

# Principles of Knowledge Representation and Reasoning

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## Exercise Sheet 10

Due: July 5, 2015

### Exercise 10.1 (ANSWER SET PROGRAMMING AND DEFAULTS, 6)

Reconsider the following knowledge base from exercise 9.2 (slightly condensed): *By default, students are not lazy. But computer science students are typically intelligent, and intelligent students are usually lazy. Anne and Bob study computer science.* Using Default Reasoning, the conclusion *Anne and Bob are lazy* follows credulously. Your task:

- Model the knowledge base as an Answer Set Program. Make use of the two versions of negation provided by the ASP language. Use `clingo`<sup>1</sup> to output all answer sets of your program.<sup>2</sup>
- Choose one of the answer sets and check that it is indeed an answer set according to the definition from the lecture.
- Show that the answer sets correspond to the extensions of the default theoretical formalization.

### Exercise 10.2 (SOLVING SUDOKU USING ASP, 6)

Sudoku is yet another well-known combinatorial problem. Sudoku is played on  $n^2 \times n^2$  grids that consist of blocks of size  $n \times n$ . The variant  $n = 3$  is the most popular one, and one of its problem instances is depicted below.

?	?	6	?	?	?	?	9	?
?	?	?	5	?	1	7	?	?
2	?	?	9	?	?	3	?	?
?	7	?	?	3	?	?	5	?
?	2	?	?	9	?	?	6	?
?	4	?	?	8	?	?	2	?
?	?	1	?	?	3	?	?	4
?	?	5	2	?	7	?	?	?
?	3	?	?	?	?	8	?	?

Initially, some of the grid's cells are filled with numbers ranging from 1 to  $n^2$ . The goal of the player is to fill all the remaining cells with numbers from 1 to  $n^2$  such that each column, each row, and each of the  $n \times n$  blocks contain all of the numbers 1 to  $n^2$ .

Write a program using ASP that can solve arbitrary instances of Sudoku.

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<sup>1</sup><https://potassco.org>

<sup>2</sup>Run `./clingo 0 <yourfile>`