

## Lab 2

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In this assignment, you will write a game-playing agent capable of playing Five-in-a-Row also called Gomoku (<https://en.wikipedia.org/wiki/Gomoku>).

**Game rules:** Players alternate turns placing a stone of their color (white or black) on an empty intersection on a 15×15 Go board. Black plays first. The first player's first stone must be placed in the center of the board. The second player's first stone may be placed anywhere on the board. The first player's second stone must be placed at least three intersections away from the first stone (two empty intersections in between the two stones). The winner is the first player to form an unbroken line of five stones of their color horizontally, vertically, or diagonally. If the board is completely filled and no one can make a line of 5 stones, then the game ends in a draw.

1. Construct a general alpha-beta game-playing agent that takes the current state as input and returns a move/action to be made by the agent. You may use the code for the AIMA book at <https://github.com/aimacode>. Please cite the source of your code.
2. Implement an evaluation function that takes the state of the game as an input and returns an evaluation value.
3. Implement a move generator function that takes a state as input and returns a list of legal moves at that state.
4. GUI is not required. You may print the 15x15 board in the console. (You are allowed to use existing GUI implementation available on the internet. Please cite the source.)
5. Your main function should be able to do the following:
  - Take as input a move from the user (e.g. two integers representing the coordinate of the move).
  - Update the board with the user's move.
  - Output the agent's move from the alpha-beta search.
  - Update the board with the agent's move.
  - Repeat the steps until the end of the game.
6. Compare the effect of increasing search depth (come up with a method to demonstrate your point).
7. Implement at least two evaluation functions with varying quality. Compare the effect of improving the evaluation function.

### What to Turn In

Turn in via Canvas a compressed file (.zip) containing the following:

- All of your source code.
- A README file explaining how to compile and run the program.
- A short lab report in text/pdf containing the answers for questions 6 and 7.