**Developing and Evaluating Multiple Tic-Tac-Toe Agents in a Tournament Environment**

**Introduction**:  
This project aims to design and evaluate AI agents employing varied strategies for Tic-Tac-Toe. By conducting tournaments among these agents, the objective is to analyze their performance and identify optimal techniques. The work highlights the potential of AI strategies in simple games, laying a foundation for scaling to more complex problems.

**Related Literature**:

1. Studies on **Minimax Algorithm** highlight its foundational role in perfect-information games like Tic-Tac-Toe.
2. Research on **Alpha-Beta Pruning** demonstrates its efficiency in reducing the computational cost of Minimax searches.
3. **Reinforcement Learning**: A dynamic approach enabling agents to improve over time through trial and reward feedback.

**Progress and Achievements**:

**Development**:

* Implemented multiple agents using Minimax, Alpha-Beta pruning, and Reinforcement Learning.
* Designed a modular Python-based framework integrating **Pygame** for the graphical interface and **NumPy** for efficient computation.

**Challenges and Adjustments**:

1. **Challenge**: Balancing computational efficiency for Alpha-Beta pruning in complex board states.  
   **Solution**: Optimized the pruning heuristic for faster evaluation.
2. **Reinforcement Learning Training**:

Agents struggled to adapt in limited iterations.

**Solution**: Refined reward functions and introduced diverse training scenarios.

1. **Framework Integration**:

Difficulty in modularizing different agents’ decision-making logic.

**Solution**: Established a unified interface for agent interaction and data collection.

**GitHub Link**: [https://github.com/karthikreddy1905/TIC-TAC-TOE]