AI-Powered Academic Advisor: 2-Page Report

Curriculum Graph Schema

The university curriculum is modeled as a **Directed Acyclic Graph (DAG)**:

- **Nodes** represent courses:
  `CS101`, `CS102`, `AI201`, `ML201`, `Math101`, `DS201`, `Capstone`
- **Edges** represent prerequisite relationships:
  Example paths:
  - `CS101 → CS102 → AI201`
  - `Math101 → DS201 → Capstone`

This graph structure ensures:

- No cycles
- Proper prerequisite enforcement
- Clean path planning from foundation to graduation

Student Simulation Logic

We simulate **100 students** using randomized academic profiles:

- Each student has:
  - A random set of **completed courses**, respecting prerequisites
  - A **GPA** based on randomly assigned grades (range: 2.0–4.0)
  - An **academic interest** in one of the following:
    - Artificial Intelligence (AI)
    - Data Science
    - Cybersecurity (Security)
- Constraints include:
  - No course can be taken without satisfying prerequisites
  - Failed courses (< 2.0) must be **retaken**
  - Students take **3–5 courses per term**, up to a max of 6 terms

RL-Based Course Recommendation Strategy

A **custom RL environment** (inspired by OpenAI Gym) was created to simulate academic planning.
At each term, the student agent chooses a batch of eligible courses to take.

- **State** includes:
  - One-hot vector of completed courses
  - GPA (normalized)
  - One-hot encoded interest

- **Action**:
  - Select up to 5 eligible courses
- **Reward Function**:
  - +1.0 per GPA increase
  - +0.5 for courses aligned with student's interest
  - +5.0 bonus upon graduation (Capstone completion)

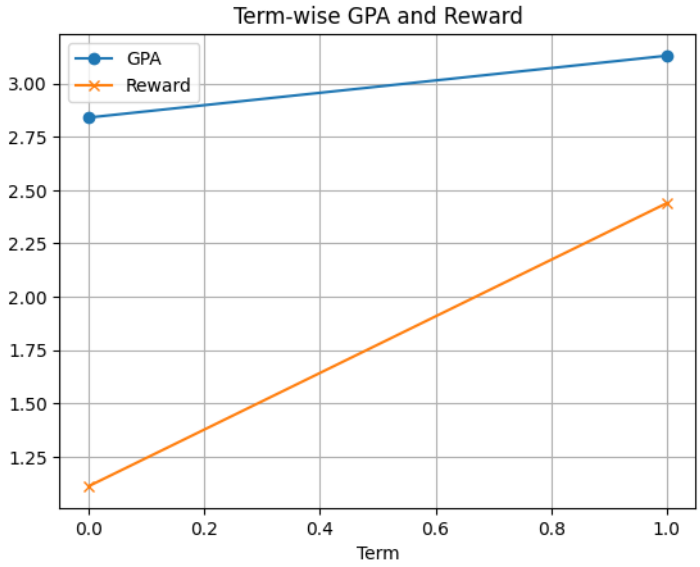
Constraints & Rules

- Cannot take a course before its prerequisites
- Max 5 courses per term
- Must retake failed courses
- Graduation requires completion of `Capstone` and key core courses (`CS101`, `Math101`, `DS201`...)

Sample Results for 5 Students

	student_id	interest	final_GPA	total_courses	graduated	total_reward
37	37	AI	3.26	7	True	4.10
87	87	AI	3.24	7	True	6.62
6	6	Security	2.95	7	True	2.73
9	9	Security	3.13	7	True	4.44
14	14	Data Science	3.26	7	True	5.32

📈 Performance Visualization



The model shows clear progress with interest-aligned course selection and increased reward per term.