CPSC 322, Practice Exercise
Solutions to Logic: Syntax

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1 Directed Questions

In propositional definite clause logic (PDCL),

- What is an atom? Give the definition and an example.

  Answer: An atom is a symbol starting with a lower case letter.
  Example: ai_is_fun

- What is a body? Give the definition and an example.

  Answer: A body is an atom or is of the form $b_1 \wedge b_2$ where b_1 and b_2 are bodies.
  Example: $students\_are\_motivated \wedge ai\_is\_fun$

- What is a definite clause? Give the definition and an example.

  Answer: A definite clause is an atom or is a rule of the form $h \leftarrow b$ where h is an atom and b is a body. (Read this as h if b.)
  Example:
  $students\_are\_successful \leftarrow ai\_is\_fun \wedge students\_are\_motivated$

- What is a knowledge case? Give the definition and an example.

  Answer: A knowledge base is a set of definite clauses.
  Example:
  ai_is_fun
  $students\_are\_motivated$
  $students\_are\_successful \leftarrow ai\_is\_fun \wedge students\_are\_motivated$

- What is an interpretation of a knowledge base KB? Give the definition and an example.

  Answer: An interpretation I is an assignment of truth values to each atom in each clause of the knowledge base. For the knowledge base above, one interpretation is:
  ai_is_fun = true
  $students\_are\_motivated$ = false
  $students\_are\_successful$ = true
  (Note that there's nothing in the definition of an interpretation that says clauses have to be true under the interpretation; that part is captured by a *model*; see below)

- What is a model of a knowledge base KB?

  Answer: A model of a set of clauses is an interpretation in which all the clauses are true. For the knowledge base above, the only model is:
  ai_is_fun = true
  $students\_are\_motivated$ = true
  $students\_are\_successful$ = true

2 Syntax

Which of the following rules are syntactically invalid in propositional definitive clause logic, and why?

1. bikeCrashed $\leftarrow$ cycledDrunk

   Answer: Syntactically valid.

2. goByBus $\vee$ goByCar $\leftarrow$ bikeBroke

   Answer: Syntactically invalid: the head of a clause has to be an atom.

3. goByBus $\leftarrow \neg$haveGas $\vee$ bikeBroke

   Answer: Syntactically invalid: atoms in a clause's body can only be connected by a $\wedge$, and you can't have negation, either.

3 Learning Goals

You can:

- Model a relatively simple domain with propositional definite clause logic (PDCL)