Introduction to AI Homework 2
To Infinity GPA — Exploring New Worlds with Algorithms on Earth 645

2025.10.2

Mission Details

The class of **Introduction to AI** is in fact a highly secret mission.

In a parallel universe, the people of Earth 645 have gained one final chance for survival: to call upon the great students of this course for help.

Far away in the universe is **Earth 645**, a world with powerful spaceships but no telescopes. The people can travel across galaxies, but they cannot see distant planets before they go there.

Life on Earth 645 depends on something called **GPA** (*Galactic Power Availability*). GPA is the amount of energy a planet can provide. The higher the GPA, the better the planet is for living. Over time, GPA has become the most important part of their culture, valued even more than leisure, friendship, or art. For them, GPA means survival.

Now, their own planet is failing-resources are gone, and the environment is collapsing. To survive, they must find a new planet with high GPA.

The GPA detector on their ships can measure GPA only at their current location, forcing them to explore blindly. Guided by their most respected scientist, **Dr. Chu**, they turn to three time-tested but powerful strategies: **Hill Climbing (HC)**, **Simulated Annealing (SA)**, and a student-designed **Ultimate Algorithm**. These will guide the search for the best planet.

Time is short. With only **14 days** left, the mission is clear: implement these algorithms, compare how well they work. The future of Earth 645 depends on it.

Submission Instructions

Submit a single ZIP file named: 國立成功大學_F12345678_王小明_HW2.zip (replace with your school, student ID and name)

The ZIP should contain a folder with the same name, including:

1. `main.py` (do not modify)
2. `visuals.py` (do not modify)

3. `landscape.py` (do not modify)
4. `algo_example.py` (do not modify)
5. `algo1.py` (Hill Climbing, implement correctly)
6. `algo2.py` (Simulated Annealing, implement correctly)
7. `algo3.py` (Custom Ultimate Algorithm, implement correctly)
8. `result1.txt` (auto-generated by `main.py`)
9. `result2.txt` (auto-generated by `main.py`)
10. `result3.txt` (auto-generated by `main.py`)

Important: Make sure the ZIP is not corrupted, contains all required files, and does not include extra files.

Survival Deadline

Due: 2025-10-16 23:59 (local time). Late submissions risk the survival of Earth 645 and will be penalized unless prior arrangements have been approved.

Evaluation Criteria

Your grade for coding will be based on correctness, completeness, and successful generation of the required output files. *If anything is incorrect or missing, you will receive **0 points** for that algorithm.*

- **Hill Climbing (60%)** — correct implementation in `algo1.py`; results must be generated in `result1.txt`. **Spaceships:** 1 ship. **Fuel capacity:** Up to 30 movements per ship.
- **Simulated Annealing (20%)** — correct implementation in `algo2.py`; results must be generated in `result2.txt`. **Spaceships:** 1 ship. **Fuel capacity:** Up to 30 movements per ship.
- **Ultimate Algorithm (20%)** — In this part, you should customize and implement an algorithm. You may either:
  - Choose an existing method (e.g., Local Beam Search, Genetic Algorithm, Particle Swarm Optimization, etc.)
  - Modify Hill Climbing or Simulated Annealing into an improved version
  - Design your own original algorithm

The algorithm should make use of 10 ships. Correct implementation in `algo3.py`; results must be generated in `result3.txt`. **Spaceships:** 10 ships. **Fuel capacity:** Up to 30 movements per ship.

The provided code should be able to run and produce both results and visualizations on its own. The ships in `optimizer_example_1.gif` and `optimizer_example_10.gif` demonstrate how ships move based on the example algorithm. In contrast, the ships in `optimizer1.gif`, `optimizer2.gif`, and `optimizer3.gif` will remain stationary at first. This is normal — the ships will only move once your implementation is complete.

Through these strategies, the people of Earth 645 can chart a path to new worlds—and, perhaps, a new beginning.