



S-STEM: Understanding Low-income Engineering Students' Backgrounds, Expectations, and Readiness for Strategic National Workforce Needs



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1 Introduction

- Engineering talent is essential for advancing national priorities in artificial intelligence, cybersecurity, microelectronics, and infrastructure resiliency.
- Projected workforce shortages, magnified by barriers faced by low-income students pose a significant challenge.
- The ACCESS S-STEM project seeks to address this gap by reducing financial, academic, and experiential constraints that hamper degree completion among talented, low-income engineering students.
- This study examines applicants' background experiences, expectations, and readiness to contribute to areas of local and national strategic need.

2 Background

- ACCESS Project Structure

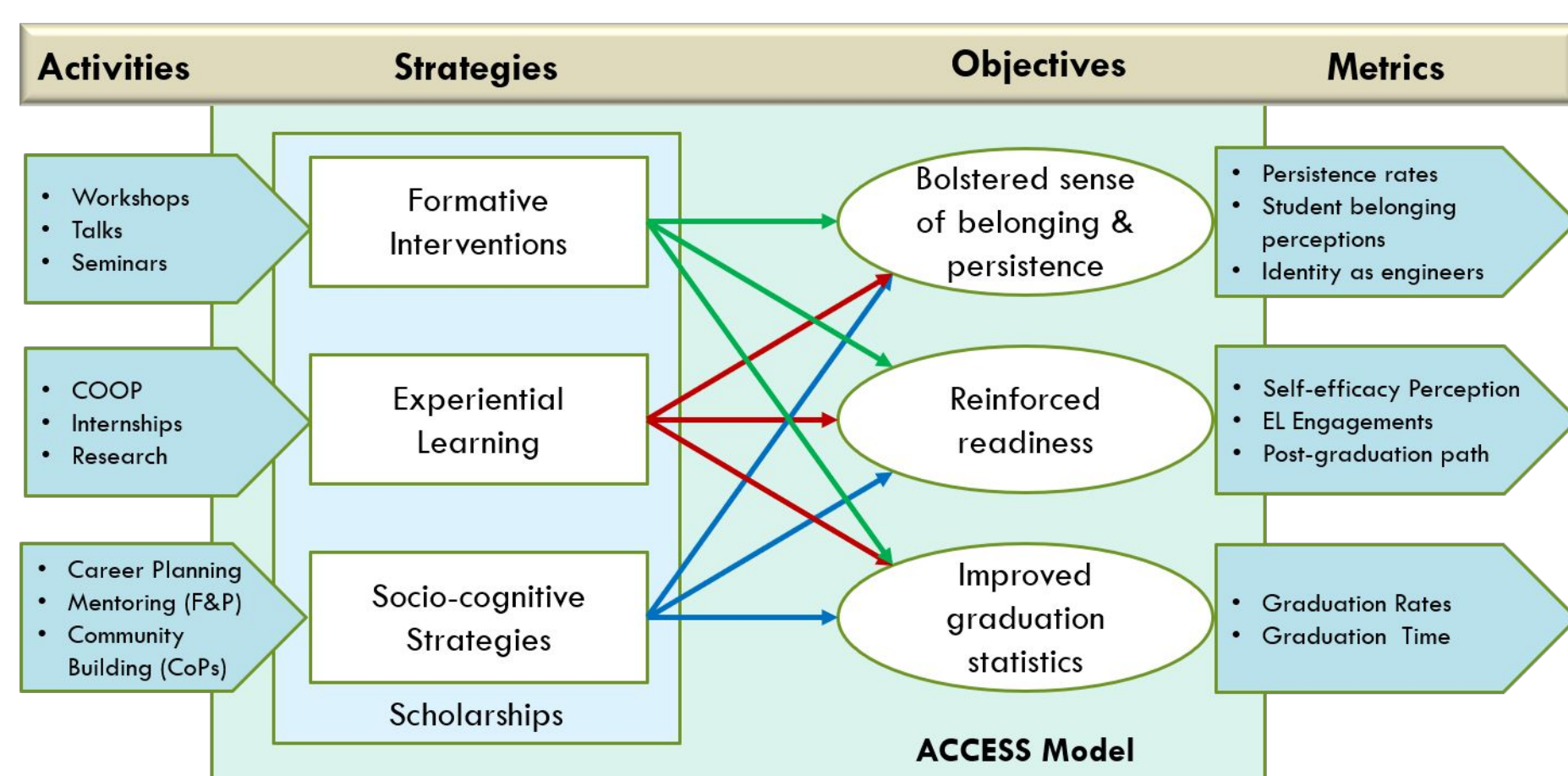


Figure 1: Structure of the ACCESS project.

- The project is being implemented at the University of Puerto Rico Mayaguez (UPRM). Systemic changes in the UPR system have increasingly affected students from low-income families.
- The recruitment effort yielded 85 complete responses, which combined with academic performance indicators formed the primary analysis dataset.

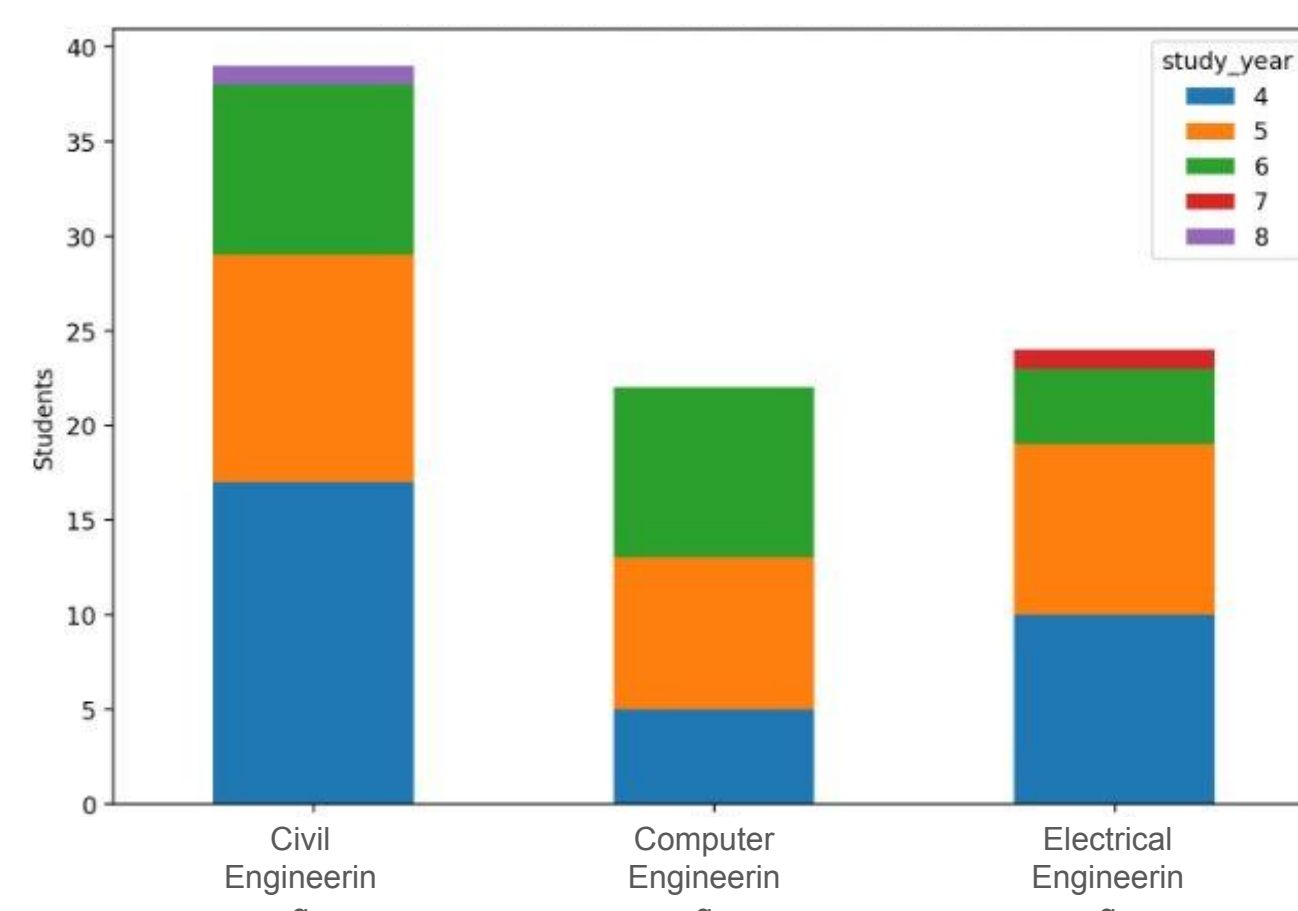


Figure 2: Cohort composition by study program and year.

3 Applicants' Academic Profile

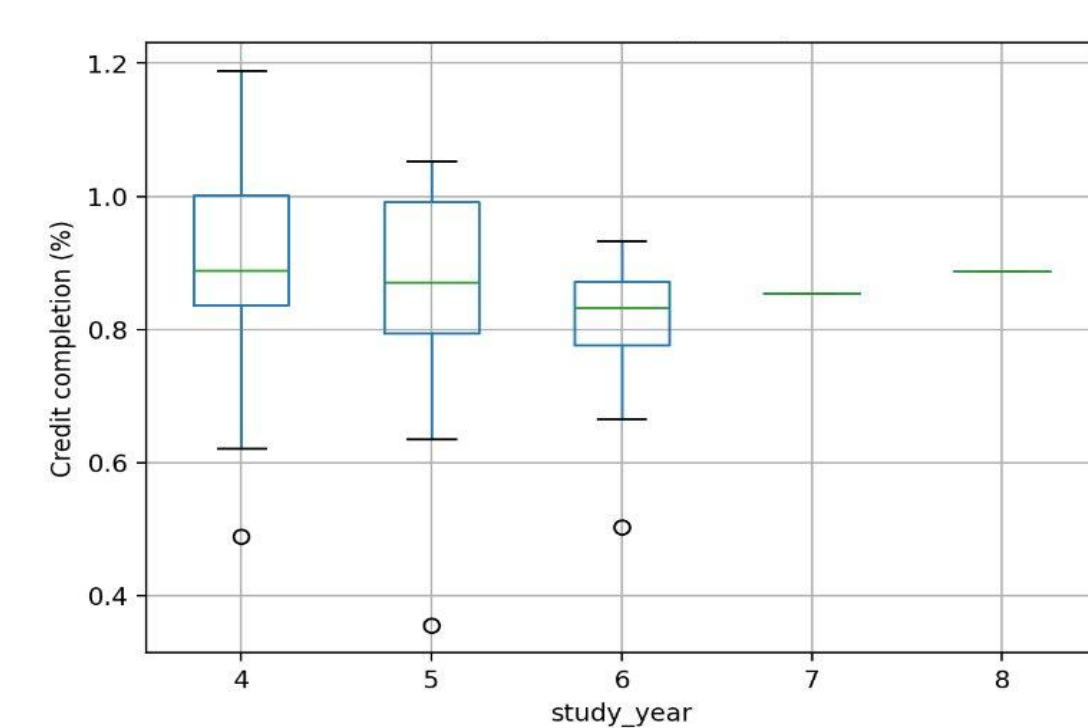
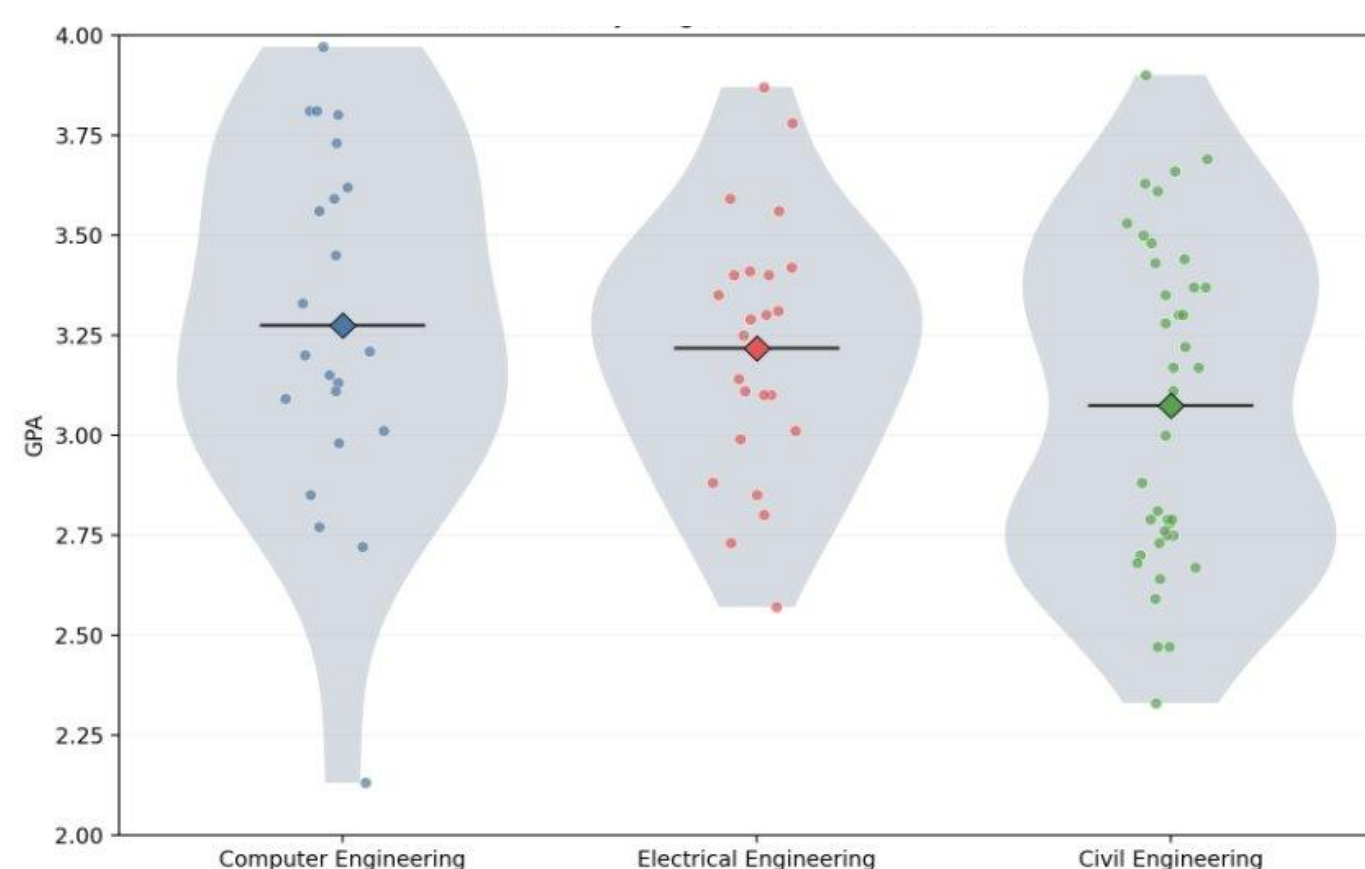


Figure 3: Credit completion rate by study year.

Figure 4: GPA distribution by academic program.



5 Results

Results show a clear alignment between students' interests, background experiences, and long-term aspirations.

- RQ1: Students' interest in areas of LNSN

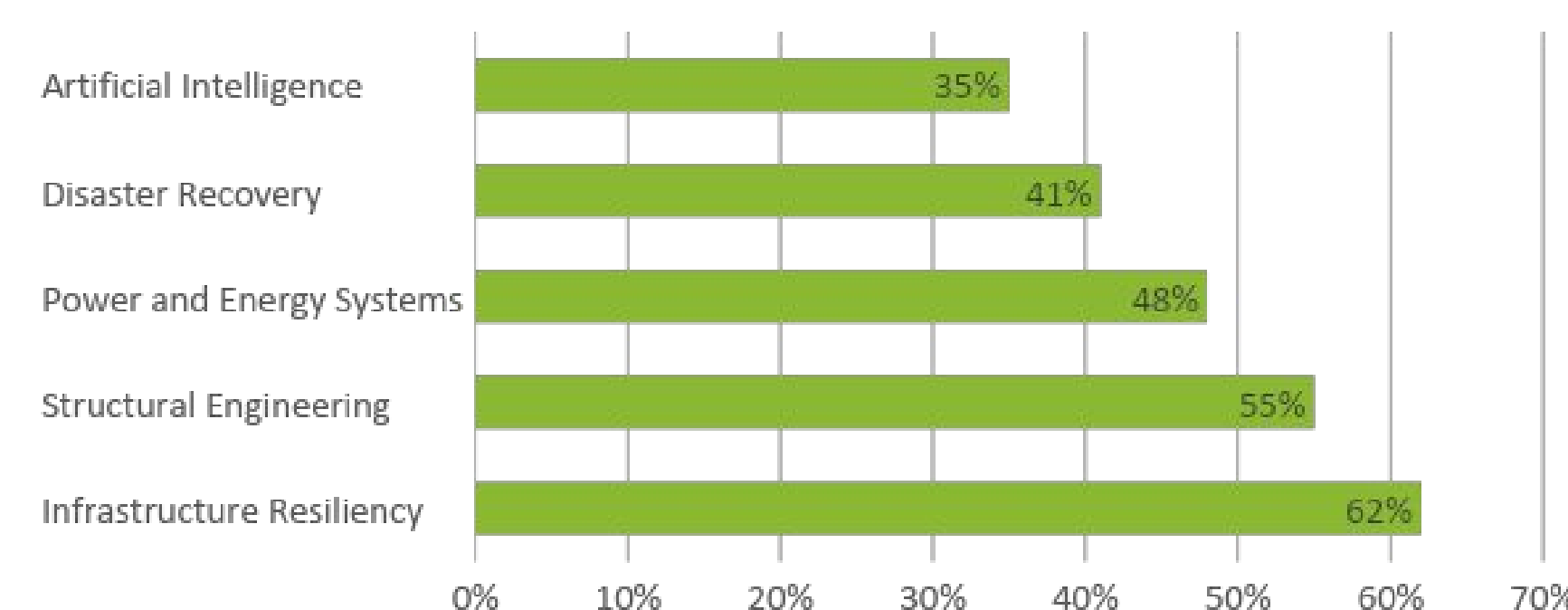


Figure 5: Top five interest areas reported by applicants.

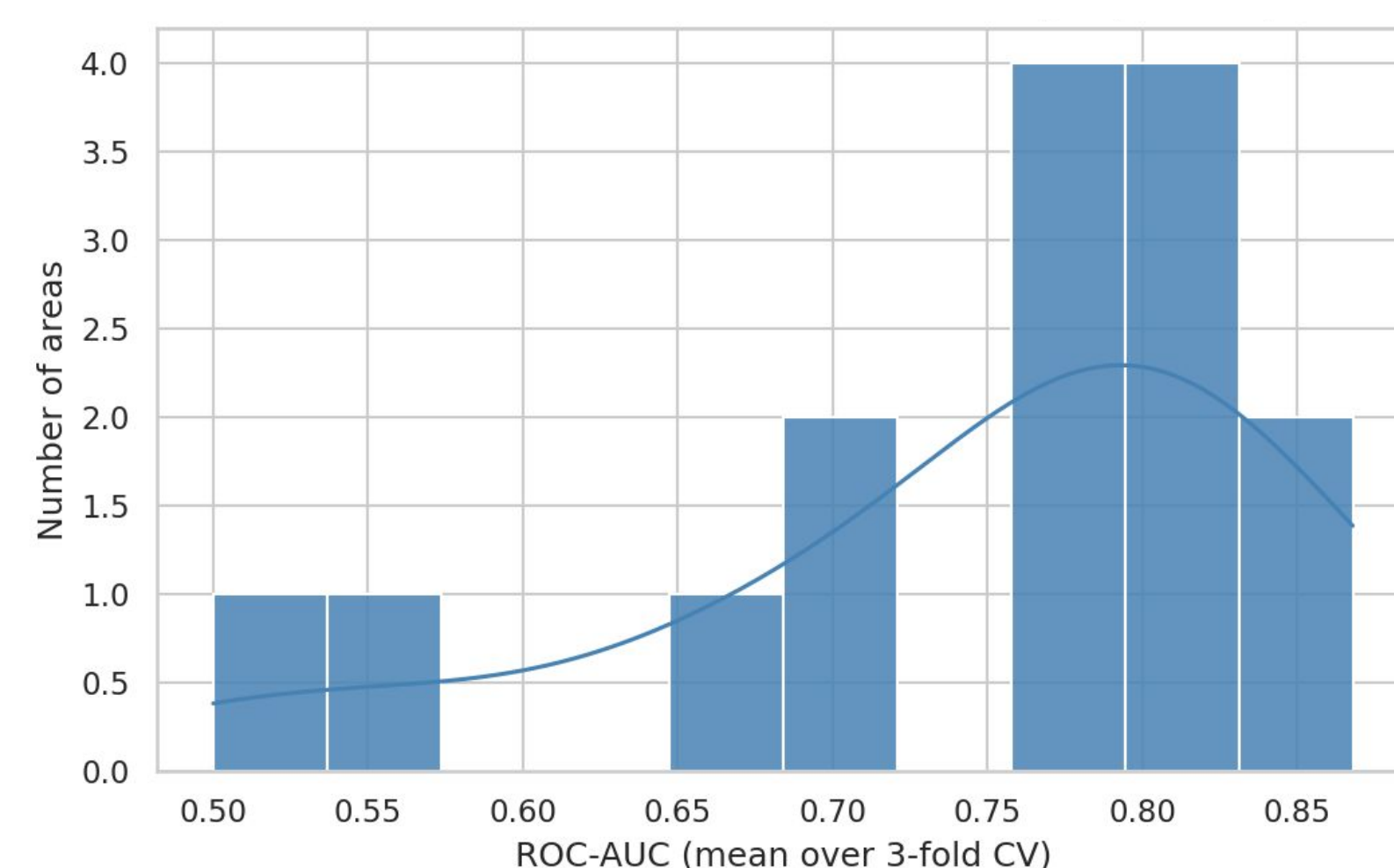


Figure 6: ROC-AUC distribution across modelled LNSN areas.

4 Research Methods

Using a mixed-methods approach, the analysis draws from institutional records and student-reported data to explore structural and individual factors shaping professional career choices, goals, and readiness.

- RQ1: How do professional development experiences influence students' interest in LNSN areas?

Approach: Elastic-net logistic regression analysis

- RQ2: What role do professional development experiences and extracurricular engagements play in shaping long-term career goals?

Approach: Elastic-net ordinal cumulative-logit analysis

- RQ3: To what extent do financial constraints and time availability affect students' readiness to pursue careers in LNSN fields?

Approach: Linear and binary regression analyses

- RQ2: Engineering students' long-term career goals within strategic engineering sectors

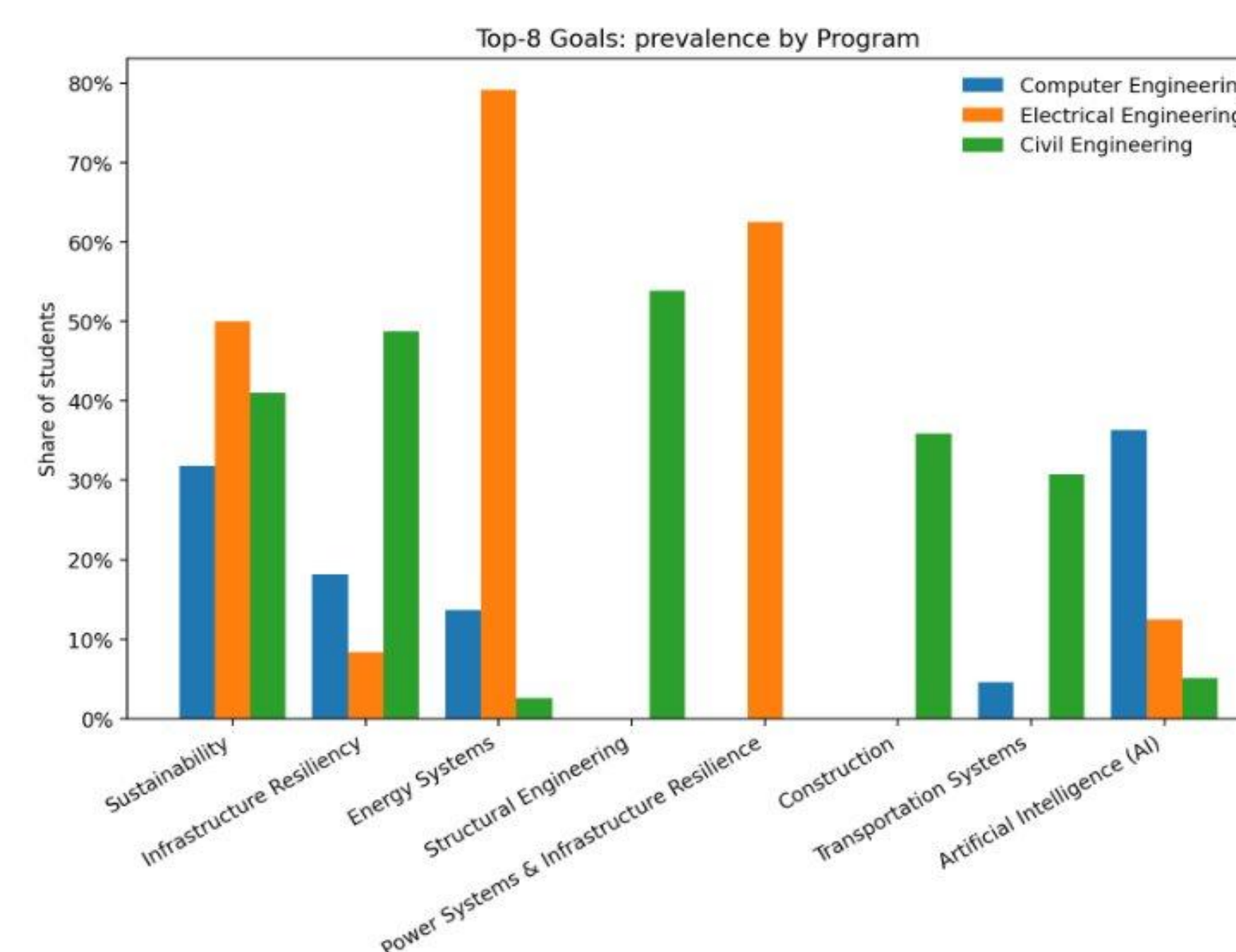


Figure 7: Top eight prevalent goal areas by study program resulting from analysis of applicant responses.

- RQ3: Engineering students' financial constraints and time availability influence on readiness to pursue careers in LNSN fields.

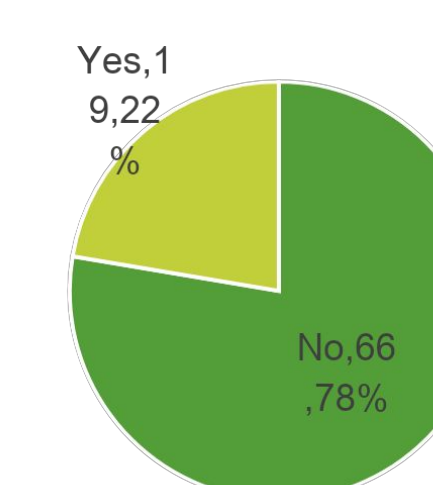


Figure 8: Working applicants.

6 Findings

- Students' interests were strongly aligned with LNSN fields.
- Reported interests closely mirror prior experiences in related areas.
- Prior professional development and extracurricular activities strongly influence interest in LNSN fields.
- Long-term goals also indicate consistent alignment between background and aspirations.
- Work burdens do not significantly affect readiness.

7 Conclusion

- Early professional development and extracurricular engagement strongly predict alignment between students' experiences, interests, and long-term goals in high-need engineering fields.
- Experience-based indicators offer effective early identifiers for students likely to contribute to key areas of strategic need.
- Findings support equity-focused recruitment strategies based on formative experiences to identify students most likely to persist, graduate, and enter high-impact careers.
- Work burdens do not significantly affect students' readiness.

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