

---

# DS2020– Artificial Intelligence

## Lab 4

---

**Due on 31/3/2025 11.59pm**

**Instructions:** Upload to your moodle account one zip file containing the following. Please do not submit hardcopy of your solutions. Late submission is not allowed without prior approval of the instructor. You are expected to follow the honor code of the course while doing this homework. This lab may be completed **pairs**.

1. Include a README file explaining how to execute the scripts.
  2. Name the ZIP file using the following convention rollnum\_rollnum.zip
- 

### Sudoku Solver using pycosat

Formulate Sudoku as a Boolean satisfiability problem. Your first objective is to represent the sudoku problem in the Conjunctive Normal Form (CNF). There are 6 sets of clauses that must be created.

1. Each cell in puzzle contains at least one value.
2. Each cell in the puzzle contains at most one value.
3. Each row in the puzzle should contain all the values.
4. Each column in the puzzle should contain all the values.
5. Each smaller block should contain all the values.
6. The initial setup (values for some of the cells).

You will use a standard SAT solver – pycosat to obtain the solution to the puzzle (if it exists). Learn more about the solver from here <https://pypi.org/project/pycosat/>. Ensure that you use the correct representation and arguments when calling the solve function in pycosat.

Include in the pdf document your approach to formulate the puzzle as a Boolean SAT problem. Specifically describe the process of converting constraints to Boolean sentence in CNF.

The input to your code will be the name of the text file containing all Sudoku puzzles. Each line in the text file will correspond to a single puzzle. The puzzles are all formatted row-wise. Empty squares in the puzzle are represented as '.'. For example, a sample input is ".94...13.....76..2.8..1.....32.....2...6.....5.4.....8..7..63.4..8." The output must be a text file

containing the solved puzzles that are also formatted like the inputs. The solutions to the puzzles must appear in the same order as the puzzle in the input file.

**Evaluation**

We will compare the output of your program on sample puzzles.