

# Smart Course Recommender – Final Report

## Graph Schema Explanation

The curriculum is structured as a directed graph using Python's networkx library.

Each course is represented as a node, and prerequisites are defined as edges between nodes.

## Example Course Paths:

IntroProgramming → OOP

MathBasics → DatabaseSystems → Networks → CloudComputing / CyberSecurity

OOP + MathBasics → AI\_Fundamentals → DeepLearning

The graph enforces course prerequisites and ensures logical learning progression.

The visualization is saved as `updated_curriculum_graph.png`.

## Student Generation Logic

The project generates 100 synthetic student profiles.

### Each student includes:

3 to 6 completed courses

GPA based on randomly assigned letter grades (A–F)

A term number (1 to 8)

1 to 2 interests selected from:

AI, Cloud, Cyber, Frontend, Visualization

Student data is stored in `sample_students.json`.

## Personalization Strategy

A Q-learning approach is used to personalize course recommendations.

### Definitions:

State: (completed\_courses, GPA, term, interests)

Action: Selecting 3 eligible next-term courses

### Reward Design:

Condition | Reward

Course aligns with interests | +3

Course contributes to graduation progress | +2

GPA > 3.0 | +1

Missing prerequisites | -4

Course already completed (repeated) | -2

### Sample Output (3 Students)

Student	GPA	Term	Interests	Recommended Courses
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S1	3.5	3	AI, Cloud	DeepLearning, CloudComputing
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S2	2.8	2	Cyber	CyberSecurity, Networks
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S3	3.9	5	Frontend	WebDevelopment, DataVisualization
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These results are based on student history, GPA, term number, and preferences.

### Visualizations and Metrics

updated\_curriculum\_graph.png: course graph visualization

sample\_students.json: student profiles

q\_table.json: Q-values from reinforcement learning

No runtime performance or ML evaluation metrics included