

Experiment 3	Modified VS Vanilla with 1 second timer							
Mod Tree Size	Mod Wins	Van Tree Size	Van Wins	Draws	Tree Size			
100 with modifie	8	100	2	0	Node expansion size: 1000			
100 with vanilla	0	100	10	0	Node expansion size: 2763			

It looks like the modified has a smaller tree size when limited to 1 second rather than the number of nodes.

I think this due to the heuristic that is present in the modified MCTS where we have to loop through the best available action before randomly rolling out, so if the for loop takes $O(n)$ time, if that computation takes longer than a second, it will not be able to grow its tree and will just return a random move.

Experiment 3	Modified VS Vanilla with 3 second timer							
Mod Tree Size	Mod Wins	Van Tree Size	Van Wins	Draws	Tree Size			
50 with modified	7	50	3	0	Node expansion size: 11364			
50 with vanilla 3	0	50	10	0	Node expansion size: 11364			
Doing it again					Node expansion size: 159102			
					Node expansion size: 159103			

So it looks like with three seconds, the size of the tree will be the exact same, so I am going to assume that the heuristic that the modified version of our MCTS uses is less than 3 seconds even with it being $O(n)$.

For experiment 3, after altering the code to account for time as a constraint, we learned that with a 1 second timer, the modified version has a smaller tree size than the vanilla. Then we increased the time constraint to 3 seconds and the size of the trees ended up being the same. With this, it can be implied that as you increase the time constraint, the size of the trees between the modified version and the vanilla version are about the same.