

ReadySet Go: A Web Application for AI Research and Education via Go

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Meet the Team



Kien Nguyen
Team Lead



Christain Arciniega
Frontend Manager



Derek Isensee
Backend Manager



Ryan Moncrief
Design/Website Manager



Ryan Clements
Database Manager

Our Clients



Dr. Liran Ma
TCU CoSci Dept



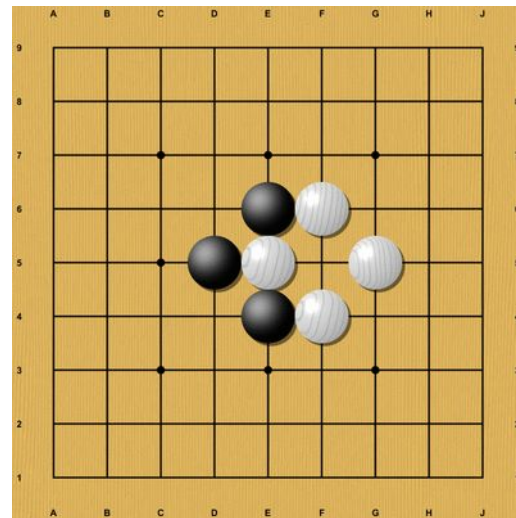
Dr. Ze-Li Dou
TCU Math Dept

Outline

- Background
- The Problem
- Our Solution
- Site Demo
- Challenges
- Lessons Learned

Background - Go Game

- A board game for two players
- Goal is to surround more territory
- Go is complex
 - Standard size 19x19
 - $> 10^{172}$ board positions
- Go AI's are hard to train



Background - Research Project

- Breakthroughs in Go AI, like AlphaGo, inspired many research projects around the globe, including an interdisciplinary endeavor here at TCU called **Go2AI**.



AlphaGo

Paradox of AlphaZero: Strategic vs. Optimal Plays

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Abstract—This article analyzes AlphaZero-type algorithms quantitatively from the viewpoint of local and global optimal sequences of play on a 7×7 board. Through targeted evaluation of the AI agent, the authors reveal the strategic, that is, winrate-dominated, nature of such algorithms, and expose thereby certain inherent obstacles against optimal play. Possible remedies are then explored, leading to techniques that may help further quantitative analysis of those algorithms and for the search for optimal solutions, on 7×7 as well as larger boards.

Index Terms—Game of Go, artificial intelligence, AlphaZero, optimal play, targeted evaluation, targeted training.

shall have little to contribute in this regard except for a few comments towards the end of this paper.

In this article, we wish to discuss a rather different approach that is at once more conceptual and more quantitative. Currently, playing strength of the various AlphaZero-type algorithms is measured by their efficacy of scoring wins. Like the Elo rating system [4], this is a relative metric. However, there is a more absolute reference against which to define and measure strength as well, namely, *optimal sequences of play*. From that vantage point, the strength of an AI agent is

The Problem

- Little gain out of research project
 - Not-so-user-friendly interface for the AI training process.
 - Limited access to gameplay against AI



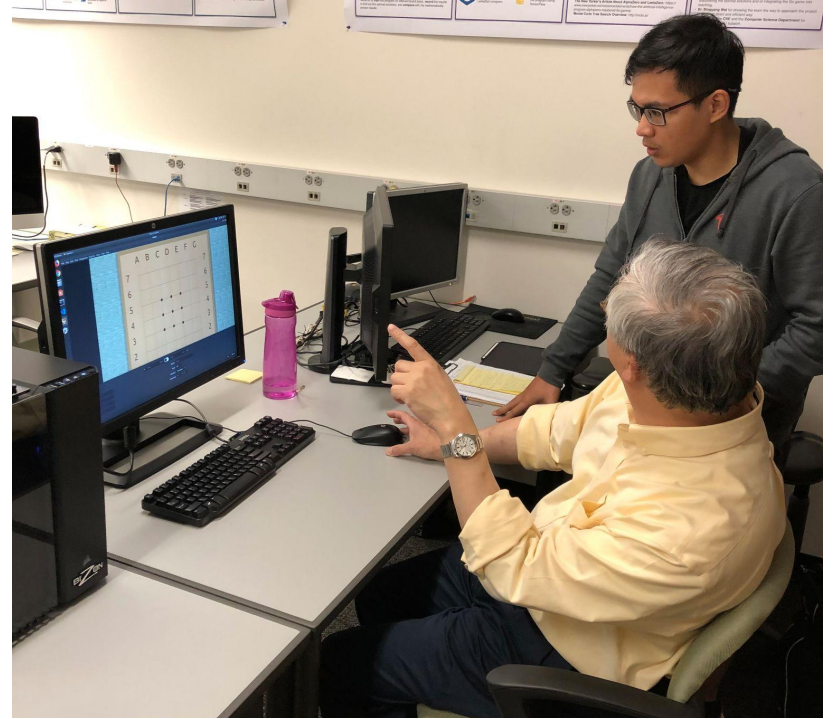
```
ai-lab@ai-lab:~$ nohup python3 main.py --mode optimal -g 50 -e ../lee  
la-zero-7/build/leelaz -t . -z ../targeted-train-stats/Exp4/ --keep-g  
ames 60000 --games-per-gen 6000 --num-process 20 --komi 9.5 --visit 2  
50 --playout 150 --size 7 --random-temp 1 --random-move 10 --init-fil  
ter 128 --init-block 4 --gate 55 --step 1000 &
```

The Problem - Command Line for AI Training

- Not user-friendly
- Prone to errors
- Few people know how-to

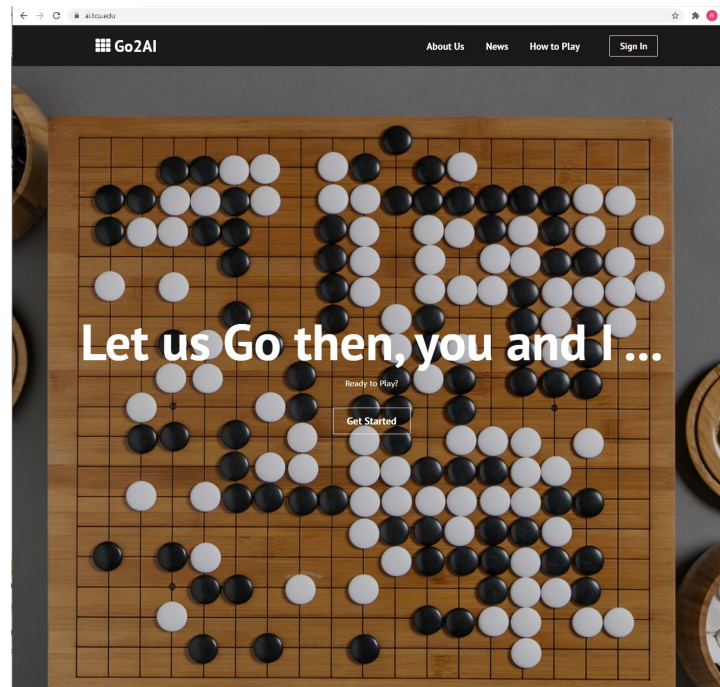
The Problem - Accessibility and Use

- User-friendly games can only be played in the lab
- Command line-based games are only available for play through TCU network



Our Solution - Web Application for Go2AI.

- User-friendly UI for researchers
- Available to everyone
- Accessed from anywhere
- Even works on mobile!
- Data protection and security



Planning

| ReadySet Go Release Plan | |
|----------------------------|---|
| Week | Features |
| 10/19 | Implement User Registration and Login |
| 10/26 | Begin User Profile interaction |
| 11/2 | Implement Research AI Training |
| 11/9 | Implement Saved Games for Users |
| 11/16 | Presentations |
| 11/23 | Finals Week |
| Winter Break Begins | |
| 11/30-1/11 | Code Review, Bug Fixes, Code Revisions, Client Feedback Revisions |
| 12/7 | |
| 12/14 | |
| 12/21 | |
| 12/28 | |
| 1/4 | Look into Gameplay Features |
| 1/11 | Gameplay Features |
| Winter Break Ends | |
| 1/18 | Begin Implementing Gameplay |
| 1/25 | |
| 2/1 | |
| 2/8 | |
| 2/15 | Finish implementing gameplay |
| 2/22 | Implement View Game Replay |
| 3/1 | |
| 3/8 | |
| 3/15 | Code Review |
| 3/22 | Documentation |
| 3/29 | Client Acceptance Tests, Bug Fixes |
| 4/5 | Testing and Deployment |
| 4/12 | Testing and Deployment |
| 4/19 | Presentation Preparation |
| 4/26 | Final Presentations |

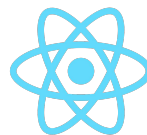
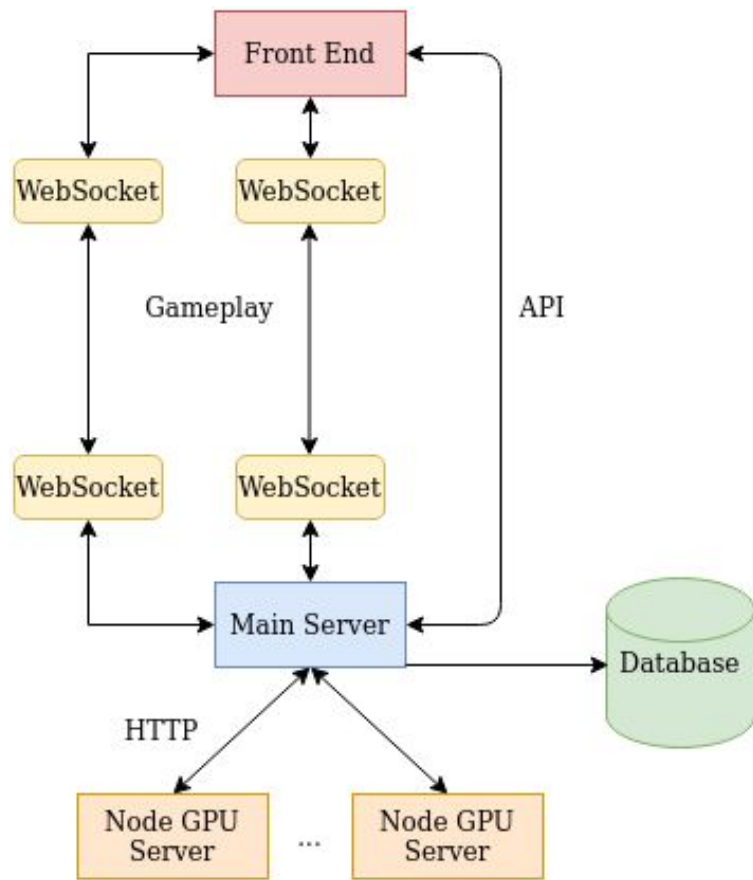
Implement User Management (~3 weeks)

Implement Research (~4 weeks)

Implement Gameplay (~11 weeks)

Deploy (~8 weeks)

System Architecture



Front End
Interactive UI



Main Server
Authentication/Serve Front End



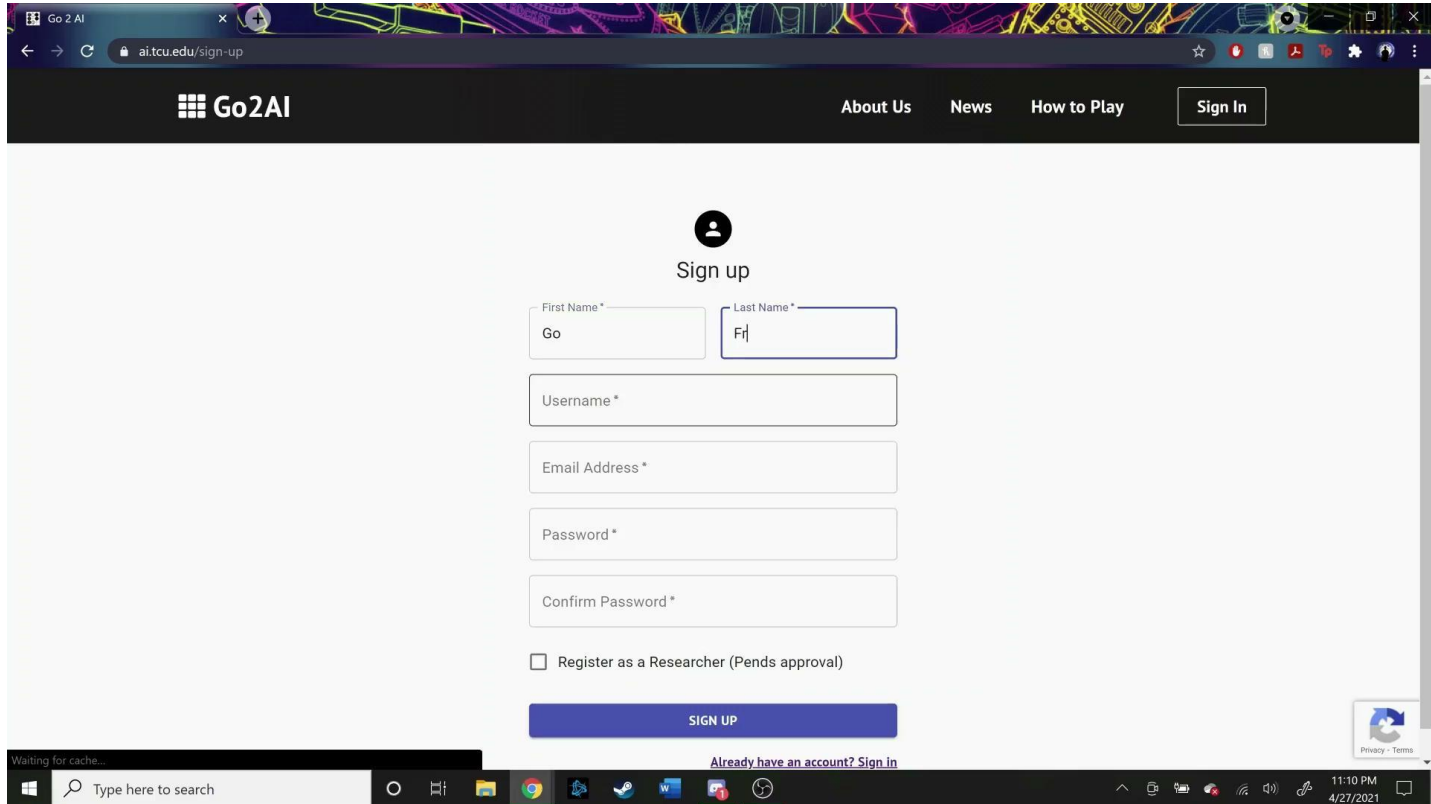
Database
Users/Games/Agents



GPU Server
Training/Gameplay

Site Demo

Account Creation



The screenshot shows a web browser window with the URL `ai.tcu.edu/sign-up`. The page header features the Go2AI logo on the left and navigation links for "About Us", "News", "How to Play", and "Sign In" on the right. The main content area is titled "Sign up" and contains a form with the following fields:

- First Name *: Input field containing "Go".
- Last Name *: Input field containing "Fi".
- Username *: Empty input field.
- Email Address *: Empty input field.
- Password *: Empty input field.
- Confirm Password *: Empty input field.

Below the form is a checkbox labeled "Register as a Researcher (Pends approval)" which is currently unchecked. At the bottom of the form is a blue button labeled "SIGN UP".

At the bottom of the browser window, there is a search bar with the text "Type here to search" and a taskbar showing the system time as 11:10 PM on 4/27/2021. A small "Privacy - Terms" icon is visible in the bottom right corner of the browser window.

Gameplay and Replay

The screenshot displays a web browser window with the URL `ai.tcu.edu/game-results?color=W&winner=A&score=6.0`. The page header includes the Go2AI logo and navigation links for Play, Player Profile, Account Management, and Sign Out. The main content area features a Go board with a final score of **Final Score: W+6.0**. The board is a 7x7 grid with columns labeled A through G and rows labeled 1 through 7. The pieces are distributed as follows:

| Row | A | B | C | D | E | F | G |
|-----|---|-------|-------|-------|-------|-------|---|
| 7 | | | | | | | |
| 6 | | | | Black | | | |
| 5 | | White | Black | | Black | | |
| 4 | | | White | Black | Black | | |
| 3 | | | White | White | Black | White | |
| 2 | | | | White | White | Black | |
| 1 | | | | | | | |

Below the board are two buttons: **PASS** and **HINT**. The Windows taskbar at the bottom shows the time as 10:24 PM on 4/27/2021.

Research

The screenshot displays the Go2AI Research interface. At the top, there is a navigation bar with the Go2AI logo and links for Play, Player Profile, Research (which is highlighted), and Account Management. A Sign Out button is also present. Below the navigation bar, the agent ID **5b13105548c44a599e664bf2700ca33e937cddd** is displayed. The main content area features a graph titled "MMR" (Mean Maximum Reward) with a y-axis ranging from 0 to 4 and an x-axis labeled "Generation 0". A single data point is plotted at (0, 0). Below the graph is a table titled "Agent Metrics" with the following data:

| Trainer | GoTestUser |
|----------------------|------------|
| Blocks | 4 |
| Board Size | 7x7 |
| Filters | 64 |
| Games per Generation | 1000 |
| Gate | 55 |
| Generations | 6 |

The bottom of the screenshot shows the Windows taskbar with the search bar and system tray icons, including the time 10:28 PM and date 4/27/2021.

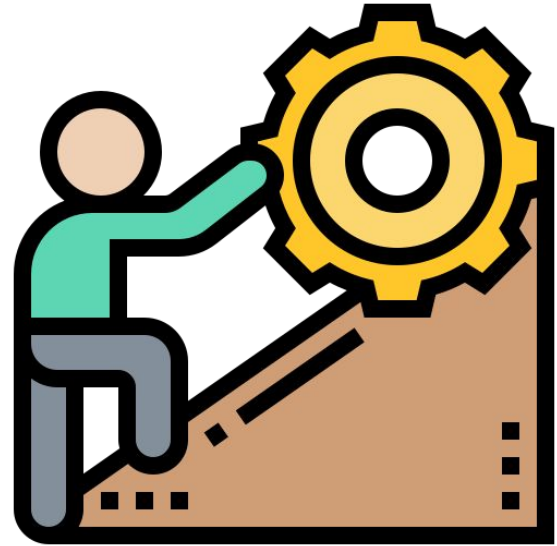
Admin Panel

The screenshot shows a web browser window with the URL `ai.tcu.edu/admin-panel`. The page header includes the Go2AI logo, the text "Admin Panel", and a "Sign Out" button. Below the header is a navigation bar with three tabs: "ALL USERS", "RESEARCHER REQUESTS", and "ALL AGENTS". The main content area is titled "Users" and features a search bar. A table lists three users with columns for Username, Email, Activated Account, Role, and Actions. The table shows three rows of data. At the bottom of the page, there are links for "About Us", "News", and "How to Play". The Windows taskbar at the bottom shows the search bar, task view, and system tray with the time 11:57 AM on 4/29/2021.

| Username | Email | Activated Account | Role | Actions |
|-------------|---|-------------------|------------|---------|
| christian14 | chrisjavarci@outlook.com | true | researcher | |
| dersensee | djasfyiovnpoqrheioqvnioqpvnewqn@gmail.com | false | player | |
| SuperfrogGo | ryan.moncrief@tcu.edu | true | player | |

General Challenges

- Many small issues
- Long time spent integrating components
- Many elements to gameplay



Technical Challenges

- Microservice Architecture → Monolithic
- React + Vanilla JavaScript
- Security Protocols/Firewalls
 - HTTPS - TCU Certificate
 - IT Department
- Fully Remote Development



Lessons Learned

- Gained skills and knowledge
- Integration of many systems into one application
- Incorporation of security protocols
- Time allocation between phases



What It Took to Get Here

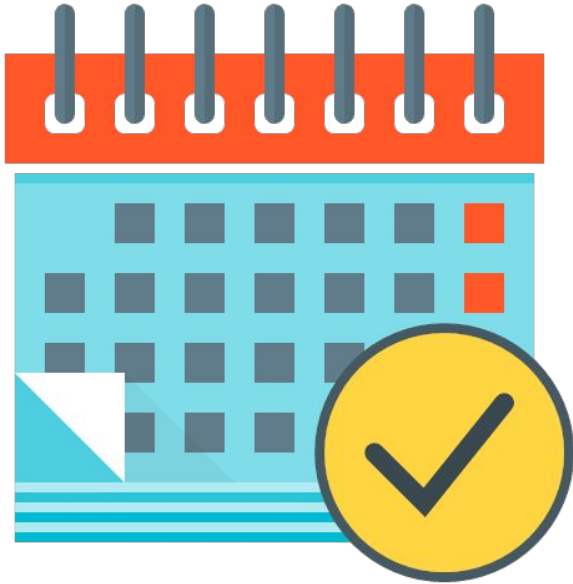
- 2 Github Repositories
- 503 Commits
- > 2,500 Discord Messages
- 43 Zoom Meetings
- 63 Active Site Users

And...

- **~940,616** lines of code



Future Plans



- Hand over admin account to the client
- Utilize in TCU classes starting as early as next semester
- Welcome new players and researchers

We thank Dr. Kadiyala and Dr. Wei for their continued support over this year

And thank you for coming and listening to our presentation!

Q&A

Try it yourself! Visit <https://ai.tcu.edu>

