DS2020– Artificial Intelligence

Lab 4

Due on 26/3/2024 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. A neatly formatted PDF document with your answers for each of the questions in the homework. You can use latex, MS word or any other software to create the PDF.

2. Viva will be conducted to check the contribution of each member of the team towards the assignment.

3. Include a separate folder named as 'code' containing the scripts for the homework along with the necessary data files.

4. Include a README file explaining how to execute the scripts.

5. Name the ZIP file using the following convention rollnumberrollnumberhwnumber.zip

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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.

Viva
The viva for the lab will be conducted on March 27 during the lab hour.