2048 Game

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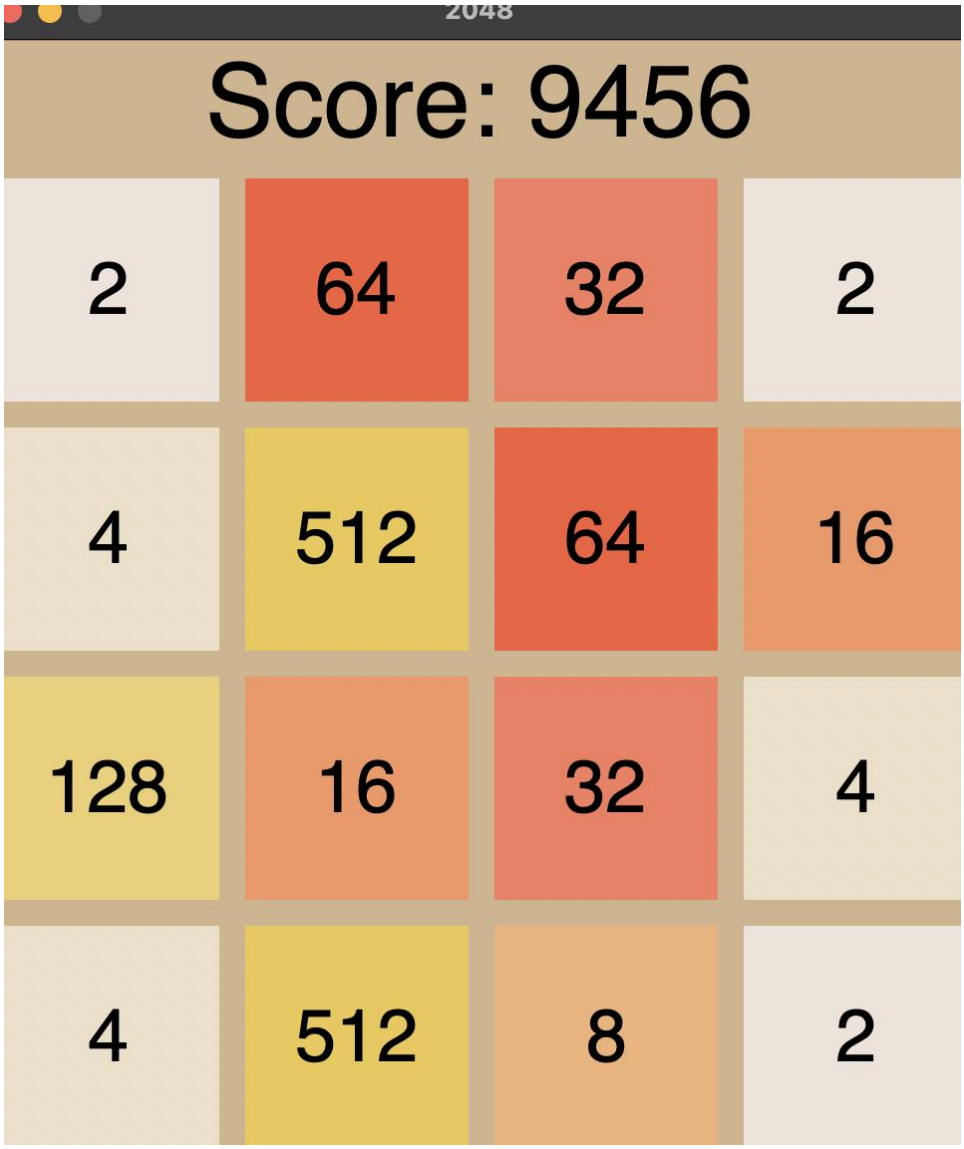
1st Version :

In this version, I implemented a basic MinMax agent for the 2048 game, utilizing a heuristic based on the game score .

Testing result :

:



• Final Score: 6040

• Time-limit:0.1

• Search depth: 10

Observations :

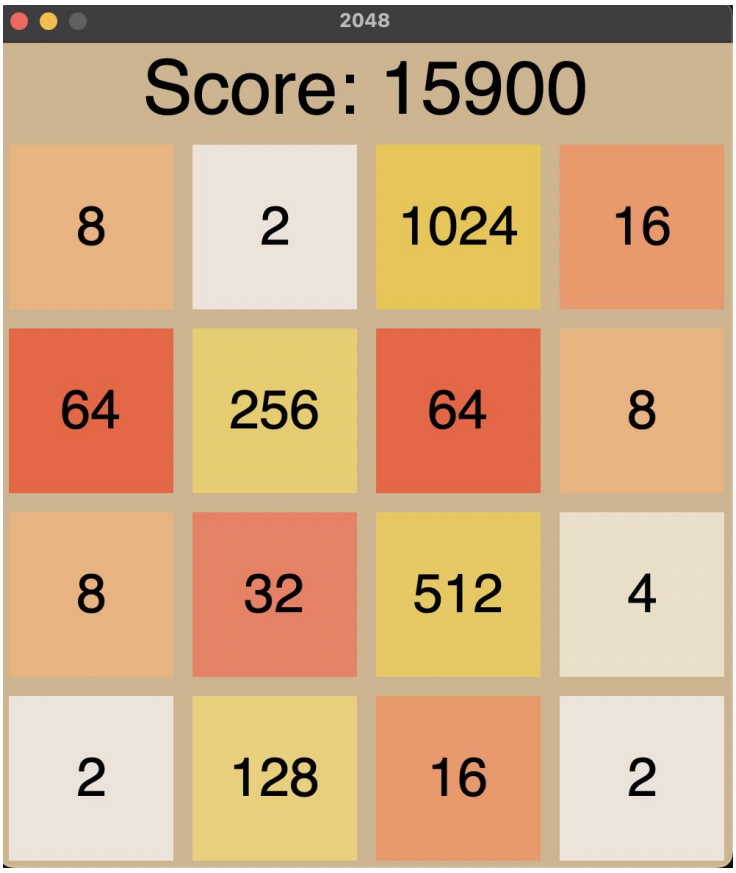
1) The current MinMax agent successfully avoids invalid moves and performs reasonably well.

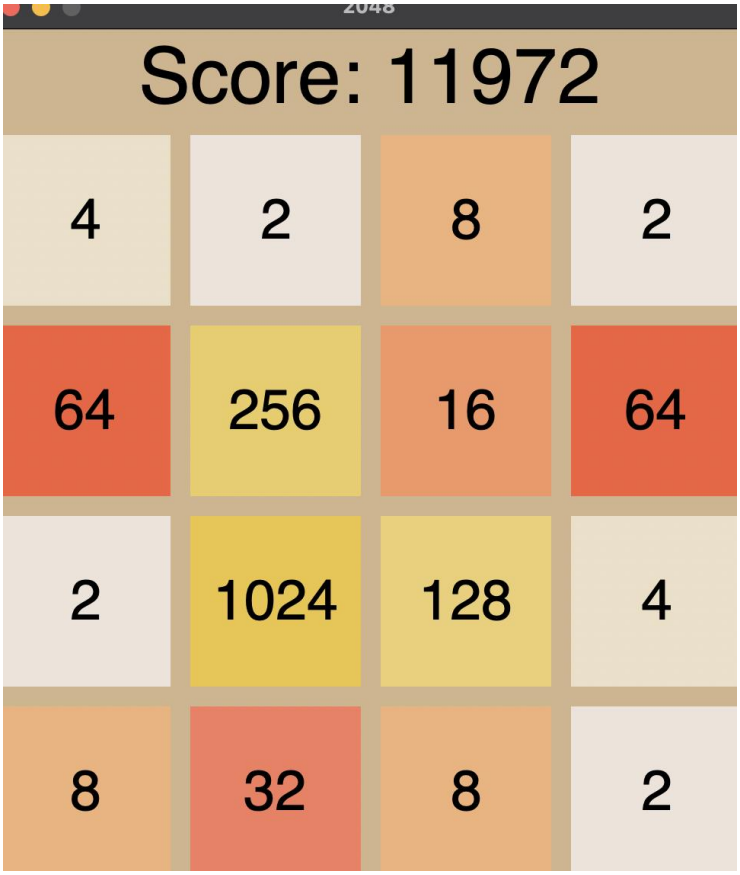
2) It primarily favors right and down moves.

3) The scoring is inconsistent, typically ending around 2000–4000 points.

2nd Version : MinMax with improved heruistic

Testing results:





Maximum Score: 15900

• Average Score: 8000

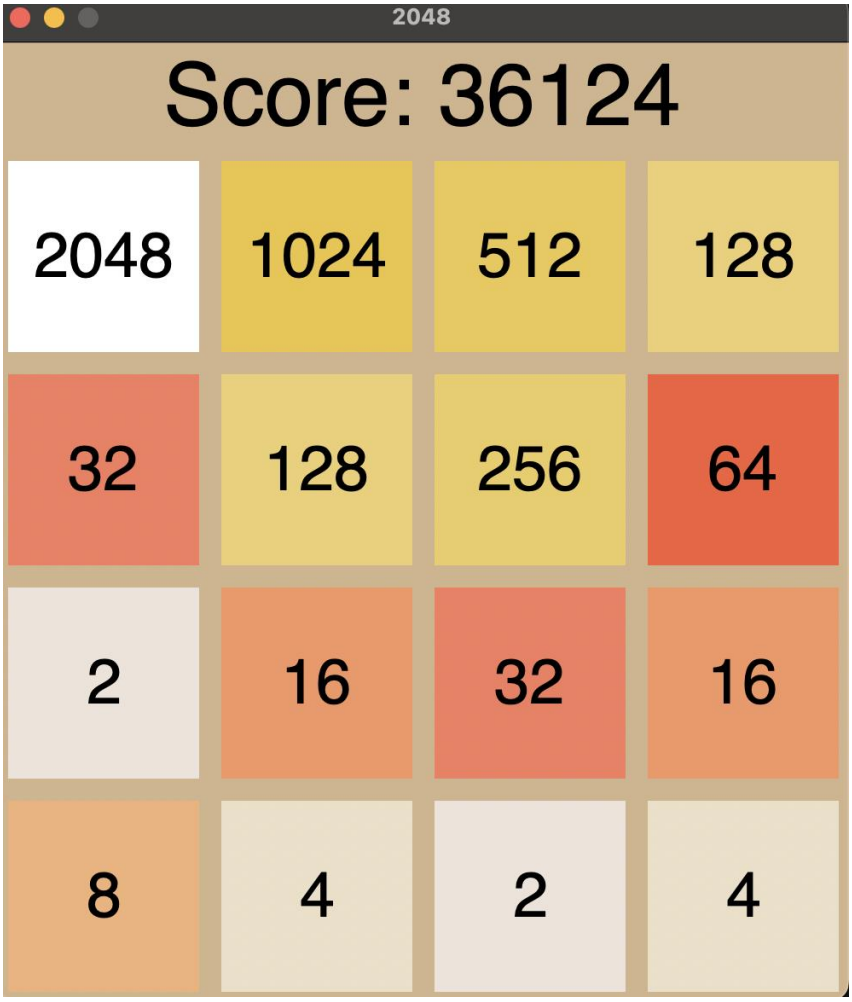
Observations:

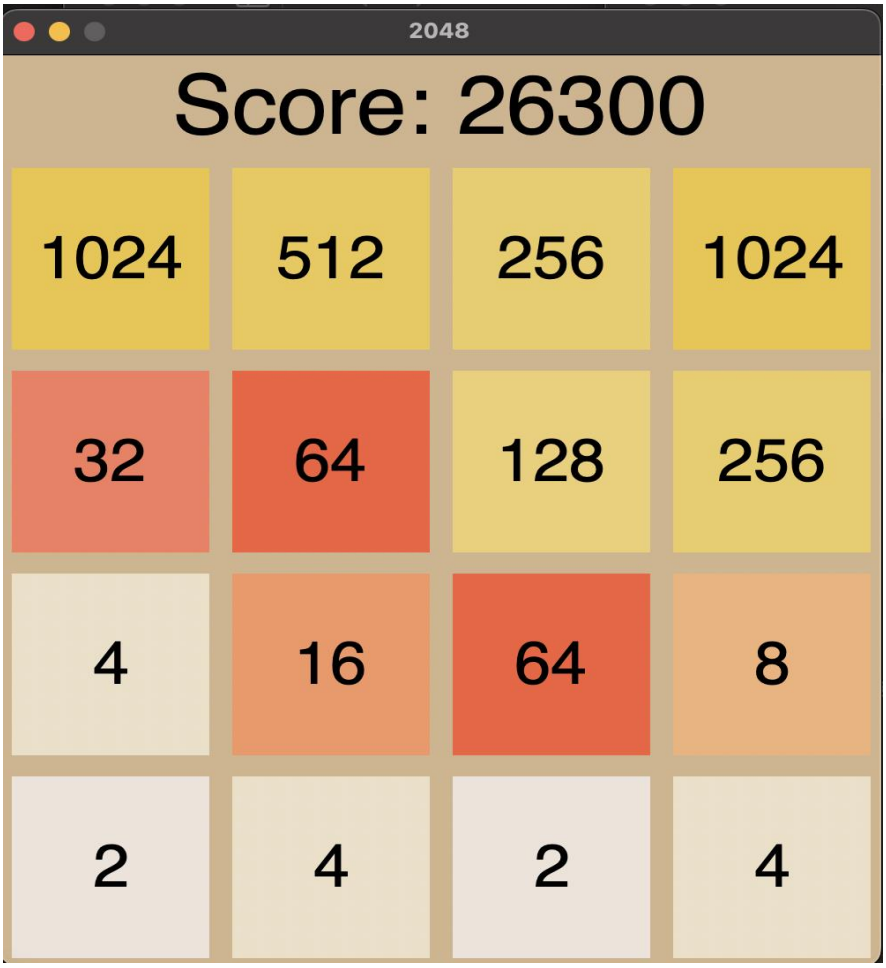
- The board consistently maintains a higher number of empty tiles.
- Overall, the score is more stable and reliable compared to version 1.

Final Version : **Expectimax with monotonic and smoothing heuristic**

In this version I used Expectimax instead of Minimax, I used :

Testing results:





Maximum Score: 58298

Average Score: 26000

Observations :

1) Expectimax gave better scores than MinMax.
2) This version was significantly more stable producing better median scores.

3) In this version, the highest tile consistently stayed in a corner — a key strategy in 2048.

Conclusion:

Across all three versions, my agent showed steady improvement over time.

- **Version 1** used a basic score-based approach for decision-making, but it didn't account for tile positioning, leading to subpar performance.
- **Version 2** introduced a smarter strategy by attempting to keep the highest tile in a corner, which resulted in more effective moves.
- **Version 3** marked the most significant improvement. By implementing Expectimax and incorporating advanced heuristics—such as maintaining board smoothness, anchoring the max tile in a corner, and using a snake-pattern layout—the agent achieved higher and more consistent scores. This version proved to be the most stable and successful overall.