📄 AI Curriculum Planner

Adaptive Academic Advising for 100 Astronomy Students

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1. 📚 Curriculum Graph

The astronomy program was modeled as a **directed graph**, where:

- **Nodes** represent courses (e.g., `A101`: Intro to Astronomy)
- **Edges** represent prerequisite relationships (e.g., `A101 → A201`)

The full curriculum includes 11 core astronomy courses:

- **Introductory level**: A101 – A103
- **Intermediate level**: A201 – A203
- **Advanced/specialized**: A301 – A402

We used:

- **NetworkX** to represent and analyze course dependencies
- **Matplotlib** to visualize the graph

This structure enables our system to understand which courses unlock access to others, and how students can progress effectively.

2. 👩‍🎓 Student Simulation

We simulated a realistic cohort of **100 astronomy students**, each with:

- **3–8 completed courses** chosen randomly
- **Grades** from A to F converted to GPA (0.0–4.0 scale)
- **1–2 interests**, such as:
    - Stellar Astrophysics
    - Cosmology
    - Planetary Science
    - Astrobiology
    - Observational Techniques

We used:

- `random` to vary interests and outcomes
- `numpy` to compute GPA
- `pandas` to store and manage the simulation

Each student ends up with a profile that mimics a real-world academic history — ideal for testing recommendation strategies.

3. 🧠 Personalized Course Recommendation Strategy

Rather than train a complex reinforcement learning agent, we implemented a **rule-based (heuristic) system** that behaves like a real academic advisor.

Our logic works as follows:

Eligibility first: Only recommend courses for which prerequisites are fully completed
Interests next: Prioritize courses that match a student's declared interests
Max Load: Limit to 3–5 courses per term
GPA balance: Avoid overly difficult courses for low-GPA students unless required

4. 📊 Sample Recommendation Output


```
{
  "student_id": 45,
  "interests": ["Planetary Science", "Cosmology"],
  "completed": ["A101", "A102", "A201", "A202", "A203"],
  "GPA": 3.1,
  "recommended_courses": ["A303", "A401", "A402"]
}
```


This student completed all the prerequisites for `A303`, unlocking access to advanced astronomy courses that match their interests.

5. Key Design Choices

- 🪐 Curriculum based on astronomy, not AI to show transferability
- 🧩 Heuristic-based AI: simpler, explainable, and effective
- 🧪 Smart logic mimics real academic advising

This shows the power of even simple rule-based AI to drive real value in personalized education.

6. 🚀 Final Notes

This project successfully demonstrates a full pipeline:

- 📚 Curriculum graph modeling
- 👨‍🎓 Realistic student simulation
- 🧠 Smart personalized recommendations