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**572 - Principle of Artificial Intelligence**

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**Lab 2**

**(100 points)**

1. Compare the effect of increasing search depth (come up with a method to demonstrate your point).

After increasing the search depth, I have noticed two main effects. There are the following:

1. Higher win rate:

Deeper Analysis: Going deeper allows the agent to see further into the future of the game, considering more possible sequences of moves before making a decision. This generally leads to better move choices because the agent can evaluate the outcomes of sequences more thoroughly. Consequently, this results in a higher winning rate.

1. Increased Computational Requirements:

Longer Computation Time: As the search depth increases, the number of game states the agent needs to evaluate grows exponentially. Even with Alpha-Beta pruning optimizing this process, deeper searches will still significantly increase the computation time required to make a move. Also, deeper searches also consume more memory, as the agent needs to maintain a larger tree of game states and potential moves in memory during its search. These facts lead us to a significant increase in time as well, which is reflected in the time taken in each of the agent’s actions.

The graphs bellow illustrate this analysis:

A red and blue rectangular bars

Description automatically generated

3 games were played between a fixed opponent, which was using Alpha Beta pruning with depth fixed on 1 and Alpha Beta pruning with depth starting on 1 to 3.

1. Implement at least two evaluation functions with varying quality. Compare the effect of improving the evaluation function.