## Project Proposal 2: Heuristics and State Space Problem Solving in Sudoku

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SUDOKU									ANSWER:								
2		9				6			2	1	9	5	4	3	6	7	8
	4		8	7			1	2	5	4	3	8	7	6	9	1	2
8				1	9		4		8	7	6	2	1	9	3	4	5
	3		7			8		1	4	3	2	7	6	5	8	9	1
	6	5			8		3		7	6	5	1	9	8	2	3	4
1				3				7	1	9	8	4	3	2	5	6	7
			6	5		7		9	3	2	1	6	5	4	7	8	9
6		4					2		6	5	4	9	8	7	1	2	3
	8		3		1	4	5		9	8	7	3	2	1	4	5	6

## Background

Sudoku is a puzzle typically played on a 9 by 9 grid (though 4 by 4 also exists). The one solving the puzzle is given the grid with some numbers filled in, and is tasked with filling in the rest of the grid such that each row, column, and 3 by 3 square contain the numbers 1-9. No duplicates can be found in any row, column, or square.

Sudoku puzzles range in difficulty based on the number and position of the blank spaces in the puzzle. Humans usually play Sudoku heuristically. The number that goes in any individual cell is determined by process of elimination. If a number appears in the same row, column, or square as the cell, that number is eliminated for consideration for that cell. A human player will also start with cells whose numbers are easily determined and use that cell to inform their plays going forward.

## Project Goals

This project involves developing the infrastructure of a sudoku puzzle, as well as a series of machines to develop answers. The first machine will use the simple heuristic of process of elimination to find a solution. For instance, if the machine tried an 8 in a given situation and that didn't lead to a correct solution, the machine will next try a different number. The second machine will use the heuristics described above to solve simple sudoku puzzles. The results of the first two machines will be compared. The second machine should be able to solve puzzles in less time than the first, and ultimately be able to solve more complex puzzles.

Additional machines will build on the heuristic machine by adding state space problem solving. This should allow the machine to solve more complex problems than heuristics alone.