

# CSL333: Assignment 5 – AllConnect NTK

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## Overview

We decided to stick with minimax with alpha-beta pruning, and improve our heuristic functions to increase the effectiveness of our player. We also added some constraint features and measures to prevent timing out.

## Heuristics

We tried to develop strong heuristics to better gauge the situations and correctly differentiate good moves from bad moves. We followed an exponentially reducing weightage policy – if a  $k$ -connect is formed, the parameter's power is the highest, when there are  $k-1$  pieces with an empty position, then the power is a unit lower, and so on until there is 1 piece and  $k-1$  empty positions, which gets a weightage of 1. We manually varied the values of the parameter so as to achieve best performance.

## Search Depth

We varied the search depth according to the board's size so as to come up with moves within the allotted time. Additionally, search depth is varied within a game. The search depth is kept at a moderate value from the beginning until  $\frac{3}{5}$ ths of our total moves. After that it is increased to a high value, so as to benefit from the added lookahead in the finishing stages of the game, without wasting time on early moves that may not gain much value from a high lookahead. In addition, we kept a time-reducing measure in case we are running out of time. If the time remaining is critically low, we reduce search depth in order to make our moves early and finish the game on time.