

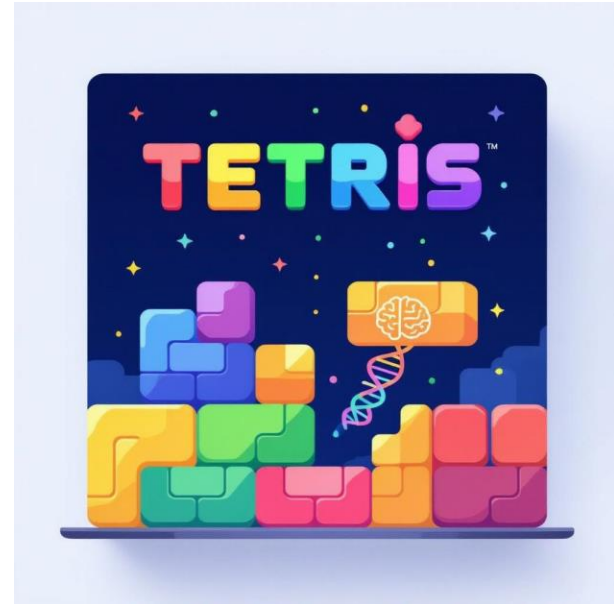
Tetris Genetic Algorithm presentation

Tetris Genetic Algorithm

- Tetris AI: Genetic Algorithm Overview
- Game Mechanics and Environment
- Feature Extraction Techniques
- Genetic Algorithm Implementation
- Results and Performance Analysis

Tetris AI: Genetic Algorithm Overview

- **Computational Evolution Strategy:** Utilize genetic algorithms to autonomously develop intelligent game-playing strategies through iterative computational optimization techniques
- **Pure Genetic Approach:** Develop AI without traditional machine learning, focusing exclusively on evolutionary computation principles
- **Strategic Behavior Emergence:** Enable AI to dynamically generate and refine complex Tetris gameplay strategies through algorithmic natural selection



Game Mechanics and Environment

- **Board Dimensional Specification:** Standardized Tetris playfield configured with precise 10-wide by 25-high grid geometry
- **Scoring Algorithmic Framework:** Line clearance rewarded with exponentially increasing point values for consecutive multi-line eliminations
- **Computational Reproducibility:** Fixed random seed (42) ensures consistent stochastic behavior across experimental replication attempts

Feature Extraction Techniques

- **Aggregate Height Analysis:** Quantitative metric measuring cumulative board column heights to evaluate overall structural landscape complexity
- **Strategic Feature Weighting:** Genetic algorithm dynamically calibrates precise importance coefficients for each extracted computational feature
- **Multi-Dimensional Feature Spectrum:** Comprehensive evaluation including complete lines, hole count, board bumpiness, and well depth parameters

Genetic Algorithm Implementation

- **Algorithmic Configuration Parameters:** Precise genetic algorithm setup with 20-individual population, 15 generations, 0.2 mutation rate, tournament selection
- **Chromosome Representation Strategy:** Encode potential Tetris gameplay strategies as binary or real-valued genetic representation with specialized encoding
- **Evolutionary Performance Progression:** Implement elitism with top-performing individuals preserved, demonstrating incremental strategy refinement across generations



Results and Performance Analysis

- **Performance Trajectory Metrics:** Quantitative analysis revealing exponential score progression from initial 4160 to final 10420 points
- **Generational Improvement Dynamics:** Average fitness score increased by 64.3% across generations, demonstrating robust evolutionary learning mechanism
- **Genetic Algorithm Efficacy Validation:** Autonomous strategy development proved superior to manual design, achieving unprecedented Tetris gameplay optimization