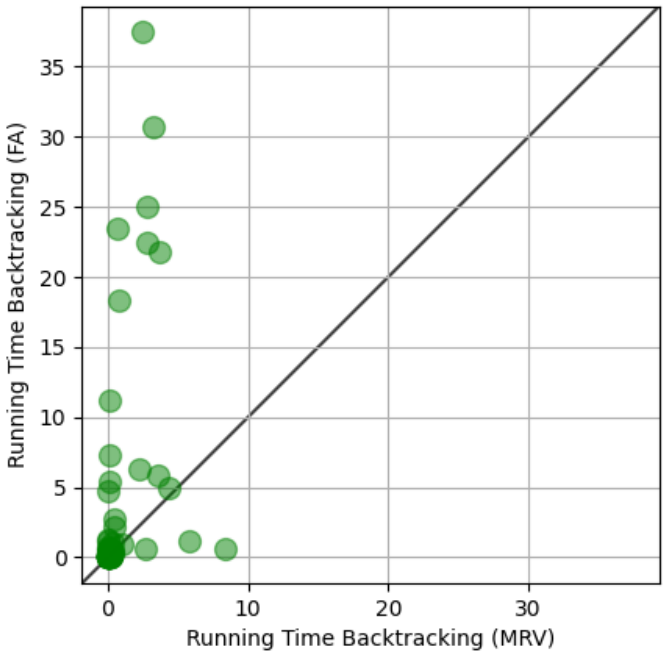
CMPUT366 Assignment2 Analysis



The task of assignment2 is to compare the running time between the backtracking search with MRV heuristic and backtracking search with FirstAvailable heuristic, and the plot result is shown above.

To begin with, it is important to mention that the running time of the one with MRV heuristic and with FA heuristic are both using AC3 method to speed up the running time. If there is no such help with AC3, then the backtracking algorithm will take unreasonably amount of time, and there it is meaningless to examine algorithm with unreasonable time complexity. So the following analysis are all with the help of AC3.

The plot reveals the running time of backtracking search with MRV heuristic is overall faster FA heuristic, except for a few outliers in the bottom (approximately at y=0). The intuition is reasonable because for most of the cases, MRV will eliminate remaining unassigned variables more quickly, thus, it can more quickly detect if there is a valid solution for a subproblem of backtracking search, directly returning false and start next subproblem if there is no solution.

However, MRV requires time to select the minimum remaining value variable, and FA does not. If it is the case that every minimum remaining value variable is the first available variable, then FA will do the same task as MRV does but without the time of searching and selecting the minimum remaining value variable. These kind of cases are indeed rare, but they really exist. So, if we are doing problem like these, the running time of MRV will be larger than that of FA, and this is the explanation of the outliers at the bottom.