

V1: Expectimax

I implemented the Expectimax algorithm to play the game 2048.

Result:

- The average search depth to play the game is 5.
- It reaches the highest tile (512) for most of the runs.
- The average score is 6500.

Search Depth 5:

- Best expected value: 6569.037760416666 → L

Players' Move: R

Score: 6540

V2: Learning Agent

I run learning agent code and provided by professor and train the agent for 10000 times and saved the file to MyData file and run the Expectimax agent with the data.using command "python Play.py MyAgent.py 0.1 -g 700 -d MyData"

Result:

- It reaches the highest score 14860
- The average search depth is 5-8
- It reaches the highest tile 1024

Version 3: Expectimax + Learned Evaluation

Integrated the learned value function from MyData into the heuristic, replacing state.getScore(). Implemented depth control based on available empty cells and remaining time.

Results:

- Average search depth: 6-10 (adaptive).
- Reaches the highest tile 2048 once in my testing.
- Average score: 13,000.

Version 4: Expectimax with Empty Tile Heuristic

This version of Expectimax incorporates a heuristic that counts the number of empty tiles on the board and adds that value to the current game score.

Result:

In comparison to Version 1 (Expectimax), this version exhibits improved performance, albeit without substantial enhancement.

Version 5: Montecarlo

This version implements the Montecarlo algorithm instead of Expectimax, which significantly improves the performance of my agent.

Results:

- The average search depth is 20,000.
- The highest score achieved during testing is approximately 35,000.
- The highest tile reached is 2,048.

Version 6: Montecarlo with Set Action

The previous version exhibited limitations in handling extremely short time limits, such as 0.1 seconds. To address this, an action “UP” has been implemented to indicate that no move was found within the specified time frame.

Result:

While the score for time limits like 0.1 seconds may not be optimal, the performance of the updated version remains comparable to that of the previous version.