**Critical Thinking Assignment: Mod 4: Informed Search Heuristics with SimpleAI**

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**Connect Four AI with Greedy Best-First Search**

For this project, I developed an interactive Connect Four AI using Greedy Best-First Search. The AI evaluates the board after the user places their move and selects its response based on a simple heuristic. This heuristic prioritizes placing a piece in the center column first, as this provides the strongest strategic position. If the center is already taken, the AI selects a random valid column to continue the game.

**Algorithm Justification**

According to Russell and Norvig (2021), heuristic search methods like Greedy Best-First Search are designed to make efficient decisions by evaluating the most promising options first. In Connect Four, the center column is the most strategically advantageous, making it the best starting move. This mirrors how human players think during the early game.

Korf (1990) explains that real-time heuristic search allows AI to act quickly without exploring every possible outcome. While this AI does not guarantee the optimal move, it demonstrates how heuristic search can provide fast, reasonable decisions in real-time.

This method:

* Is not complete, since it doesn’t explore all moves.
* Is not guaranteed optimal, but provides reasonable outputs.
* Uses an evaluation function (center-first heuristic).
* Is very space-efficient, using no large search trees.

**Testing Instructions**

**How to Run the Script (Environment Setup)**

To run the Connect Four AI solution, please follow these steps:

1. Save the provided Python script as connect\_four\_ai.py in a folder of your choice on your computer.
2. Open Command Prompt (Windows) or Terminal (Mac/Linux) on your machine.
3. Navigate to the folder where you saved the script. For example:

cd path/to/your/folder

*(Replace path/to/your/folder with the actual path where you saved the script.)*

1. Run the script by entering:

python connect\_four\_ai.py

**How to Evaluate the AI Behavior (Expected Output)**

Once the script runs:

1. You will see an empty Connect Four board displayed.
2. You will be prompted to enter a column number (0–6) to place the 'O' player’s move.
3. After you enter your move, the updated board will be displayed with your move in place.
4. The AI will then automatically make its move, choosing the center column if it is available or selecting a random valid move if the center is occupied.
5. The final board state will be displayed, showing both your move and the AI’s move.

This demonstrates the AI’s ability to apply Greedy Best-First Search using a center-first heuristic to make a fast, reasonable decision based on the current board state.

**References**

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