Artificial Intelligence 2: Games
Assignments List

Last update: 08.12.2024

Note: There will be no more assignments. Assignment 8 is the last one.Have fun.

Assignment 8 (3p). CG Winter Challenge

Participate in the CodinGame Winter Challenge 2024. Use any idea or algorithm to score as highly as possible on the leaderboard. Remember that your CG profile school has to be set to **University of Wrocław**.

Deadlines: 06.01/06.01[1]:

- (1p) Reach Bronze League.
- (1p) Reach Silver League.
- (1p) Reach Gold League.
- (+2p) Bonus points for reaching Legend League.
- Bonus points based on general ranking (not cumulative):
  Top 100 +1p, Top 75 +2p, Top 50 +3p, Top 25 +4p, Top 10 +5p.
- Bonus points for being in UWr representation (top 5 UWr): +4p.

Assignment 7 (4p). Evo+MarsLander

In this assignment we will play Mars Lander.

Deadlines: 24.01/31.01:

- (1p) Implement forward model.[2]

Deadlines: 31.01/31.01:

- (2p) Implement RHEA[3], so that your program passes all the test cases and validators of the second episode of the Mars Lander puzzle.
- (1p) Reach a better score than 2000 fuel left in Mars Lander optimization. We assume online scenario, where the submitted program does not know the validators and has 100 ms of computation time per turn.
- (+1p) Bonus: pass the third episode of the Mars Lander puzzle.

[1] This is the date when the contest ends. You can present your code to the lab assistant later.

[2] Note that underlying physics engine works on doubles, but every turn player inputs are rounded to integers. Thus, to be consistent with the true state of the game you should simulate its course from the beginning and discard inputs from later turns.

[3] For inspiration, you can take a look at the Tech.io playground about Genetic Algorithms and the blog post about GAs usage for Mars Lander.

Assignment 6 (5p). MCTS+Bandas

In this assignment we will play Bandas.

Deadlines: 17.01/24.01:

- (2p) Implement FlatMC

Deadlines: 24.01/31.01:

- (2p) Implement standard UCT MCTS.
- (1p) Implement tree reuse extension.
- (+1p) Bonus point for implementing solver extension (you can omit draws).

Assignment 5 (8p). Gargoyles vs. Santas

This time, we will play the Gargoyles vs. Santas game. It consists of four leagues, and each league will be graded separately (see detailed rules below).

The game is still in (late phase of) development, so I will mostly welcome your input on its playability, spotted bugs, and balance issues (I will ask some specific questions regarding the rules and parameter tuning later on a lecture channel).

- League 1
- League 2
- League 3
- League 4

Deadlines: This time, deadlines are strict times. This will be the time when the leaderboards will be scanned. Presenting your code to your lab assistant can be done later.

Language: The rules of the game are in Polish. Sorry for the inconvenience, but the game is really simple and just using Google auto-translate gives good results, so I hope it won't be a problem (in-game and error messages are in English).

Deadline: 05.12, 10:00 AM:

- (0.5p per league) Be in the top 50% (rounded-up) of the players on the leaderboard who are students of this lecture. **Update.** Set tu constant: top 15 guarantees points.
- (+0.5p per league) Bonus points for being in the top 3 in a league leaderboard.

Deadline: 13.12, 10:00 AM:

- (1p per league) Reach higher ranking than `Gargoyles_and_Santas_Boss`.
- (0.5p per league) Be in the top 50% (rounded-up) of the players on the leaderboard who are students of this lecture. **Update.** Set tu constant: top 15 guarantees points.

Assignment 4 (8p). General Game Playing

Implement a game in the High-level Regular Games language using the Regular Games IDE.

- You can pick one from the Ludii's database or any other game you know. A few examples:
  - Easy (max 6p): Fox and Geese, Hex, Yavalath.
  - Moderate (max 8p): All Queens Chess, Reversi.
  - Hard (max 12p): Arimaa, Chess, Go, Pentago.

- If you choose one from Ludii's database, use the Ludii Player to check the statistics using the "Analysis" options.
  - "Estimate Branching Factor" (per state) should match the "avg. moves".
  - "Estimate Game Length" should match the "avg. turns".
  - "Compare Agents" should match the "avg. scores".
    Make sure to use the "Random" agent; switch by clicking on the player name.
- It cannot be any of the existing HRG games.
- It has to be non-trivial, i.e., more complex than TicTacToe.
- It has to be booked on Discord, so we will not end up with everyone doing the same one.
  - While booking, confirm the expected complexity of the game (and thus the maximum number of points).
- The code should be documented using the original game rules, so others could verify it.
  Do not hesitate to use the game rules and terms (e.g., pawn names) verbatim.

Deadlines: ~~29.11 / 06.12~~ 06.12 / 13.12.

Assignment 300 (0p). CCC

Participate in Cloudflight Coding Contest, 25.10.2024. Bonus points for good results.

- (1p) Complete level 4.
- (2p) Complete level 5.
- (2p) Rank in World Top 10.

Assignment 3 (8p). Pathfinding

A series of pathfinding-related puzzles to complete.

Deadlines: 08.11/15.11:

- (2p) Reach a 50% score on Pathfinding with Landmarks puzzle.
- (2p) Reach a 100% score on Pathfinding with Landmarks puzzle.

Deadlines: 15.11/22.11:

- (2p) Reach a 50% score on Lazzie Come Home puzzle.
- (2p) Reach a 100% score on Lazzie Come Home puzzle.

Assignment 2 (10p). SA+A*Craft

In this assignment we will play A*Craft. All tasks assume online scenario, where the submitted program does not know the validators and has 1 second of computation time.

Deadlines: 25.10/01.11:

- (4p) Implement fully random search. Use evaluation function based on simulated game result.[4]

Deadlines: 01.11/08.11:

- (4p) Implement simulated annealing. Add some search space reduction optims.

[4] After the main deadline, I will release simulation code to ease the work for those who still want to catch up with the second part of the assignment.

- (1p) Reach better score than the `AI2Games` bot (7984 points).
- (1p) Reach better score than the `AI3Games` bot (8814 points).

Assignment 1 (4p). CG Fall Challenge

Participate in the CodinGame Fall Challenge 2024. Use any idea or algorithm to score as highly as possible on the leaderboard :-). Remember that your CG profile school has to be set to **University of Wrocław**.

Deadlines: 19.10/19.10:

- (2p) More or less understand what the task is about. Parse input into some reasonable structures. Build only greedy teleports. This should be enough to score ∼2,300,000.
- (1p) Extend your program with some greedy tubes between landing pads and proper type module building. Build pods going on a single tube in a loop. Even trying to add one tube per turn and without checking for collisions, it should help you gain some additional score.
- (1p) When added tube collision checks (with other tubes and with buildings), greedy tubes landing pads → building until enough resources and space, and then greedy teleports should give above 4,800,000.
- Note: The tasks above serve as guidelines, they are not obligatory. If your program achieves at least a 5,000,000 score, you get 4 base points for the assignment.
- Bonus points based on general ranking (not cumulative):
  Top 100 +1p, Top 75 +2p, Top 50 +3p, Top 25 +4p, Top 10 +5p.
- Bonus points for being in UWr representation (top 5 UWr): +2p.