

AI-Driven Chess Game

This project aims to develop an AI-powered Chess Game that allows players to compete against an intelligent, adaptive opponent. The AI opponent will utilize the Minimax algorithm with Alpha-Beta Pruning to evaluate moves and make strategic decisions. The goal is to create an engaging and dynamic chess-playing experience while integrating core AI principles.

Significance of the Project

Chess has long been a benchmark for artificial intelligence research, dating back to early AI experiments like IBM's Deep Blue. This project is significant because it provides hands-on experience with AI problem-solving techniques, including game theory, decision trees, and heuristic evaluations. This project is also particularly meaningful because it allows for adaptive difficulty scaling, providing an accessible learning experience for beginners while challenging more experienced players.

I have recently started learning to play chess, and I am absolutely loving it. The strategic depth and problem-solving aspects of the game have sparked my interest in understanding how AI can simulate human-like decision-making in chess. This newfound passion is a major reason why I am excited to undertake this project.

Proposed Methods

The project will involve the following key components:

- **Chess Logic Implementation:** Ensuring valid movements for each piece, detecting check/checkmate, and handling turn-based play.
- **AI Opponent:** Implementing the Minimax algorithm with Alpha-Beta Pruning to efficiently search possible moves and make optimal decisions.
- **User Interaction:** Click-and-drag movement, move validation, and possible hints for legal moves.

- Extra Features (Optional): Undo/redo functionality and adjustable AI difficulty.

Relation to Class

This project directly ties into AI concepts discussed in class, particularly in game AI, search algorithms, and decision-making processes. It provides practical application of heuristic evaluation, adversarial search, and optimization techniques. Additionally, it explores AI's role in entertainment and competitive problem-solving, reinforcing its significance in real-world applications.

This proposal aligns with AI fundamentals while also pushing the boundaries of game AI implementation. It is not based on any previous coursework but serves as an independent exploration of AI methodologies in an interactive setting.

Conclusion

By developing an AI-driven chess game, this project will provide valuable insights into algorithmic decision-making, efficiency optimizations, and user experience considerations in AI applications. This work will serve as both a learning tool and a demonstration of AI's capabilities in strategic gameplay.