**Assignment #3 – Adversarial Search**

Goal: Create a program that will allow a human to play an AI agent in Connect Four.

* Create an AI agent that uses the minimax algorithm with alpha-beta pruning to play a human player.
* Make sure your program has a good user interface i.e. it is easy for the human player to see the board and decide what they want to do.
* Decide what sort of time limit each player has to make their move and have your AI agent follow that time limit.
* Play the agent in a few games and record the number of times the human and AI win, lose or tie. Your agent should also output performance information about how many states and how far down the game tree your algorithm is able to search.
* Now, update your minimax algorithm to use alpha-beta pruning with more effective move ordering. You need to come up with a heuristic on your own about how to evaluate if a move is “better” than another, given the game state.
* Then play the agent in a few more games and record the number of times the human and AI win, lose or tie. Also record the performance information about how many states and how far down the game tree your algorithm is able to search.

**Connect Four Rules**

* Size: 6x5
* A player can win by getting four pieces in a row (horizontally, vertically or diagonally).
* The two players tie if the board fills up completely without either player getting four of their pieces in a row.

**Programming language** You are welcome to use any programming language you like.

**Deliverables**

* Write a 1-2 page report. It should detail your first algorithm attempt (and its performance), detailing your decision-making process behind the time limit and how many games you tested the algorithm on. Next, describe the changes you made, your decision process behind the heuristic you came up with and the performance. Conclude with a comparison of the two.
* Overall code for your first version of your program.
* Overall code for your second version of your program.

*You are allowed to work in groups of 2 if you would like but you then must do a third version of your program, making the AI an even better player! Additionally, each person must individually demo the code and know the entirety of how it works!*

**Rubric (125 points)**

* Implementing Minimax algorithm (25 points)
* Implementing alpha-beta pruning (25 points)
* Two versions (25 points)
* Report (40 points)
* Code documentation (10 points)
  + Overall comments describing purpose of program with name and date
  + In-line comments

***You must demo this sometime before 1 week past the due date or you will get a 0!***

***You are allowed to talk to each other about this, but your code should be your own 🡪 there should be a lot of variability in your assignments (I don’t want to see anyone with the exact same code).***