AI 2048 AGENT

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INTRODUCTION

The 2048 game challenges AI agents with a stochastic 4x4 environment, exponential tile merges, and long-term planning. While heuristic and supervised approaches exist, they often neglect explicit feedback mechanisms and dynamical sensitivity.

GOAL

Make a AI agent to win the 2048 game and get higher ladeboards

PROPOSED SOLUTION

Our proposed solution is a Reinforcement Learning (RL)-based autonomous agent for the 2048 game. The agent will learn optimal strategies by interacting with a custom-built environment and receiving feedback through a reward system.

EXPERIMENTS

Completed Experiments
1. Random Agent Baseline
   - Goal: Establish a performance baseline for comparison.
   - Setup:
     - Agent selects moves randomly.
     - Evaluated over 100 episodes.
   - Observed Metrics:
     - Average score: X (placeholder for your data).
     - Max tile reached: Y.
     - Distribution of game lengths.
   - Outcome: Confirms environment stability and highlights lack of strategy.
2. Environment Validation
   - Verified correct behavior of tile merging, reward assignment, and terminal state detection.
   - Reward function behavior tested with edge-case moves (e.g., invalid moves, merges).

RESULTS

ACTION	REWARD	SCORE
2	1600	1600
3	776	776
1	628	628

CONCLUSIONS

- We successfully built a custom environment for the 2048 game using Gymnasium, ensuring correct game logic and step-by-step interaction.
- A baseline agent was implemented using random moves, which allowed us to test the environment and verify basic functionality.
- We confirmed that the reward system works correctly, providing positive feedback for merges and penalties for invalid moves.
- Initial testing showed that random strategies are insufficient for reaching high scores, justifying the need for a learning-based agent.
- The project is currently moving toward the implementation of Q-Learning, which will allow the agent to start learning from experience.

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