HEURISTIC ANALYSIS

SIMPLE HEURISTIC

Simple Heuristic is a function that returns a difference between the number AI agent moves and its opponent moves. This is one of basic heuristic functions evaluated by AI agents.

Table below shows results of 5 runs

Run #	ID Improved	Student
1	80.71%	80.00%
2	88.57%	85.00%
3	88.57%	89.29%
4	85.71%	87.14%
5	85.71%	86.43%

Looking at the results, it seems like our simple heuristic function does better than ID Improved in 2 out of 5 cases. Not a very impressive performance!

COMPLEX HEURISTIC

The complex heuristic function is a modification of the simple heuristic function. In addition to looking at the difference between the AI agent moves and the opponent moves, it looks the difference between center cell (3,3) and the AI agent moves and that between the center cell (3,3) and opponent moves. The idea behind this heuristic function is to try to get most of the middle of the board and thereby push the opponent towards edges.

Below are the results:

Run #	ID Improved	Student
1	82.14%	85.00%
2	83.57%	84.29%
3	87.14%	90.00%
4	85.00%	85.00%

5	87.14%	87.86%

Looking at the results, it seems like this complex heuristic function does not do worse than the ID Improved function in any run. This makes a strong case for the complex heuristic.

CLOSE PROXIMITY

The close proximity heuristic function is an attempt to apply a hunch that a player with moves in close proximity will likely win over a player with far apart moves. While I am not 100% sure about this, I feel that by having close proximity moves, you create a partition for the opponent and partitions help you win.

Run #	ID Improved	Student
1	85.00%	87.14%
2	90.00%	86.43%
3	87.14%	79.29%
4	85.71%	85.00%
5	87.14%	90.00%

Results demonstrate that close proximity does better than ID improved function in 2 out of 5 runs. Again, not a very impressive performance.

In the interest of time, we decided to run each heuristic 5 times. If we had more time, I would have run the heuristic functions more often. Using the information we have, out of the 3 heuristics we have, I decide to choose the Complex heuristic because

1. Complex heuristic performs no worse than ID improved in any of the 5 runs.
2. It uses a combination of simple heuristic (one that we learned in the class) and a strategy to occupy the center of the board and thus can be rationalized.
3. The other two heuristic functions were not consistent in their performance winning only 2 out of 5 trials we conducted.