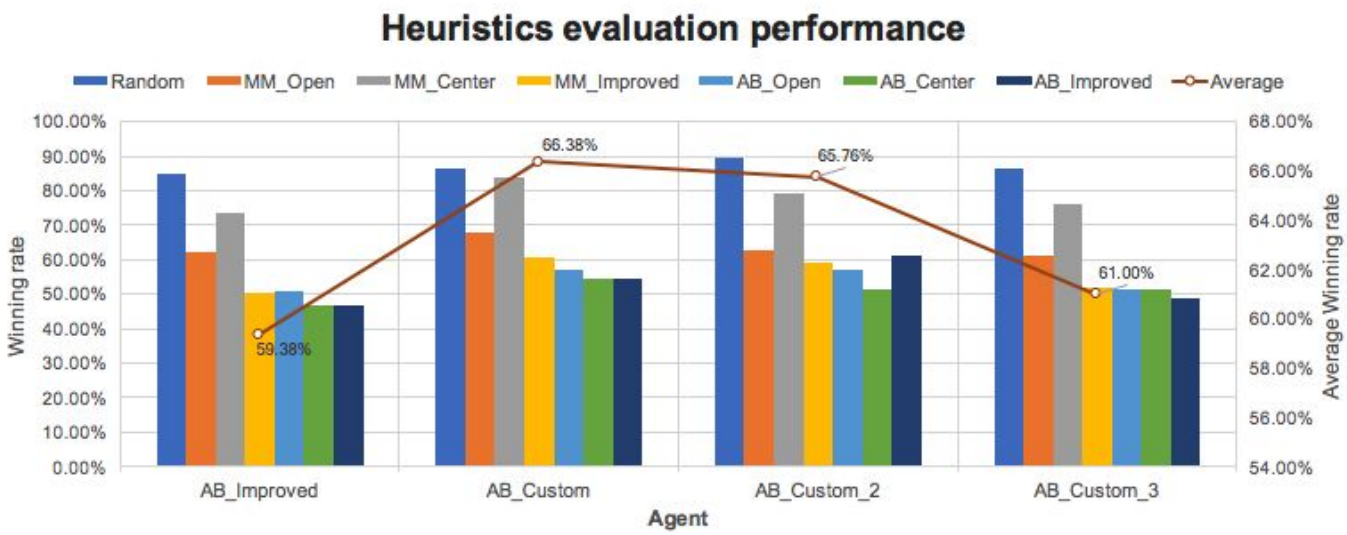
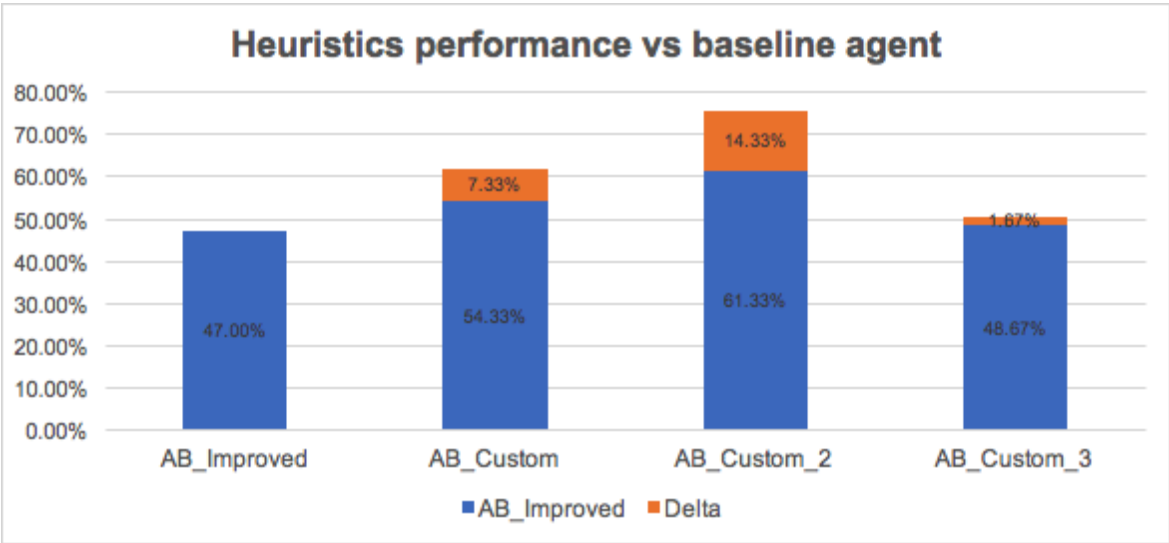
Heuristic Analysis

Evaluation heuristics performance summary





*Remark: delta is = AB_Custom - AB_Improved

Benchmarking

CPU Agents	Description
Random	Agent using random move
MM_Open	Agent using minimax with open move score heuristic
MM_Center	Agent using minimax with center move score heuristic
MM_Improved	Agent using minimax with improved score heuristic
AB_Open	Agent using alpha-beta pruning with open move score heuristic
AB_Center	Agent using alpha-beta pruning with center move score heuristic
AB_Improved	Agent using alpha-beta pruning with improved score heuristic

This evaluates the performance of the custom_score evaluation function against a baseline agent using alpha-beta search and iterative deepening (ID) called `AB_Improved`. The three `AB_Custom` agents use ID and alpha-beta search with the custom_score functions defined in game_agent.py.

Summary of the heuristic evaluation function

AB_Custom : Legal move weight

This heuristic start by looking on one move for each player then find out the number of legal moves in each subsequent position, accumulate the find out of legal moves for the given board, then calculate the ratio of legal move, the average winning rate was only 66.38%,
This performance was improved 7.33% compared with baseline against “AB_Improved”.

AB_Custom_2 : Distance from opponent

This heuristic focused on how move position on the given board between player and opponent's current position. The function yield the reward to player when choosing moves farther away from opponent's current position, the average winning rate was 65.76%
This performance was improved 14.33% compared with baseline against “AB_Improved”.

AB_Custom_3 : Closer to center

This heuristic focused on how player distance closer to the center of the given board position, if game move is smaller than a half of the given board, the function yield the reward to player who stay closer to the center, this heuristic performance yield average winning rate was 61.00%,
This performance was improved 1.67% compared with baseline against “AB_Improved”.

Heuristic Recommendation

The “AB_Custom” and AB_Custom_2 was show better evaluation performance against “AB_Improved”. Heuristic score was 66.38% and 65.76% respectively vs 59.38%, any way by consideration by compare the improved from best line agent, the AB_Custom_2 heuristic is perform double time better than AB_Custom. Then the my recommended to picked AB_Custom for submitted into custom_score():
The justifying reason for my recommended as following:

- Better performance against “AB_Improved” (54.33% vs 47.0%)
- Better average winning rate against “AB_Improved” (66.38% vs 59.38%)
- Simple and easy heuristic, by looking for total legal move between player and opponent.
- The heuristic go deeper through over s given game board.