

Advanced Heuristic

- **What features of the game does your heuristic incorporate, and why do you think those features matter in evaluating states during search?**

The heuristic incorporates a score based on weighted difference between minimax player and custom player to penalize the minimax player's liberty. It is further weighted to favour centre weight of row and column squares.

Table of a comparison between Normal MinMax algorithm and Heuristic with :

- Opposition Weight = 3.5
- Own Weight = 1
- Centre Weight = 2

Minimax Player	Custom Player	Time for Depth = 3 (Minimax Player)	Time for Depth = 3 (Custom Player)
Your Agent Won: 50% against Minimax Agent	Your Agent Won: 70% against Minimax Agent	10.03 sec	20.31 sec
Your Agent Won: 20% against Minimax Agent	Your Agent Won: 40% against Minimax Agent	10.14 sec	21.08 sec
Your Agent Won: 80% against Minimax Agent	Your Agent Won: 60% against Minimax Agent	10.60 sec	19.05 sec

Minimax Player	Custom Player	Time for Depth = 6 (Minimax Player)	Time for Depth = 6 (Custom Player)
Your Agent Won: 50% against Minimax Agent	Your Agent Won: 50% against Minimax Agent	6.24 sec	1.31.42sec
Your Agent Won: 50% against Minimax Agent	Your Agent Won: 40% against Minimax Agent	5.32 sec	1.35.32 sec
Your Agent Won: 50% against Minimax Agent	Your Agent Won: 80% against Minimax Agent	5.72 sec	1.36.87 sec

- **Analyze the search depth your agent achieves using your custom heuristic. Does search speed matter more or less than accuracy to the performance of your heuristic?**

When the depth is doubled to 6, the custom heuristic takes almost 6 times longer than before to run. Also, the accuracy is varied. There is complexity involved between the trade off between accuracy and time with evaluation of non-terminal states strongly correlated with actual chances of winning