Xuan Bui
Priyanka Lee
Tiffany Tran

Project Proposal: "Optimizing Connect 4 Gameplay Using Mini-Max Algorithm"

Connect 4 is a popular two-player strategy game in which players alternate turns and drop a colored disc into a grid with the objective of lining up four of their discs vertically, horizontally, or diagonally. When the pieces are inserted into the grid they automatically fall to the lowest unoccupied space on the board (within that column).

Though this is a well-known game, we want to create an AI opponent to play against a human player utilizing the Mini-Max algorithm using the programming language, Python. We will employ some existing code as a foundational starting point and create our own extensions to implement the Mini-Max algorithm and add a function to show the player all available/valid moves that can be taken. We also plan to use a slightly more complex variant of the game replacing the standard 7x6 board with a 9x7 grid size which will involve some modifications and additions to current Connect 4 gameplay code.

Our goal is to create an AI opponent that can evaluate all possible moves and choose the optimal move. The algorithm will recursively search the game tree and assess each outcome. We will also make use of an Alpha-Beta pruning algorithm to improve the performance of the algorithm and reduce the run-time. For the possible moves function we will modify the existing code to track which rows/columns have available space i.e. with a list to store the current board state. The empty board spaces will be displayed to the user as valid moves in tuple form.

For our project timeline we plan to split up the project into three phases. The first couple weeks will be given to exploring existing code, deciding on which functions to apply, and developing a roadmap/pseudocode for the upcoming phase. The second phase will be to program the game, test the code, and optimize the code as necessary. The last phase will involve reflection

on what went well and what could have been improved during the project and preparation for the presentation portion.

Our roles will be broken down as such:

Priyanka: responsible for research into game implementation and editing existing code as necessary to accommodate a bigger board.

Tiffany: responsible for implementing the Mini-Max algorithm.

Xuan: responsible for adding the possible moves function.

Though our roles are broken down individually, we will also work collaboratively during the planning phase to research game implementation prior to any coding and in the last phase to test and optimize the code. Furthermore, we plan to help each other through the programming process with any ongoing blockers or hurdles.