Advanced Heuristic
(with fair matches)

Depth of 1 to 4
Baseline

rounds	type	%	output
40	Minimax	71.9	Your agent won 71.9% of matches against Minimax Agent
40	Minimax	66.9	Your agent won 66.9% of matches against Minimax Agent
40	Minimax	61.9	Your agent won 61.9% of matches against Minimax Agent

My heuristic

rounds	type	%	output
40	Minimax	65	Your agent won 65.0% of matches against Minimax Agent
40	Minimax	76.2	Your agent won 76.2% of matches against Minimax Agent
40	Minimax	72.5	Your agent won 72.5% of matches against Minimax Agent

Depth of 1 to 5
Baseline

rounds	type	%	output
40	Minimax	60.6	Your agent won 60.6% of matches against Minimax Agent
40	Minimax	63.1	Your agent won 63.1% of matches against Minimax Agent
40	Minimax	61.9	Your agent won 61.9% of matches against Minimax Agent

My heuristic

rounds	type	%	output
40	Minimax	80.0	Your agent won 80.0% of matches against Minimax Agent
40	Minimax	75.0	Your agent won 75.0% of matches against Minimax Agent
40	Minimax	70.0	Your agent won 70.0% of matches against Minimax Agent

Depth of 1 to 6
Baseline

rounds	type	%	output
40	Minimax	75.6	Your agent won 75.6% of matches against Minimax Agent
40	Minimax	72.5	Your agent won 72.5% of matches against Minimax Agent
40	Minimax	73.8	Your agent won 73.8% of matches against Minimax Agent

My heuristic

rounds	type	%	output
40	Minimax	80.0	Your agent won 80.0% of matches against Minimax Agent
40	Minimax	77.5	Your agent won 77.5% of matches against Minimax Agent
40	Minimax	77.5	Your agent won 77.5% of matches against Minimax Agent

Depth of 1 to 7
Baseline

rounds	type	%	output
40	Minimax	81.2	Your agent won 81.2% of matches against Minimax Agent
40	Minimax	70.0	Your agent won 70.0% of matches against Minimax Agent
40	Minimax	74.4	Your agent won 74.4% of matches against Minimax Agent

My heuristic

rounds	type	%	output
40	Minimax	80.0	Your agent won 80.0% of matches against Minimax Agent
40	Minimax	75.0	Your agent won 75.0% of matches against Minimax Agent
40	Minimax	72.5	Your agent won 72.5% of matches against Minimax Agent

Depth of 1 to 8

Baseline

rounds	type	%	output
40	Minimax	78.8	Your agent won 78.8% of matches against Minimax Agent
40	Minimax	78.1	Your agent won 78.1% of matches against Minimax Agent
40	Minimax	80.6	Your agent won 80.6% of matches against Minimax Agent

My heuristic

rounds	type	%	output
40	Minimax	87.5	Your agent won 87.5% of matches against Minimax Agent
40	Minimax	82.5	Your agent won 82.5% of matches against Minimax Agent
40	Minimax	82.5	Your agent won 82.5% of matches against Minimax Agent

Depth of 1 to 9

Baseline

rounds	type	%	output
40	Minimax	79.4	Your agent won 79.4% of matches against Minimax Agent
40	Minimax	76.9	Your agent won 76.9% of matches against Minimax Agent
40	Minimax	80.6	Your agent won 80.6% of matches against Minimax Agent

My heuristic

rounds	type	%	output
40	Minimax	87.5	Your agent won 87.5% of matches against Minimax Agent
40	Minimax	70.0	Your agent won 70.0% of matches against Minimax Agent
40	Minimax	77.5	Your agent won 77.5% of matches against Minimax Agent

Depth of 1 to 10

Baseline

rounds	type	%	output
40	Minimax	81.2	Your agent won 81.2% of matches against Minimax Agent
40	Minimax	78.8	Your agent won 78.8% of matches against Minimax Agent
40	Minimax	81.2	Your agent won 81.2% of matches against Minimax Agent

My heuristic

rounds	type	%	output
40	Minimax	80	Your agent won 80.0% of matches against Minimax Agent
40	Minimax	87.5	Your agent won 87.5% of matches against Minimax Agent
40	Minimax	87.5	Your agent won 87.5% of matches against Minimax Agent

What features of the game does your heuristic incorporate, and why do you think those features matter in evaluating states during the search?
My heuristic incorporates looking at free cells in quadrants. Quadrants are divided in 4 sections. On top of looking at the number of free cells at the player's position, I also look at the surrounding area (the quadrant). If the quadrant doesn't have that many free cells, it means you might not have that many futures moves.

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?
Speed matters more than accuracy because the accuracy fluctuates even at higher depths. Also the accuracy doesn't increase by that much at higher depths.

Opening Book

Describe your process for collecting statistics to build your opening book. How did you choose states to sample? And how did you perform rollouts to determine a winner?

I only record the winning moves. While recording, the depths are from 1 to 10 and the timeout to 1150 ms so that for each move, it has time to go into deeper depths. The greater the depth, the better the results (more wins).

What opening moves does your book suggests are most effective on an empty board for player 1 and what is player 2's best reply?

I always choose the middle cell. If the opponent chose the middle cell, I look at all of my available actions and choose the middle action. From my book, it seems I will most likely win if my opponent chooses a cell that is close to me or at the edge of the board.