

# Progress Report: Innovative Go AI Development

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## Overview

Our project aims to develop an innovative Go AI that surpasses existing models in strategic depth and understanding. Leveraging advanced techniques in deep reinforcement learning, neural network architectures, and Monte Carlo Tree Search algorithms, we intend to create an AI capable of competing with top human players. Unlike traditional Go AIs, our project introduces unique features to enhance both the development process and the end-user experience. These include a comprehensive Move Tree for tracking game progress, an after-game analysis with a win rate curve, and an AI match rate metric for in-depth game review.

## Research Questions

Our investigation centers on several pivotal questions:

- What neural network architectures best evaluate Go board states and predict optimal strategies?
- In what ways can Monte Carlo Tree Search algorithms be refined to improve the AI's decision-making?
- What computational challenges arise in the development of Go AI, and how can they be effectively addressed?
- How do our proposed features (Move Tree, after-game analysis, AI match rate) improve upon existing Go AIs in terms of player learning and engagement?

## Value to User Community

The primary beneficiaries of our project are Go enthusiasts and AI research communities. Our Go AI offers a challenging opponent for players, enriching their understanding and skills in the game. The new features, such as after-game analysis and AI match rate, provide players with tools for self-improvement and deeper game insight. We plan to disseminate our work through public repositories on GitHub and/or Zenodo, facilitating access and fostering a collaborative environment for further development.

## **Demo**

For our elevator pitch, we will highlight the project's innovative aspects, emphasizing its potential to transform Go play and strategy through AI. The demo, planned for the class's last week, will showcase the AI engaging in a match, illustrating its strategic decision-making, utilization of the Move Tree for move tracking, and the after-game analysis features, including the win rate curve and AI match rate metrics.

## **Delivery**

The project's outcomes, including code, scripts, data, documentation, and other artifacts, will be shared via GitHub and/or Zenodo repositories. Our preference for public repositories aligns with our commitment to open access and collaborative improvement. We will ensure that the instructor and TA have access to any necessary private repositories, in compliance with the guidelines provided on Courseworks.

## **Additional Considerations**

We intend to build upon existing datasets, software, and methodologies, extending, incorporating, or reusing these resources to avoid redundancy and enhance our project's efficacy. We haven't decided how we will use the model, the repository are following

<https://github.com/CGLemon/pyDLGO>

By tackling these ambitious goals, our project not only advances the field of AI in board games but also provides the Go community with a valuable tool for both enjoyment and improvement.