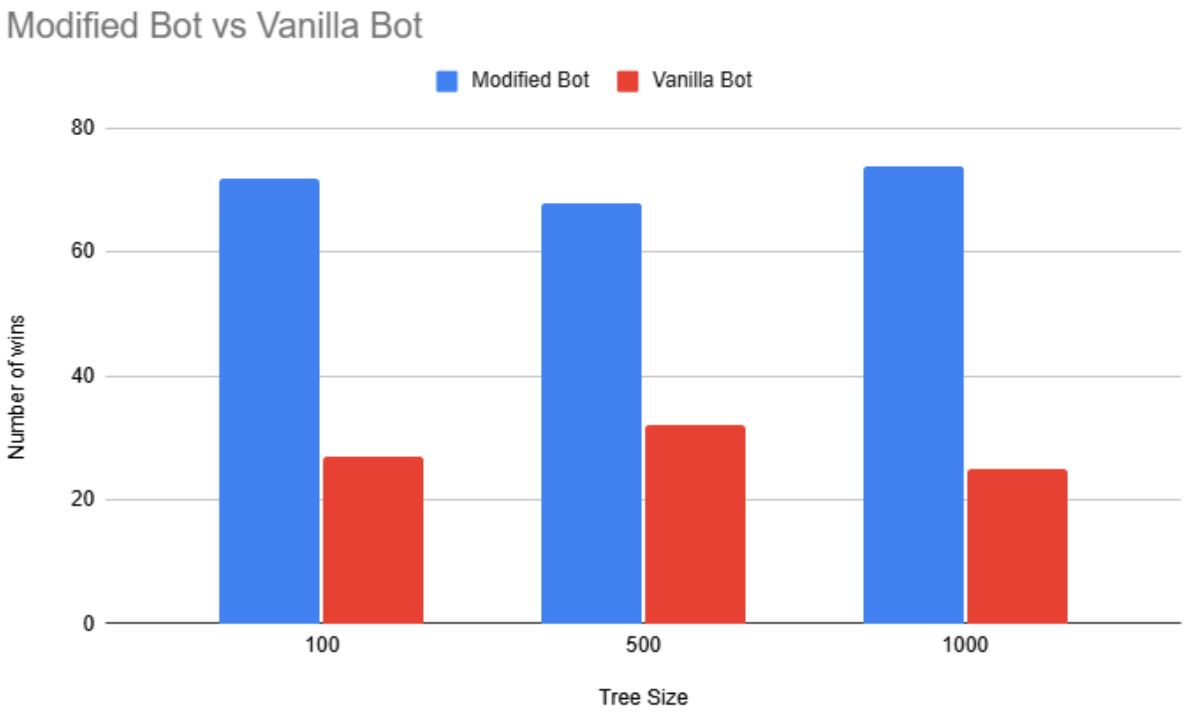
Introduction: This experiment involved comparing the win rate of a modified MTCS bot vs a vanilla MCTS bot in ultimate tic tac toe using different tree sizes for both bots.



Based on my 3 simulations of 100 games each, the modified bot is able to beat the vanilla bot on average about 70% of the time. The different tree sizes of 100, 500, and 1000 nodes seem to have no effect on the performance of the modified bot. My hypothesis is that there is no performance increase due to my heuristic not being able to utilize the extra tree size. The time increase that came with increasing the tree size seems linear but still does not seem worth it with my implementation since the performance is not enhanced. Running 100 games with 100 nodes took about 20 minutes whereas running 100 games with 1000 nodes took about 3 hours.

The heuristic I chose to use for the modified bot rewarded moves that allowed the bot to win or have a winning move next turn. It penalized moves that let the opponent win or having a winning move next turn. I also chose to give a small reward for taking positions on the middle big board or the middle of any board since taking the middle position is often advantageous in tic tac toe and I wanted the bot to take these positions if possible. I also implemented roulette selection when choosing nodes so it wouldn't be as deterministic in its play.