Experiment Report

The best game strategy that I found is to play offensively at first trying to block the opponent moves and then later in the second half, as there are less open spaces left, play defensively by prioritizing the available moves left. This strategy works great because the agent is playing both offensively and defensively at suitable times, therefore maximizing the winning chances.

The custom heuristic, that is developed for the custom agent, will first calculate the value ‘m’, where m = Ply count/Board size, this represents what percentage of the board has been filled. We will use it to determine if the custom agent will play offensively or defensively.

$$H(t) = \begin{cases} p - (o \times 2), & \text{if } m \leq 0.5 \\ (p \times 2) - o, & \text{if } m > 0.5 \end{cases}$$

Here p is the no. of player moves and o is the no. of opponent moves at any given board state. At first, the agent is playing aggressively and offensively trying to exhaust the opponent’s moves by penalizing opponent liberties more. The next step (after 50% of the board is filled) is to play defensively prioritizing the available movements (for the custom agent) during the second half of the game.

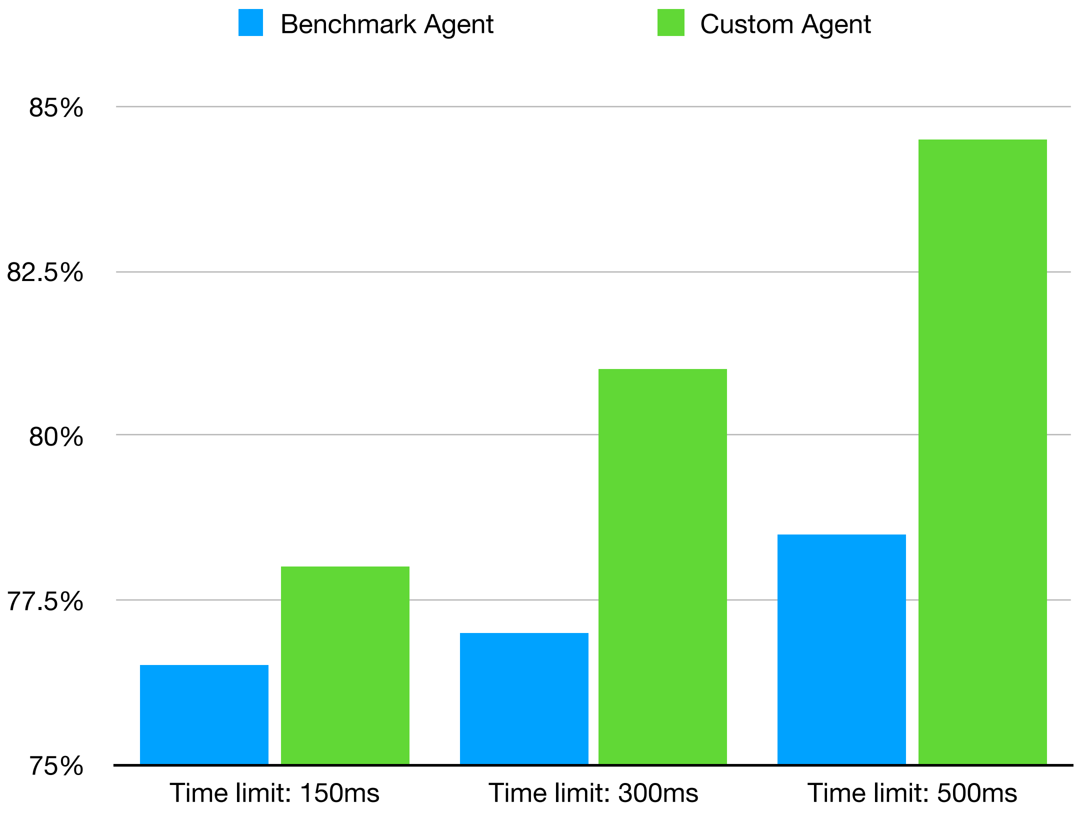
We will use the following agents to play the game with every other agent defined in the sample_players.py file.

- Benchmark Agent: Minimax with alpha-beta pruning and Iterative deepening using #my_moves - #opponent_moves heuristic. This agent will define the benchmark that the new custom agent needs to beat.
- Custom Agent: Minimax with alpha-beta pruning and Iterative deepening using the custom heuristic. The goal of this agent is to surpass the benchmarks that were set by the Benchmark Agent.

Below is the table that gives us a summary of the results of the experiment. Each cell in the tables represents the win percentage of the Benchmark/Custom Agent against the minimax agent defined in the sample_players.py. The experiment was conducted with the fair matches flag enabled and 200 rounds were played for each run.

Table 1: Agents vs Minimax Agent

	Benchmark Agent	Custom Agent
Time limit: 150ms	76.5%	78.0%
Time limit: 300ms	77.0%	81.0%
Time limit: 500ms	78.5%	84.5%



The win percentage of the custom agent is greater than benchmark agent at every series of games.

We can see that adding more search time increase the win percentage of both the benchmark and custom agent. More search time allows the agents to search to more depth and get better estimations for the board values. This increases the performance of the both the agents.