**Artificial Intelligence**

**Sudoku Game**

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**Sudoku Solver and GUI Documentation**

Sudoku Solver

The Sudoku Solver is a Python class that provides functionalities to solve Sudoku puzzles. It includes methods for generating puzzles, checking consistency, and solving puzzles.

Functionality:

Initialization: Initializes the Sudoku grid as a 9x9 matrix with all cells set to 0.

Print Grid: Prints the current state of the Sudoku grid.

Is\_safe: Checks if it's safe to place a number in a given row and column.

solve: Solves the Sudoku puzzle recursively using backtracking.

find\_empty\_cell: Finds the first empty cell in the Sudoku grid.

generate\_puzzle: Generates a solvable Sudoku puzzle with random values.

print\_consistency: Checks the consistency of the Sudoku grid, including row, column, and grid consistency, and displays the domain of each cell.

Sudoku GUI

The Sudoku GUI is a tkinter-based graphical user interface for playing Sudoku puzzles providing 3 available difficulties: Easy, Medium and Hard. It allows users to input puzzle values, generate puzzles, solve puzzles, and check consistency.

Functionality:

Initialization: Sets up the GUI window and creates the Sudoku grid.

generate\_puzzle: Generates a new Sudoku puzzle and updates the GUI grid.

update\_entries: Updates the GUI grid with the current state of the Sudoku solver.

get\_input\_grid: Retrieves the current values from the GUI grid.

solve\_puzzle: Solves the Sudoku puzzle using the Sudoku solver and updates the GUI grid.

check\_consistency: Checks the consistency of the user-input Sudoku grid and prints the results.

State Representation

State represented using 2D arrays although it is not very efficient and takes a lot more time than using 1D array

Sample run

Puzzle after generation

A screenshot of a game

Description automatically generated

Consistency checking and domain checking

A screenshot of a computer

Description automatically generated

Solved puzzle using AI

A screenshot of a puzzle game

Description automatically generated

Easy 23 filled cells Medium 19 filled cells Hard 13 filled cells

A screenshot of a game

Description automatically generatedA screenshot of a game

Description automatically generatedA screenshot of a game

Description automatically generated

**They all take relatively a small amount of time to solve with the exception of some cases in the hard difficulty taking a little bit more time.**