

Task 2: Tic-Tac-Toe AI

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■ Introduction

This project implements an AI agent that plays the classic game of Tic-Tac-Toe against a human player. The AI is designed using the Minimax algorithm with Alpha-Beta Pruning, making it unbeatable. This project enhances understanding of game theory and search algorithms.

■■ Methodology

- Human player uses 'X', while AI uses 'O'. - The AI evaluates all possible moves using the Minimax algorithm. - Alpha-Beta Pruning optimizes computation by cutting off unnecessary branches. - The AI always plays optimally.

■ Minimax Algorithm

The Minimax algorithm is a recursive decision-making strategy used in game theory. It assumes that the opponent also plays optimally. The AI maximizes its score while minimizing the opponent's score. Alpha-Beta Pruning enhances efficiency by ignoring branches that cannot influence the final decision.

■ Results

The AI plays optimally and cannot be defeated. Below is a sample gameplay screenshot showing the AI winning against a human opponent.

```
... Welcome to Tic-Tac-Toe!
| | | |
| | | |
| | | |
Enter your move (1-9): 7

AI has made its move:
| | | |
| | O | |
| X | | |
Enter your move (1-9): 2

AI has made its move:
| O | X | |
| | O | |
| X | | |
Enter your move (1-9): 6

AI has made its move:
| O | X | |
| | O | X |
| X | | O |
😎 AI wins!
```

■ Conclusion

This project demonstrates how AI algorithms like Minimax can be applied in simple games. It provides practical understanding of adversarial search and decision-making strategies. These concepts form the foundation for more complex AI in games such as Chess or Go.