**National University of Computer & Emerging Sciences**

**Karachi Campus**



**Samurai Sudoku Solver using CSP**

**Project Proposal**

**Artificial Intelligence**

**Section: E**

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Project Proposal

**Introduction**

We will develop a solver for Samurai Sudoku, a complex variant of the classic Sudoku puzzle, using Constraint Satisfaction Problem (CSP) modelling. The solver will employ Backtracking Search and Constraint Propagation techniques to efficiently solve the puzzle.

**Existing System**

Standard Sudoku solvers are widely available and use CSP modelling. However, Samurai Sudoku, which consists of five overlapping Sudoku grids, has not been rigorously analysed or solved using these methods.

**Problem Statement**

Existing Sudoku solvers cannot directly handle the complexity of Samurai Sudoku due to its overlapping grids. Our goal is to address this gap by developing a specialized solver that can efficiently solve Samurai Sudoku puzzles.

**Proposed Solution**

We will model Samurai Sudoku as a CSP, where each cell is a variable with constraints ensuring no repetition in rows, columns, or regions. The solver will use:

* Backtracking Search with the Minimum Remaining Values (MRV) heuristic.
* Constraint Propagation to reduce the search space.

**Salient Features**

1. Solves Samurai Sudoku puzzles with overlapping grids.
2. Handles both solvable and unsolvable puzzles.
3. Generates heatmaps to analyse puzzle solvability patterns.

**Tools & Technologies**

* **Programming Language:** Python
* **Frameworks:** NumPy, Seaborn (for visualization)
* **Operating System:** Windows/Linux