

EECS 371

HW 4

Due 2/14/2019 1:59 p.m.

In this assignment, we will practice reasoning in a knowledge base. Specifically, we will use Horn clauses and the Cyc knowledge base via Companions. Because Companions requires access to a Windows or Linux machine (i.e., can't be used on Mac unless you have a VM), you may work in a group of **1-3 people**. Make sure to include all names on your assignment.

Your goal is to learn more about the people of the Northwestern CS department. To do so, you will write a set of Horn clauses that, when queried, return the answers to the following questions. Put your Horn clauses in a text file with a krf extension (e.g. "<names>_hw4.krf") and the line `(in-microtheory KRR-Winter2019RulesMt)` at the top. For each query, include a comment with the question number and the answer(s). You can manually extract the relevant parts (i.e. variable bindings) of the returned query answer. When we load your file into Companions, and run the appropriate query (using `KRR-Winter2019RulesMt` as the context), we should get the same answer(s) you do.

0. Getting Set Up

- 1) Unpack the appropriate Companions executable (from Companions-->Box)
- 2) Start a Companions
 - a) Double click the CompanionsServer64.exe
 - b) Enter a username
 - c) Click Start Session>Interaction-Manager
- 3) Load knowledge
 - a) Right click on the interaction-manager agent
 - b) Select "Load Flatfile" and navigate to "KRR-Winter2019Facts.krf"
- 4) Access the kb
 - a) Right click on the interaction-manager agent
 - b) Select "Browse KB"
- 5) See HornClausesCheatSheet.pdf (on Canvas) for some tips

1. Horn clauses

Please write queries that answer the following questions. The second line of each is how we will call the query (HINT: This, with open variables, should be the consequent in your Horn clause). You will need to use the Cyc knowledge base, but do not define any new concepts. The first one is done for you.

0. **Question:** When do the courses that are taught by Willie Wilson meet?
Query: `(courseTaughtTime Wilson ?time)`
`;;; 0) "Tuesday and Thursday from 12:30 pm to 1:50 pm",`
`;;; "Tuesday and Thursday from 2:00 pm to 3:20 pm",`
`;;; "Tuesday and Thursday from 11:00 am to 12:20 pm"`

```
(<== (courseTaughtTime ?person ?time)
      (courseInstructor ?course ?person)
      (courseTimeString ?course ?time))
```

1. **Question:** What is the email address of the person who teaches the Design of Problem Solvers class in the winter of the 2018 academic year?
Query: (emailOfCourseInstructor DesignofProblemSolvers-Winter2018 ?email)

2. **Question:** Who are the faculty who earned at least one degree at Northwestern University?
Example answer: BrentHecht (who earned his PhD at Northwestern University)
Query: (degreeEarnedAt ?faculty NorthwesternUniversity)

3. **Question:** At which universities did the instructors, who teach courses in the spring quarter of the 2018 academic year, earn their PhD degrees?
Example answer: MassachusettsInstituteofTechnology (Ken Forbus teaches Conversational Interfaces in the spring and got his PhD at MIT)
Query:
 (phdInstitutionsByQuarterTaught (SpringQuarterFn (AcademicYearFn NorthwesternUniversity (YearFn 2018))) ?institution)

4. **Question:** What are the full names of the instructors, each of whom teaches two or more courses during the fall quarter of the 2018 academic year?
Example answer: "Haoqi Zhang" (teaches Design Technology & Research and Social Computing & Crowd Sourcing)
Query:
 (teachesMultiple ?name (FallQuarterFn (AcademicYearFn NorthwesternUniversity (YearFn 2018))))

5. **Question:** What are the full names of the instructors, each of whom teaches two or more courses during the fall quarter of the 2018 academic year and teaches at least one course at the same time as Willie Wilson? (They do not need to teach at the same time during the same quarter)
Example answer: "Jesse Tov" (teaches Tuesday and Thursday 12:30pm to 1:50 pm)
Query:
 (teachMultipleAtSameTime ?instructor "Jason 'Willie' Wilson" (FallQuarterFn (AcademicYearFn NorthwesternUniversity (YearFn 2018))))
Hint: Make use of Horn clauses that you have already defined.
Note: The comment on teachMultipleAtTheSameTime is incorrect. That's ok for now.

6. **Bonus Question:** What are the full names of the pairs of instructors, each of whom teaches two or more courses during the fall quarter of the 2018 academic year and who teach at least one course at the same time as each other? (They do not need to teach at the same time during the same quarter)
Query:
 (teachMultipleAtSameTime ?instructor1 ?instructor2 (FallQuarterFn (AcademicYearFn NorthwesternUniversity (YearFn 2018))))
Note: The comment on teachMultipleAtTheSameTime is incorrect. That's ok for now.