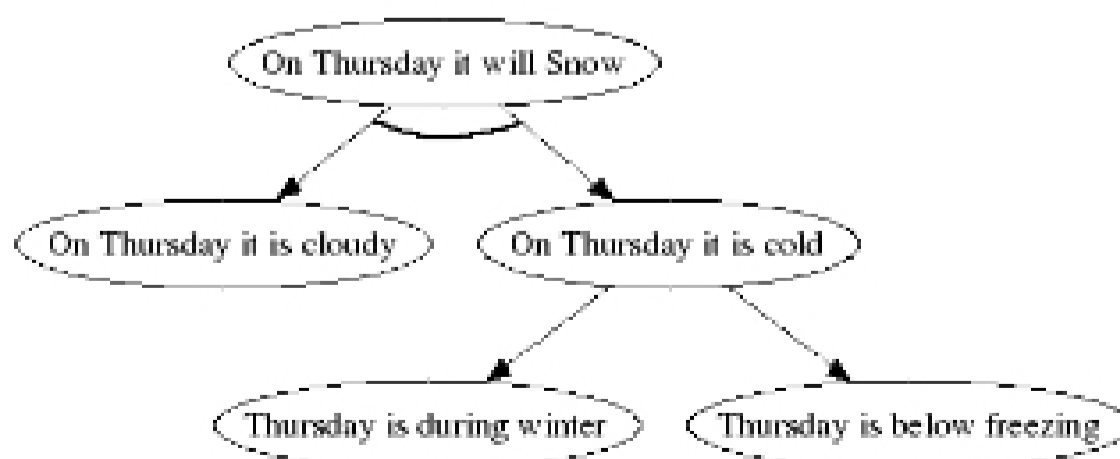
- A1: (Gotti is in the mob)
- A2: (Cagoni is a businessman)
- A3: (Cagoni knows Gotti)

Goal Trees

An example goal tree is shown below using the following rules:

- P1: (IF (AND (On (? x) it is cloudy)
(On (? x) it is cold))
THEN (On (? x) it will snow))
- P2: (IF ((?x) is during winter)
THEN (On (? x) it is cold))
- P2: (IF ((?x) is below freezing)
THEN (On (? x) it is cold))

Don't forget that facts are nodes and edges indicate either an AND or an OR relationship. A goal tree for the proposition *(On Thursday it will snow)* will look like:



1.1 Backward Chaining (30 pts)

Essential Assumptions for backward chaining:

- 1) When working on a hypothesis, the backward chainer tries to find a matching assertion in the database. If no matching assertion is found, the backward chainer tries to find a rule with a matching consequent. In case none are found, then the backward chainer assumes the hypothesis is false.
- 2) The backward chainer never alters the database, so it can derive the same result multiple times.
- 3) Rules are tried in the order they appear.
- 4) Antecedents are tried in the order they appear.

Josh first wants to determine who is a criminal. Seeing that Gotti is a mobster, he starts his investigation there. Draw the goal tree for the statement *Gotti is a criminal*. Partial credit will be given for partial completion of the goal tree.

Draw the Goal Tree

(Gotti is a criminal)

What additional fact is necessary to conclude that Gotti is a criminal?