Université de Haute-Alsace
Université Franco-Azerbaïdjanaise

Master DSAI
Année 2023-2024

Project-Mode applied Programming in Python

Project : AI for Connect Four

Objectives

Implement min-max and $\alpha - \beta$ for Connect Four.

Write an evaluation function which give a score to a non-terminal state of the game (before end game).

Understand that AI is integrated into application architectures, it is not an end in itself but a means of improving treatment.

Integer AI in an existing software.

Adapt previous code

Instructions

Study the AI code for Tic-Tac-Toe.

Use Python at 100%, Python comes with lot of tools to make your life easy, use them.

Think "object", use object programming at your advantage.

Code neatly with well-chosen variables and functions/methods names. Add useful comments to your code in order to be able to understand it in some days.

Respect coding styleguides. I advise you to follow python styleguide PEP8[1] or Google Python Styleguide[2].

Simple is beautiful. Do not try to code complicated, keep it simple, it will be more efficient and less error-prone.

Think before you code, take some time to draw/write your idea on a sheet. The tinking time before you code will save you a lot of debugging time after.

Do not trust ChatGPT or other AI generator. Use them with caution and only for things you master.

You can work by pair.

You have until December 22nd at 23h59 to render your project which must be a zip file containing your project, which means your `connect4_ai.py` file and your report the name of the zip must contain the names of the two students of the pair.

In addition to your code, you will write a report presenting the strategy you used, in particular to evaluate the grids of incomplete connect four, this evaluation MUST have at least a length of one page.

BEWARE OF PLAGIARISM: Copy/paste of code from the Internet (or work of others classmates) even by changing variable/functions names or switchong code position will be considered as plagiarism.

[1] PEP8: `https://www.python.org/dev/peps/pep-0008/`
[2] Google Python Styleguide: `https://google.github.io/styleguide/pyguide.html`

1 Work

1. Download the python skeleton on moodle (available December 4th), there are two files `connect4.py` which contains the game and which you can not modify and `connect4_ai.py` which now is just playing randomly and where you will write your code for $alpha - \beta$ and the evaluation of non terminal grid.

2. The work will consist of the implementation of $\alpha - \beta$ for the Connect Four (already done in PW for Tic-Tac-Toe).

⚠ The difficulty level of an AI is the number of moves in advance it anticipates (i.e. the depth of your game tree)

3. The efficiency of the AI is limited by the computing power of your machine (even if an AI of difficulty 6 already outpowers us), introduce a dose of parallel calculations to improve the results of your implementations of $\alpha - \beta$. Processes are your friends.

4. Do not send me jupyter notebooks, I want python files.

2 Evaluation

You will be evaluated on

- Respect of the instructions
- Implementation of $\alpha - \beta$
- Evaluation of non-terminal connect 4 grid
- Implementation of parallel computing (if any)
- Respect of Python styleguide and cleanliness of the code
- Quality of the report