CPSC 322, Practice Exercise
Logic: Proofs

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1 Directed Questions

- Given a knowledge base KB and a conjunction of atoms g, what is meant by $KB \models g$?
- Given a proof procedure P, a knowledge base KB and a conjunction of atoms g, what is meant by $KB \vdash_P g$?
- Define what it means for a proof procedure to be sound.
- Define what it means for a proof procedure to be complete.
- What is the key idea of the bottom-up proof procedure?
- How do you know when you have completed a successful derivation using the bottom-up proof procedure?
- How can the bottom-up proof procedure show that there is no successful derivation?
- What is the key idea of the top-down proof procedure?
- How do you know when you have completed a successful derivation using the top-down proof procedure?
- Give an example of an admissible heuristic for top-down search.

2 Datalog

A university has asked you to write a program to help them determine whether or not to accept students who have applied for admission. There are 3 basic pathways for a student to be accepted. If a student is returning to the university after a time away and is in good academic standing with no outstanding fees, they are accepted. Students who submit a complete application and are qualified are also accepted. Students are qualified if they have high SAT scores as well as good high-school transcripts. The university also has a legacy program, wherein children of former graduates are qualified (though these student must still submit a complete application). For brevity, let's only talk about 3 individuals: Sam is a former graduate and Chris is his son. Chris has good high-school transcripts and he submitted a complete application. Laura is a returning student in good academic standing.

- Give the knowledge base representing this problem, using unary predicates `accepted`, `returning`, `goodStanding`, `clearBalance`, `appComplete`, `qualified`, `legacyStudent`, `highSAT`, `goodHS`, and `graduate`, as well as the binary predicate child. The university admissions officials should be able to provide queries such as *accepted*(*chris*) and get a true or false answer.
- Show the top-down derivation of the query *accepted*(*chris*) applied to your KB.

- Show one of the failing top-down derivations of the query $accepted(laura)$ applied to your KB.

3 Learning Goals

You can:

- Define/read/write/trace/debug the BottomUp proof procedure
- Define/read/write/trace/debug the TopDown proof procedure
- Define/read/write/trace/debug the TopDown proof procedure as a search problem
- Represent simple domains in Datalog
- Apply TopDown proof procedure in Datalog