

Heuristic Analysis

Three custom heuristics were programmed for the Knight Isolation game. These heuristics were used with an Alpha Beta player that used iterative deepening to search for the best move. The player competed against other sample players that were provided in the *tournament.py* script. The results were compared with that of the Improved score heuristic provided in the *sample_players.py* script. The improved score heuristic calculates the difference between the moves available to the active players and those available to his opponent. The three custom heuristics are described below:

Heuristic 1 : Defensive Improved score:

The first Heuristic is derived from the improved scoring metric in *sample_players.py* that "outputs a score equal to the difference in the number of moves available to the two players". When calculating the difference, this heuristic assigns the active player a weight double to that of the inactive player. This is a defensive approach as it favors keeping your options open over limiting your opponent's moves.

Heuristic 2: Attacking Improved Score

The second custom heuristic also derives from the improved score metric in *sample_players.py*. This heuristic takes a more attacking strategy. When calculating the difference in the number of moves, the inactive players is weighted twice against the active player. This tries to narrow the number of spaces available to the opponent.

Heuristic 3: Distance From Opponent

Calculates a score equal to the distance between the player and the opponent. This heuristic helps a player keep a distance from the opponent and therefore theoretically avoid being cornered in.

The results of the *tournament.py* script indicated that none of the heuristics performed better than the *improved_score* heuristic. *Improved_score* was able to win 68.8% of the times. Its closest competitor was *Custom Heuristic # 2*, the more attacking version of the winner which won 65.7% of the times. *Custom Heuristics 1 and 3* both recorded a win rate 58.6%. The results do seem to favour the balanced approach of the improved score heuristics. However, the win rates seem to be close. The sample size of 70 games might be too small. A more exhaustive simulation might be able to offer better insight. The results are indicated in the table below:

Match #	Opponent	AB_Improved		AB_Custom		AB_Custom_2		AB_Custom_3	
		won	Lost	won	Lost	won	Lost	won	Lost
1	Random	9	1	9	1	8	2	8	2
2	MM_Open	7	3	6	4	6	4	3	7
3	MM_Center	7	3	7	3	9	1	8	2
4	MM_Improved	9	1	5	5	4	6	7	3
5	AB_Open	4	6	2	8	7	3	4	6
6	AB_Center	7	3	7	3	9	1	5	5
7	AB_Improved	5	5	5	5	3	7	6	4

win Rate:		68.6%		58.6%		65.7%		58.6%	

