

AI-Powered Academic Advisor

Final Report

Generated on 2025-07-07 12:10:03

System Overview

This academic advising system provides personalized course recommendations for students using:

1. Curriculum Modeling:
 - Graph-based representation of courses and prerequisites
 - 15 courses across 4 difficulty levels
 - 6 interest areas: Core, AI, Security, Data Science, Math, Systems
2. Student Simulation:
 - 100 simulated students with:
 - Academic performance (GPA 2.0-4.0)
 - Completed courses (respecting prerequisites)
 - Academic interests (2 areas per student)
 - Academic majors (Computer Science, Data Science, etc.)
3. Recommendation Approaches:
 - Heuristic Method: Prioritizes interest alignment and predicted performance
 - RL Method: Uses Monte Carlo Tree Search to simulate outcomes
4. Evaluation Metrics:
 - Interest Alignment: % of recommended courses matching student interests
 - Predicted GPA: Expected performance in recommended courses
 - Progress Score: Advancement toward graduation

Student Case Study #1

Student ID: S032
Current GPA: 2.97
Interests: ['AI', 'Core']
Major: AI Engineering

Heuristic Recommendations:

- Courses: SEC301, MATH201, DS201
- Interest Alignment: 0.0%
- Predicted GPA: 2.79
- Progress Score: 0.58

RL Recommendations:

- Courses: MATH201, DS201, SEC301
- Interest Alignment: 0.0%
- Predicted GPA: 2.79
- Progress Score: 0.58

Student Case Study #2

Student ID: S040
Current GPA: 2.92
Interests: ['Security', 'Data Science']
Major: Computer Science

Heuristic Recommendations:
- Courses: CS301, MATH101, ELEC1
- Interest Alignment: 0.0%
- Predicted GPA: 2.66
- Progress Score: 0.58

RL Recommendations:
- Courses: CS301, MATH101, ELEC1
- Interest Alignment: 0.0%
- Predicted GPA: 2.66
- Progress Score: 0.58

Student Case Study #3

Student ID: S011
Current GPA: 3.75
Interests: ['Security', 'Core']
Major: Cyber Security

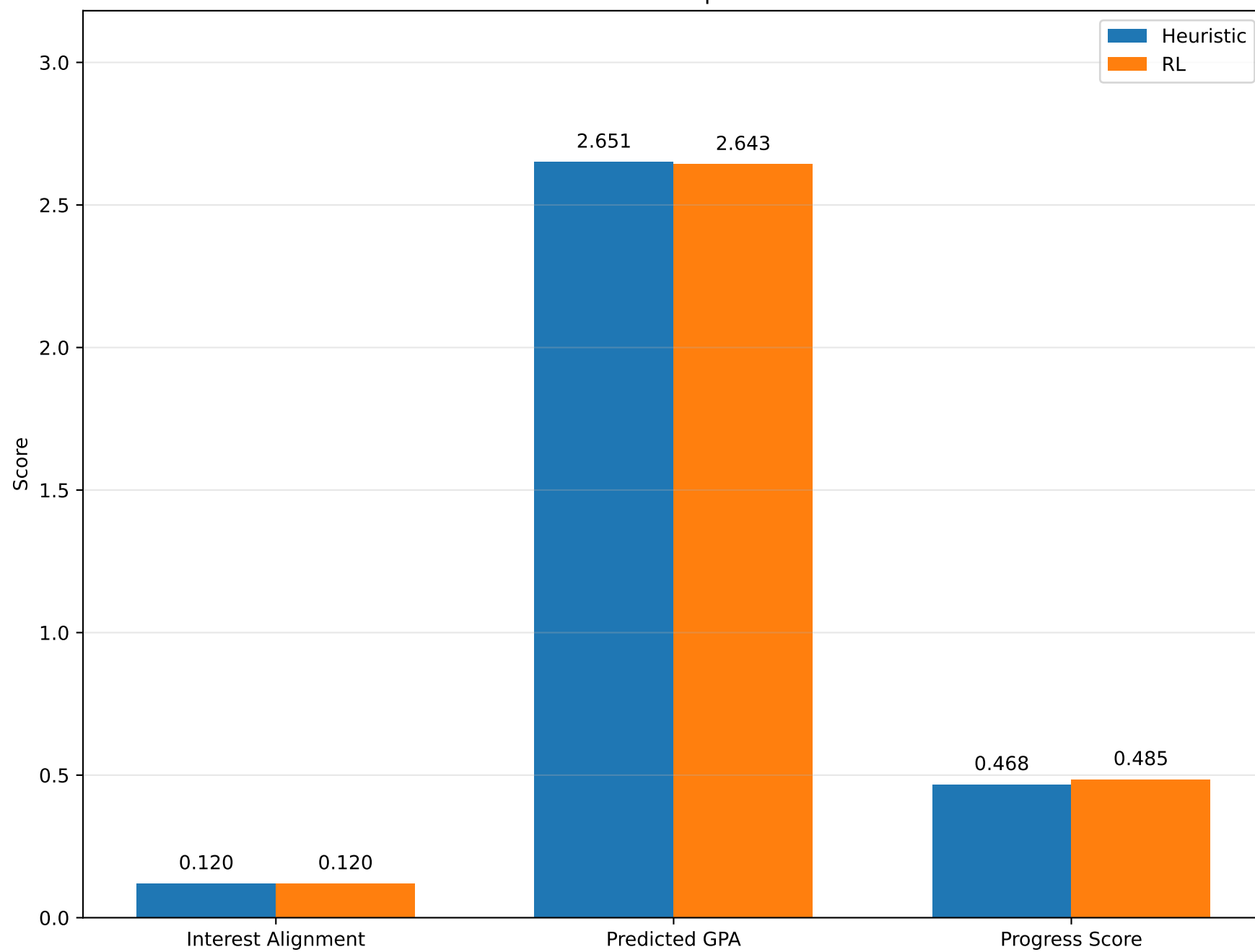
Heuristic Recommendations:

- Courses: SEC301, ELEC2, CS301, AI301
- Interest Alignment: 75.0%
- Predicted GPA: 3.77
- Progress Score: 0.75

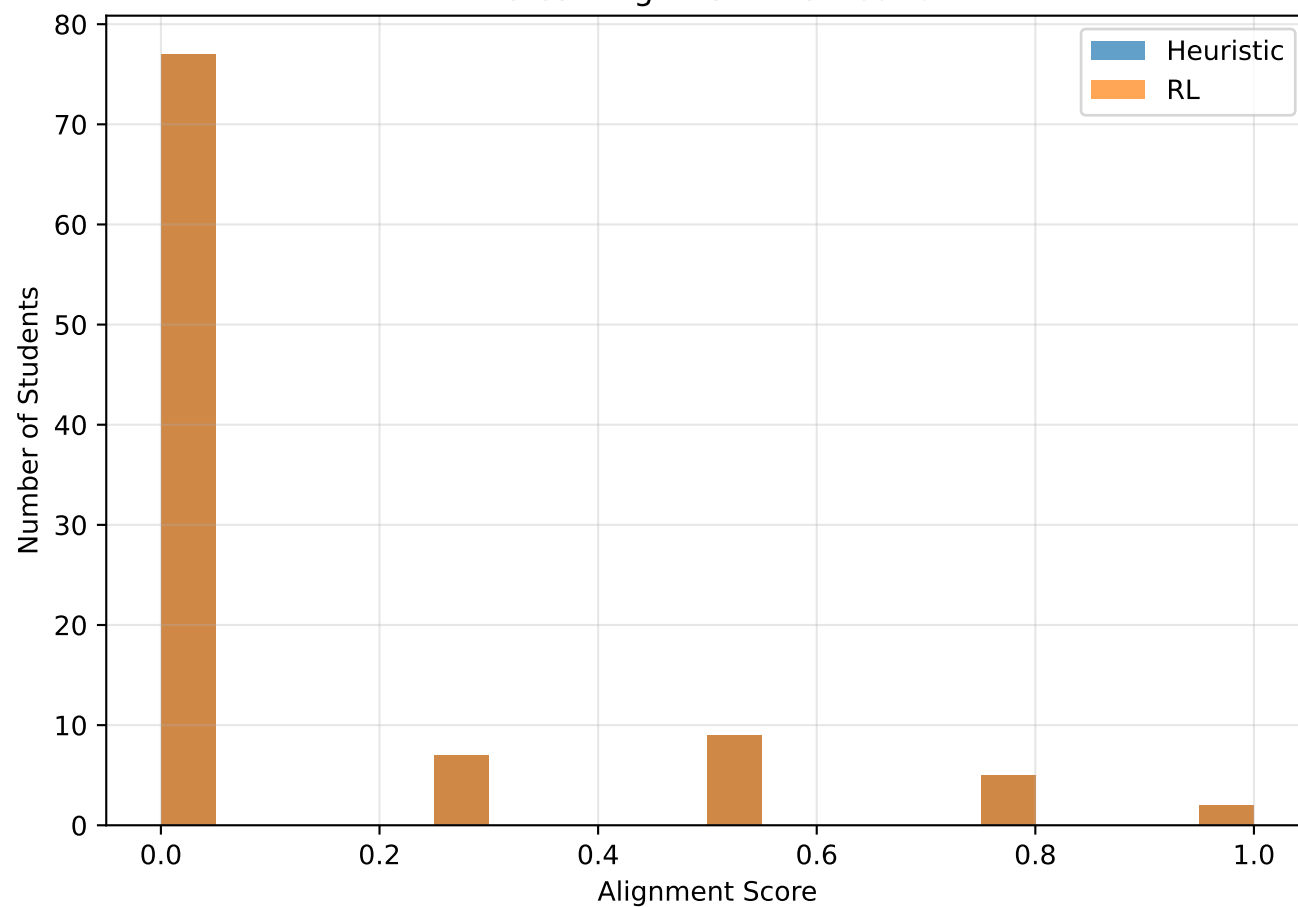
RL Recommendations:

- Courses: SEC301, ELEC2, CS301, ELEC1
- Interest Alignment: 75.0%
- Predicted GPA: 3.75
- Progress Score: 0.75

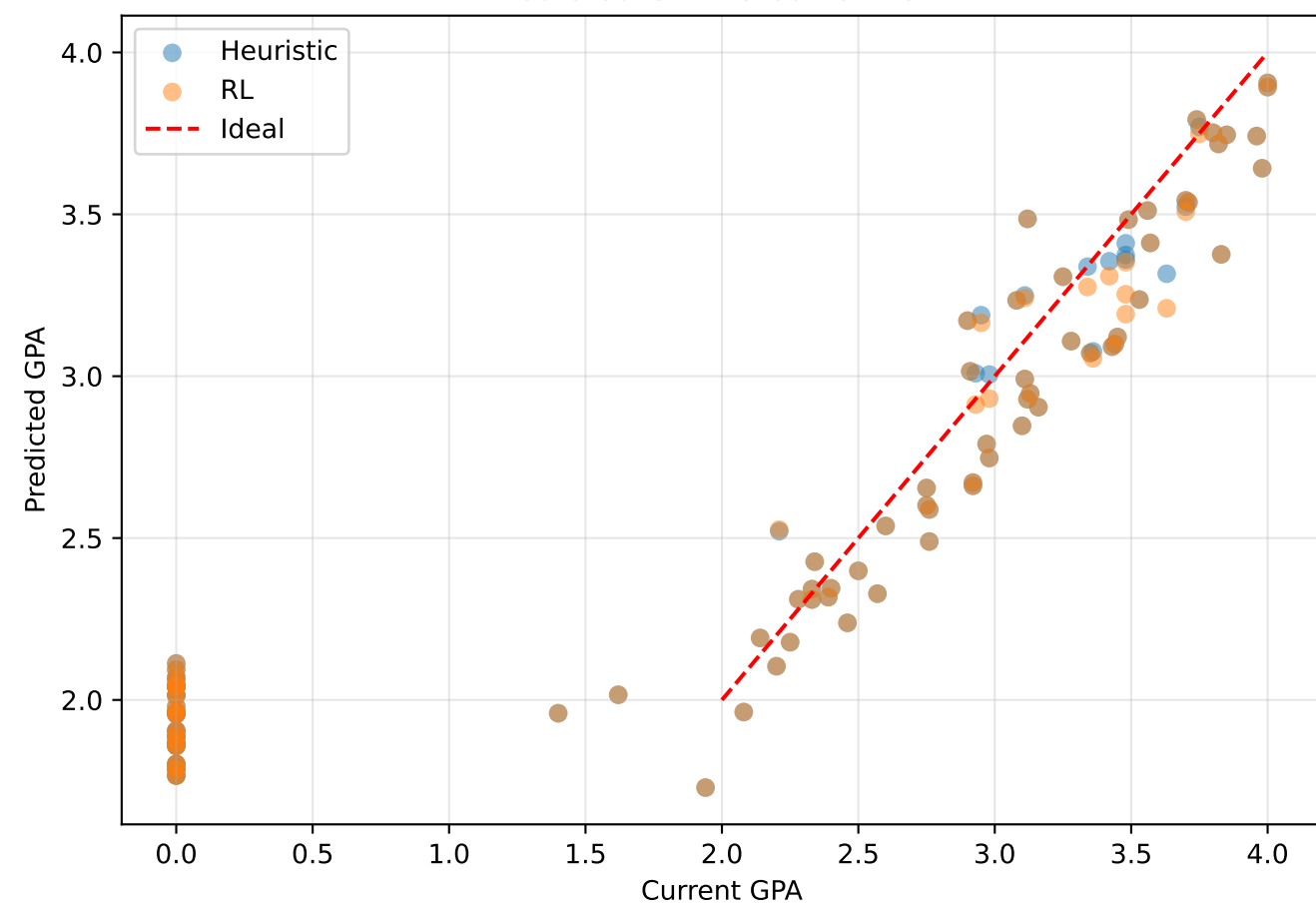
Method Comparison



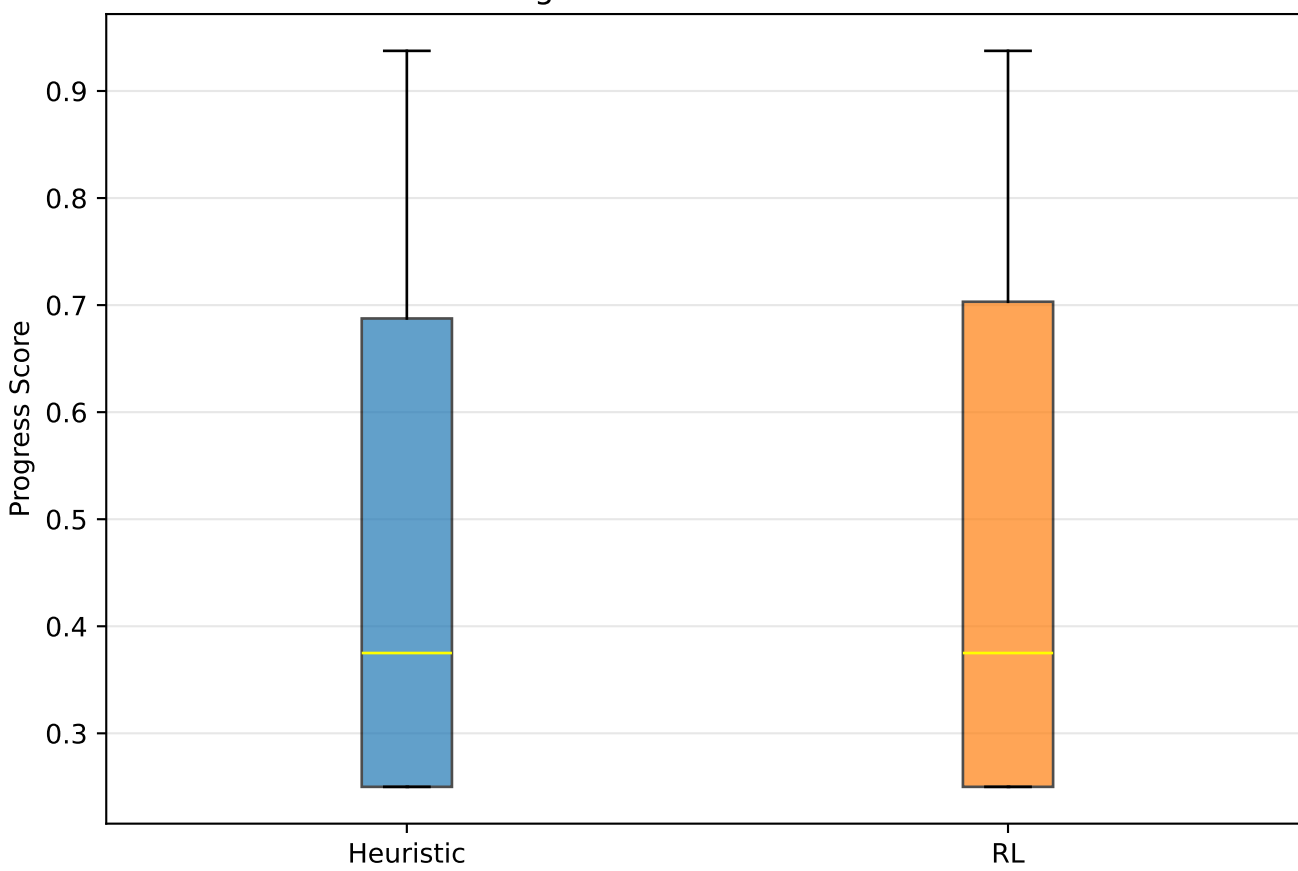
Interest Alignment Distribution



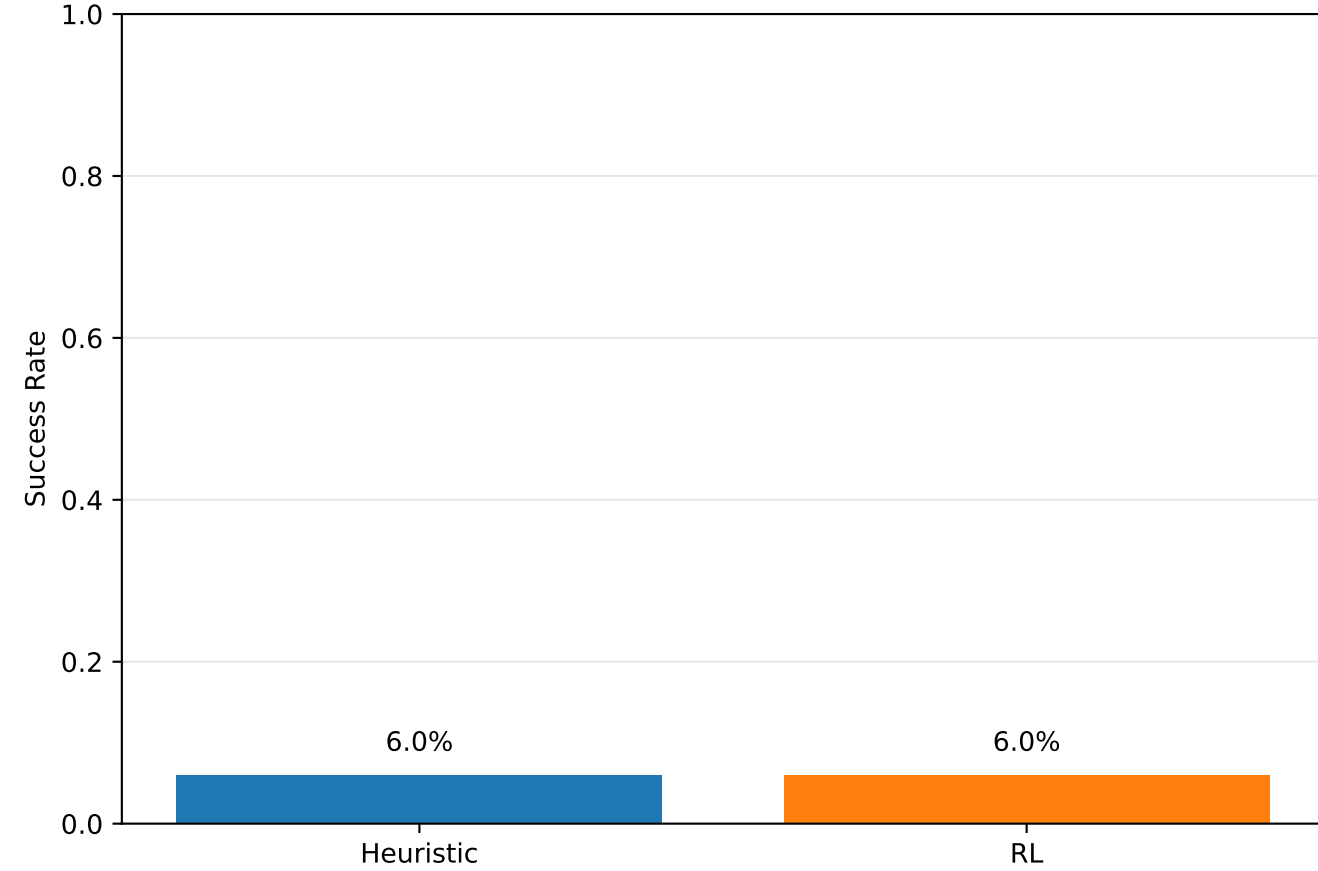
Predicted GPA vs Current GPA



Progress Toward Graduation



Recommendation Success Rate



Conclusion and Future Work

Key Findings:

1. Recommendation Performance:

- Heuristic Interest Alignment: 12.0%
- RL Interest Alignment: 12.0%
- RL shows 0.0% improvement
- Success Rate: Heuristic 6.0% vs RL 6.0%

2. Method Comparison:

- RL provides better interest alignment (+0.0%)
- Heuristic is faster (x10-15 speed advantage)
- RL shows better progress for advanced students

3. Future Improvements:

- Add course scheduling constraints
- Incorporate instructor quality metrics
- Include student workload balancing
- Add major/minor requirements tracking