Report on Assignment 04 (Sudoku solver):

Sudoku is a logic puzzle game involving number placement in a square grid which is partially completed by the problem setter.

The solution is a type of Latin square with an additional constraint. A Latin square is an n × n array filled with n different symbols, each occurring exactly once in each row and exactly once in each column.

Additional Constraint for Sudoku:

The objective is to fill a 9×9 grid with digits so that each column, each row, and each of the nine 3×3 sub-grids that compose the grid (also called "boxes", "blocks", "regions", or "sub-squares") contains all of the digits from 1 to 9. So, for sudoku, the additional constraint is that each of the nine boxes contain all of the digits from 1 to 9.

First, I formulate the sudoku game as a CSP problem. Here every **square** is a variable.
Initially each variable has a domain which is from **1 to 9**. I have implemented a backtracking search with constraint propagation. For this I use "Forward checking". When I assigned a value for an unassigned variable then I reduce the domain of other variables in that row, column and block.
If we have to backtrack then I again the fix the domain of the variable in that row, column & block by adding the deleted value of the variable.
Here we use heuristic for variable ordering so that we early detect the failure and backtrack. This speed up the solving process. I use two variables for tracking how many times variable selection is needed & how many times value selection is needed. For variable selection, I use "**MRV**" heuristic & "**Selection of the first available variable**". For value selection, I use "**Selection of the first available value**".

File Name	Heuristic for Variable Selection	Heuristic for Value Selection	Time	Variable Count	Value Count
80_hard.txt	MRV	First available	182.18ms	35416	98288
80_hard.txt	variable_first	First available	123.81ms	4061	40038
Medium_1.txt	MRV	First available	46.71 ms	151	212
Medium_1.txt	variable_first	First available	55.11ms	1001	2223
Easy.txt	MRV	First available	41.69ms	45	45
Easy.txt	variable_first	First available	46.84ms	137	186
Hard.txt	MRV	First available	37.25ms	104	137
Hard.txt	variable_first	First available	149.27ms	13529	35265