Analysis of Running Time for Sudoku Solvers

1 Scatter Plot Analysis

The scatter plot below compares the running times of two different backtracking heuristics—Minimum Remaining Values (MRV) and First Available (FA)—on 95 Sudoku puzzles.

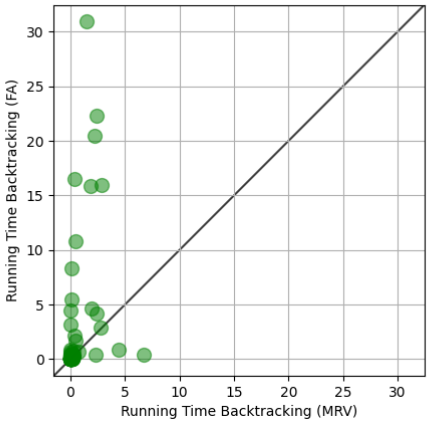

Figure 1: Scatter plot comparing Running Time of Backtracking (MRV) and Backtracking (FA)

2 Discussion of Results

2.1 Clustering at Lower Running Times

Most data points are concentrated near the origin, indicating that for most Sudoku puzzles, both heuristics complete execution in a short time.

2.2 Higher Running Times for FA

Many points lie above the diagonal reference line ($y = x$). This suggests that for a significant number of cases, the FA heuristic takes longer than the MRV heuristic. MRV is often more efficient in pruning the search space and reducing the time required for solving Sudoku puzzles.

2.3 Few Outliers

Some points have significantly higher y-values compared to x-values, which indicates that for these specific puzzles, FA performs much worse than MRV. This aligns with the expectation that MRV, which chooses the variable with the fewest legal values first, leads to a more constrained and guided search, whereas FA may lead to inefficient branching.

3 Conclusion

The results suggest that using the MRV heuristic is generally more efficient than the FA heuristic for Sudoku solving. This is evident as most points either lie on or above the diagonal, showing that MRV typically performs equal to or better than FA in terms of running time.