

**CASUAL GAMER (20 POINTS).** Develop a checkers player agent using minimax with alpha-beta pruning. To get you started, you need to:

1. Identify how you will represent your game tree (refer to page 162 of AIMA). What information is represented in each state of the game?
2. Research strategies for playing checkers. Consider what can be used to compute utility functions. Create your utility function (note: this is similar to a heuristic function used by informed search algorithms). Cite your sources.
3. Study the pseudocode for minimax (Figure 5.3) and minimax with alpha-beta pruning (Figure 5.7) in Chapter 5 of AIMA.
4. Study sections 5.1 to 5.4, implement your intelligent agent, and answer the following questions.
  - a. What is the effect of move ordering (Section 5.3.1) on the performance of the checkers player agent? (Note. Before you can proceed, you need to determine how to measure the agent performance).
  - b. How close does your effective branching factor come to the ideal case of perfect move ordering  $O(b^{m/2})$ ?

To do this, you will need to perform experiments (one using move ordering vs. one that does not).

**HARD CORE GAMER! (20 + 10 POINTS)** Develop a general game-playing program, capable of playing a variety of games (from end of chapter exercise – AIMA). Using all information above:

1. In this case, implement an intelligent agent that can play both checkers and chess.
2. Create a general alpha-beta game playing agent.
3. Study the pseudocode for minimax (Figure 5.3) and minimax with alpha-beta pruning (Figure 5.7) in Chapter 5 of AIMA.
4. Study sections 5.1 to 5.4, implement your intelligent agent, and answer the following questions.
  - a. What is the effect of move ordering (Section 5.3.1) on the performance of the checkers and chess player agent? Compare the performance between the two games, and between with/out move ordering. (Note. Before you can proceed, you need to determine how to measure the agent performance).
  - b. How close does your effective branching factor come to the ideal case of perfect move ordering  $O(b^{m/2})$ ?

To do this, you will need to perform experiments (one using move ordering vs. one that does not).

Those who choose the hard core gamer option will receive higher scores.

Additional information.

1. The AI agent is set as the maximizer.
2. Use standard checkers (not Chinese checkers) and chess rules.
3. No GUI is required for the project. If you are constructing the general game player agent, and developed a GUI, you may toggle between games, or have buttons to accept a human player's choice of game.
4. This is a programming assignment. You are allowed to use references only for the strategies to play the game, and definition of utility function (which you are expected to cite properly).

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Name and Section.

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1. What information did you represent in a state? Show the source code for the representation of the state, and tree.
2. What utility function did you use? Cite your source, if you adapted an already existing one. Show the source code.
3. Show the results of your experiments (your answer to 4.a), using appropriate visualization.
4. With a maximum of 2 paragraphs, answer 4b.
5. Fill - out the table below.

1	Skills I already possess which I used for this project	
2	Skills I had to learn for this project	
3	Challenges I encountered and how I solved it (may be technical, or contextual such as poor internet connection, machine is too slow, etc))	

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MCO2 (HCG – SURNAME, FIRST NAME, SECTION)

Name and Section.

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1. What information did you represent in a state? Show the source code for the representation of the state, and tree.
2. Show the architecture/design of your general game playing agent.
3. What utility functions did you use? Cite your source, if you adapted an already existing one. Show the source code for both checkers and chess.
4. Show the results of your experiments (your answer to 4.a), using appropriate visualization.
5. With a maximum of 2 paragraphs, answer 4b.
6. Fill -out the table below.

1	Skills I already possess which I used for this project	
2	Skills I had to learn for this project	
3	Challenges I encountered and how I solved it (may be technical, or contextual such as poor internet connection, machine is too slow, etc))	