

# DATA130008 2021 Fall: Final Project

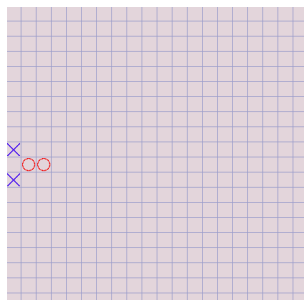
## Gomoku

### Submitting

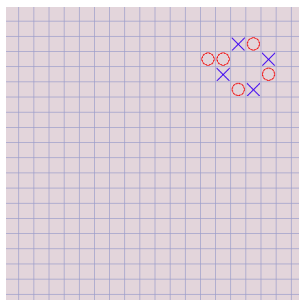
- Server address: <ftp://10.192.7.236/>
- Midterm 1:
  - Implement **Minimax with Alpha-Beta Pruning** in your agent.
  - Due: **November 14th, 2021**
- Midterm 2:
  - Implement **MCTS** in your agent.
  - Due: **November 28th, 2021**
- Final
  - Implement **Reinforcement Learning** in your agent and improve your agents.
  - Due: **December 19th, 2021**
- Programming language: Python3 (No marks for other language)
- Uploaded file: No more than 20 MB space and named as id.zip
- **No marks for plagiarism!**

## Gomoku Rule

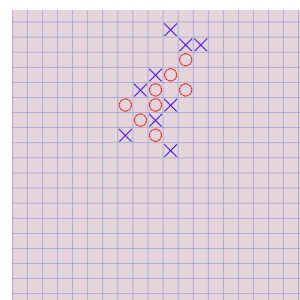
- Chessboard:  $20 \times 20$  grid intersections.
- Free-style Gomoku: A row of five or more stones for a win.



Opening1



Opening2



Opening3

- Openings: The competition should be started with three openings. The opening file can be downloaded from E-Learning.

## AI Agents

We will provide 12 agents for competition, including:

YIXIN17	WINE17	PELA17	ZETOR17	EULRING	SPARKLE
NOESIS	PISQ7	PUREROCKY	VALKYRIE	FIVEROW	MUSHROOM

And 12 matches will be conducted for you with each agent.

- Command line for Combat with AI agents:

```
piskvork.exe -p xxx.exe FIVEROW.zip -opening 1 -rule 0 -memory 512  
-timeturn 15000 -timematch 90
```

## Grading

- Midterm 1(20%)
  - Report(70%): No more than 6 pages;

- Baseline(30%): Full marks if the rating of your AI agent (Minimax with Pruning) is higher than the rating of MUSHROOM;
- Midterm 2(30%)
  - Report(70%): No more than 6 pages;
  - Baseline(30%): Full marks if the rating of your AI agent (MCTS) is higher than the rating of MUSHROOM;
- Final(50%)
  - Report(50%): No more than 6 pages;
  - Baseline(15%): Implement the Reinforcement Learning. You need to describe the details and results of your RL in the report.
  - Rating(35%):  $(\text{your final rating} - \text{lowest rating}) / (\text{highest rating} - \text{lowest rating})$ .
    - \* All ratings are calculated using [Bayesian Elo](#) with  $\text{eloAdvantage} = 0$ ,  $\text{eloDraw} = 0.01$ , and default prior.
    - \* [Latest Ratings](#) can be found here! (<http://www.sdspeople.fudan.edu.cn/zywei/DATA130008/ranking.txt>)

## Grouping

- The group consisting of no more than **two** people is encouraged, otherwise we will take **10%** off each student's grade in this group.
- Include names and IDs of **all** members in your group in the **report**.

## Websites

- Gomocup: <http://gomocup.org/>
- Gomoku AI: <http://gomocup.org/download-gomoku-ai/>
- Gomoku manager: <http://gomocup.org/download-gomocup-manager/>
- Python Template: <https://github.com/stranskyjan/pbrain-pyrandom>

## References

- (1) Go-moku and threat-space search(1993), Louis Victor Allis and HJ Van Den Herik.
- (2) Searching for Solutions in Games and Artificial Intelligence(1994), Louis Victor Allis.
- (3) Go-Moku Solved By New Search Techniques(1996), Louis Victor Allis, H. Jaap van den Herik, and M. P. H. Huntjens.
- (4) Self-teaching adaptive dynamic programming for Gomoku(2012), Dongbin Zhao, Zhen Zhang, and Yujie Dai.
- (5) Evolving Gomoku Solver by Genetic Algorithm(2014), Junru Wang and Lan Huang.
- (6) Effective Monte-Carlo tree search strategies for Gomoku AI(2016), J H Kang and H J Kim.
- (7) ADP with MCTS algorithm for Gomoku(2016), Zhentao Tang, Dongbin Zhao, Kun Shao, and Le Lv.

For more information, please check slides "Tutorial1-Lab2.pdf". If you have any questions, please contact:

- Luo, Ruipu, 21210980112@m.fudan.edu.cn
- Liang, Jingcong, 18307110286@fudan.edu.cn