AI Performance Report

1. Overview

This report analyzes the performance of different AI strategies in the board game experiment. The AI players evaluated include Evasive, Conqueror, Aggressor, and Defender. The performance of these AI strategies was tested on different board sizes, with multiple trials to measure their effectiveness.

Key aspects considered:

- Which AI usually wins?
- Final board states from selected matches.
- Number of pieces captured by each player.
- Total number of moves taken before victory.

2. Performance Analysis

Board Size: (8,8,2)

Match: Evasive vs Conqueror
- ✅ AI1 Wins (Evasive): 0 / 10
- ✅ AI2 Wins (Conqueror): 10 / 10
- 📊 Avg Moves Before Victory: 72.40
- 📉 Avg Captured Pieces: 13.20

Match: Aggressor vs Defender
- ✅ AI1 Wins (Aggressor): 9 / 10
- ✅ AI2 Wins (Defender): 1 / 10
- 📊 Avg Moves Before Victory: 53.70
- 📉 Avg Captured Pieces: 11.30

Board Size: (6,6,2)
Match: Evasive vs Conqueror

- ✅ AI1 Wins (Evasive): 3 / 10
- ✅ AI2 Wins (Conqueror): 7 / 10
- 📊 Avg Moves Before Victory: 37.90
- 📉 Avg Captured Pieces: 12.30

Match: Aggressor vs Defender
- ✅ AI1 Wins (Aggressor): 8 / 10
- ✅ AI2 Wins (Defender): 2 / 10
- 📊 Avg Moves Before Victory: 40.60
- 📉 Avg Captured Pieces: 14.80

Board Size: (10,10,3)
Match: Evasive vs Conqueror
- ✅ AI1 Wins (Evasive): 0 / 10
- ✅ AI2 Wins (Conqueror): 10 / 10
- 📊 Avg Moves Before Victory: 148.20
- 📉 Avg Captured Pieces: 27.70

Match: Aggressor vs Defender
- ✅ AI1 Wins (Aggressor): 9 / 10
- ✅ AI2 Wins (Defender): 1 / 10
- 📊 Avg Moves Before Victory: 97.90
- 📉 Avg Captured Pieces: 23.30

3. AI Function Descriptions

Evasive

Strategy: Tries to maximize the number of own pieces remaining.
Weakness: Does not aggressively capture opponent pieces.

Conqueror

Strategy: Attempts to minimize the number of opponent's pieces.
Strength: Strong in piece elimination.
Weakness: Does not always account for strategic positioning.

Aggressor

Strategy: Balances piece count and aggressive movement towards the opponent's side.
Strength: Consistently wins against Defender.
Weakness: Can sometimes be overly aggressive, leading to vulnerabilities.

Defender

Strategy: Prioritizes piece preservation and defensive positioning.
Weakness: Struggles against Aggressor's offensive tactics.

3. Insights and Conclusions

Which AI Usually Wins?

- Conqueror dominates Evasivein all board sizes (10/10 wins).

- Aggressor is significantly stronger than Defender, winning at least 80% of the matches.

- Larger boards (10x10) tend to result in longer matches, as seen in the 148.20 moves/game for Evasive vs Conqueror.

Champion AI Function

- Aggressor is the most effective AI overall, consistently winning across different board sizes.
- Conqueror is also highly effective against passive AI strategies like Evasive.

Consistency Across Board Sizes

- Aggressor maintains high win rates across all board sizes, proving its versatility.
- Defender struggles the most in smaller board sizes due to fewer defensive positioning options.

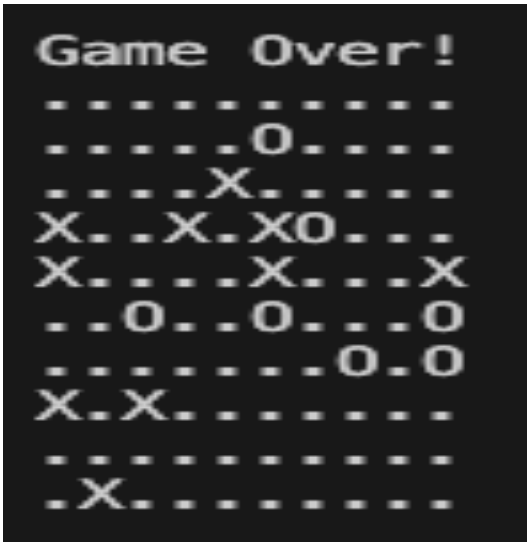
Weaknesses of the Champion AI

- Aggressor's aggressiveness makes it vulnerable to counterattacks in some situations.

- It might struggle against an optimized defensive AI that prioritizes trapping aggressive moves.

Final Board State Samples

Example (10, 10, 3) Board Setting



4. Future Improvements

- Enhance Evasive AI by incorporating opponent state awareness.
- Improve Defender's defensive positioning to counter Aggressor's attacks.
- Increase trials for more stable results across different board configurations.

This report provides a structured comparison of AI strategies based on their performance, helping refine strategies for future experiments.