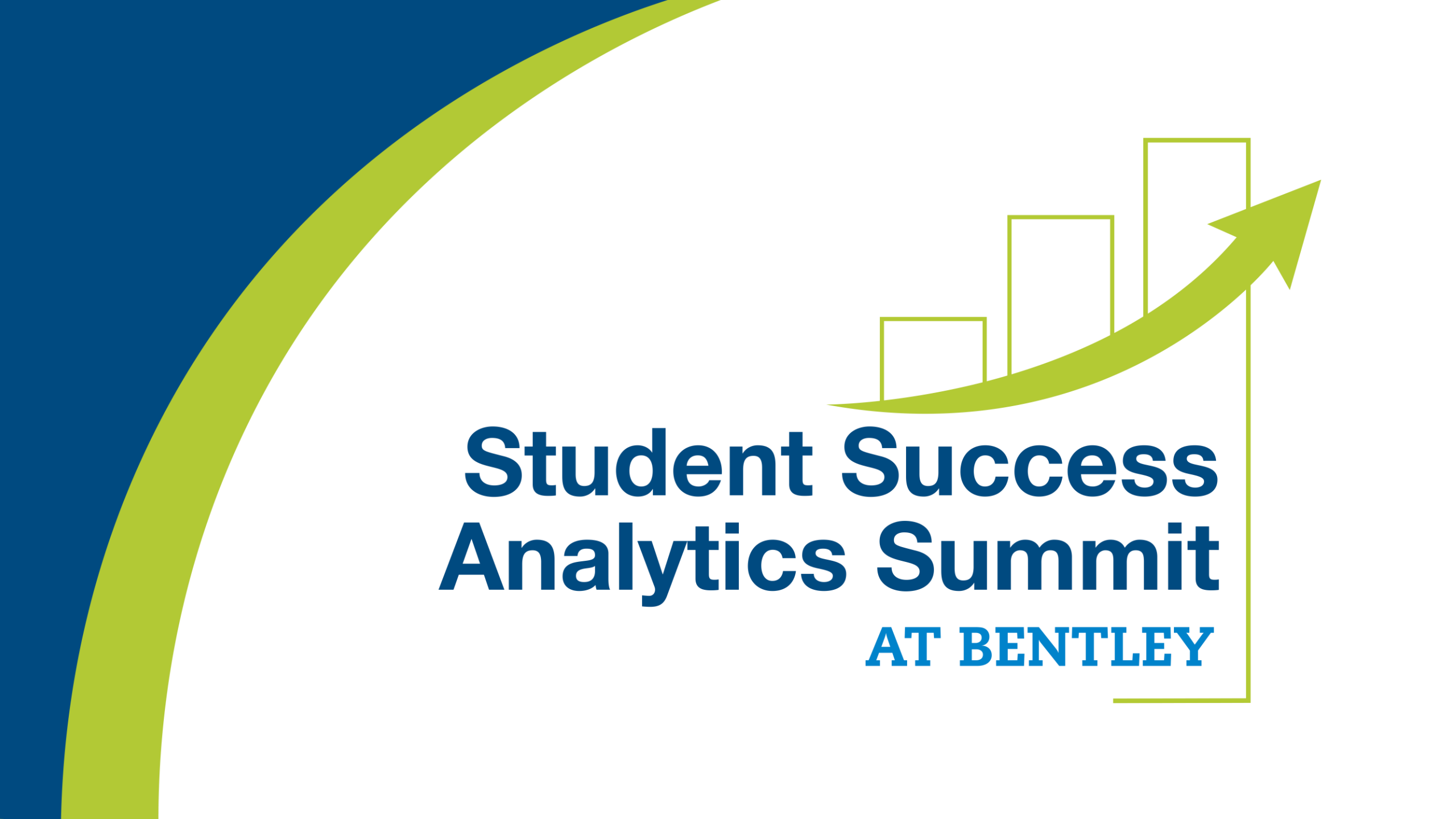
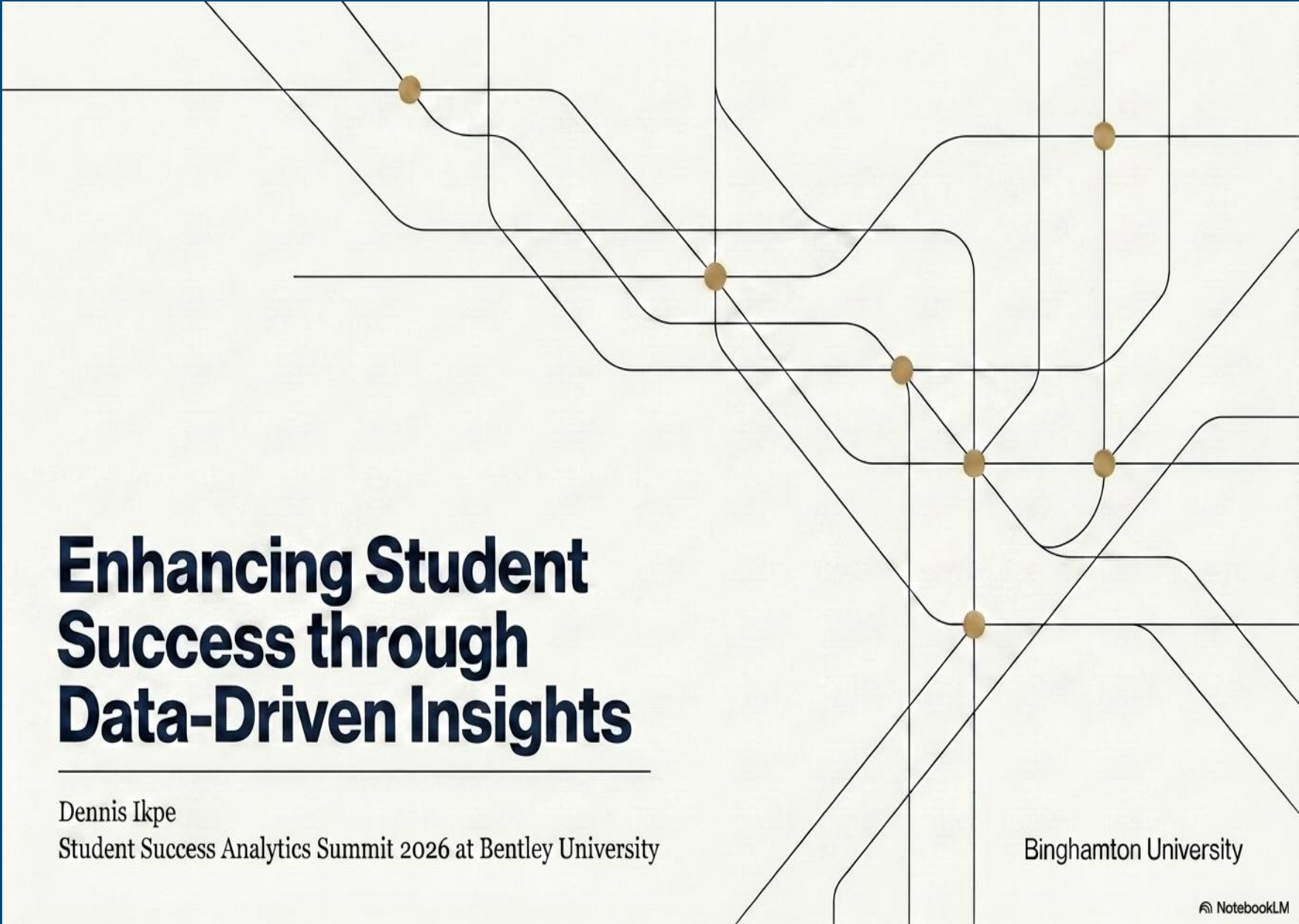




Student Success Analytics Summit

AT BENTLEY



Enhancing Student Success through Data-Driven Insights

Dennis Ikpe
Student Success Analytics Summit 2026 at Bentley University

Binghamton University

 NotebookLM



A Baseline of Institutional Success

14,307

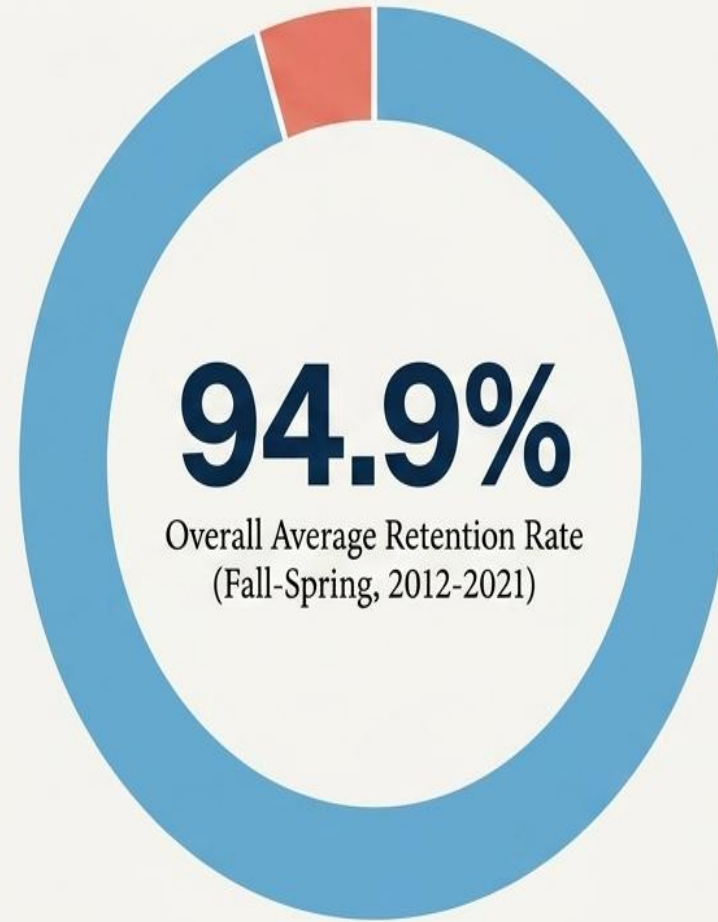
Undergraduate Students Enrolled
(Fall 2021)

2,732

Average Incoming
Freshmen Annually

142

Undergraduate Programs
across 45 Departments



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The Hidden Retention Cliff



General Freshman Population



Retention Rate for Students with a GPA ≤ 2.0

While overall retention remains exceptionally high, an unseen friction point exists. When freshman grade point averages slip to 2.0 or below, attrition spikes dramatically. The challenge is no longer just identifying struggling students, but anticipating the structural roadblocks that cause the slip in the first place.

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Decoding Academic Friction



How can we look beyond individual student effort to identify the specific, interdisciplinary course combinations that create the highest friction?

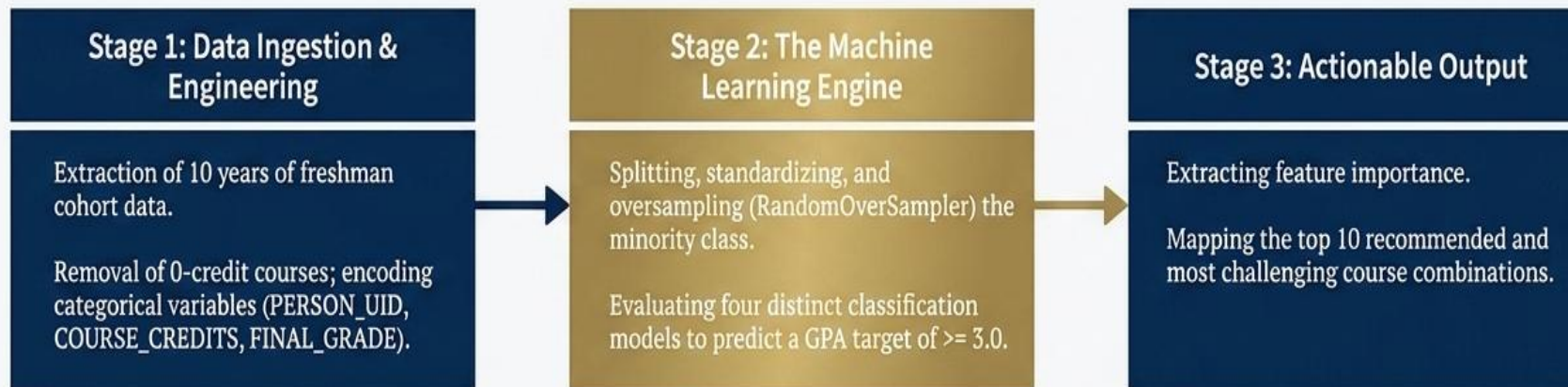
Shift from reactive advising to proactive, predictive modeling.

Identify the most challenging course groupings across 3,312 total courses.

Operationalize 10 years of historical GPA and enrollment data to map optimal pathways.

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A Predictive Pipeline for Student Pathways



Evaluating the Diagnostic Engine

Machine Learning Diagnostic Matrix

Model	Algorithmic Approach	Peak Performance & Interpretability
Logistic Regression	Linear Classification	Baseline accuracy; limited ability to capture complex non-linear course relationships.
Random Forest	Ensemble Decision Trees	Strong performance; moderate interpretability for isolating specific course variables.
Multi-Layer Perceptron	Neural Architecture	Lower relative AUC; acts as a 'black box' making advisor explanations difficult.
Gradient Boosting	Sequential Ensemble Learning	Optimal choice: Achieves ~0.85 ROC AUC while delivering highly transparent feature importance for precise course recommendations.

Gradient Boosting provides the highest predictive accuracy while maintaining critical interpretability, allowing advisors to see exactly **which** courses drive the predictions.

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Isolating the Friction Points

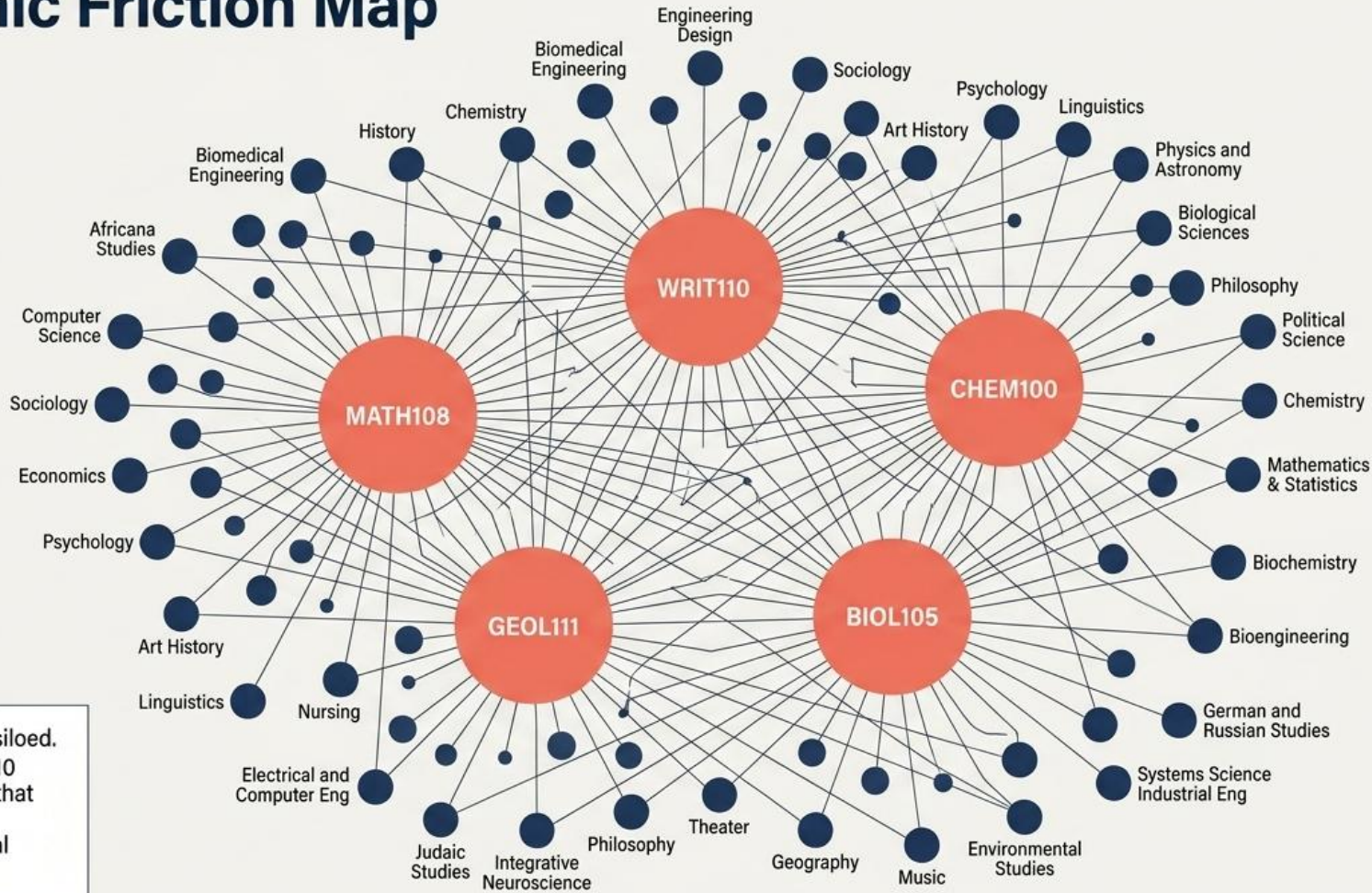


By isolating feature importance, the model moves beyond generic GPA prediction. It pinpoints the exact foundational courses acting as tipping points for freshman success.

In the Harpur-Undeclared cohort, introductory writing and chemistry carry the heaviest predictive weight.

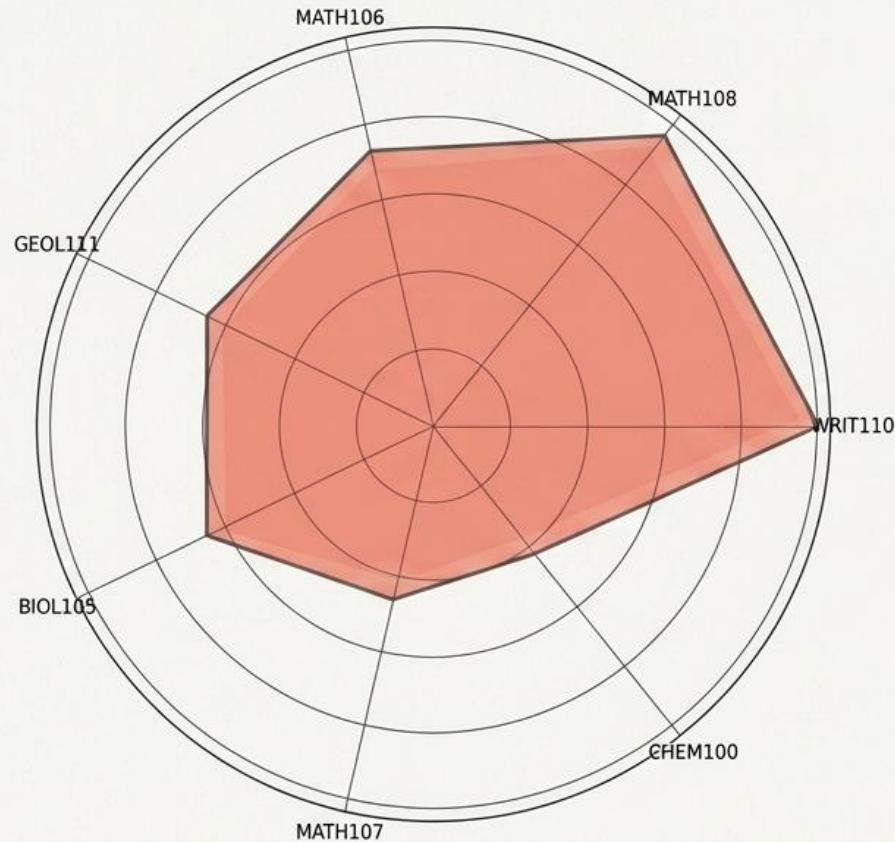
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The Academic Friction Map



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Cross-Disciplinary Vulnerabilities

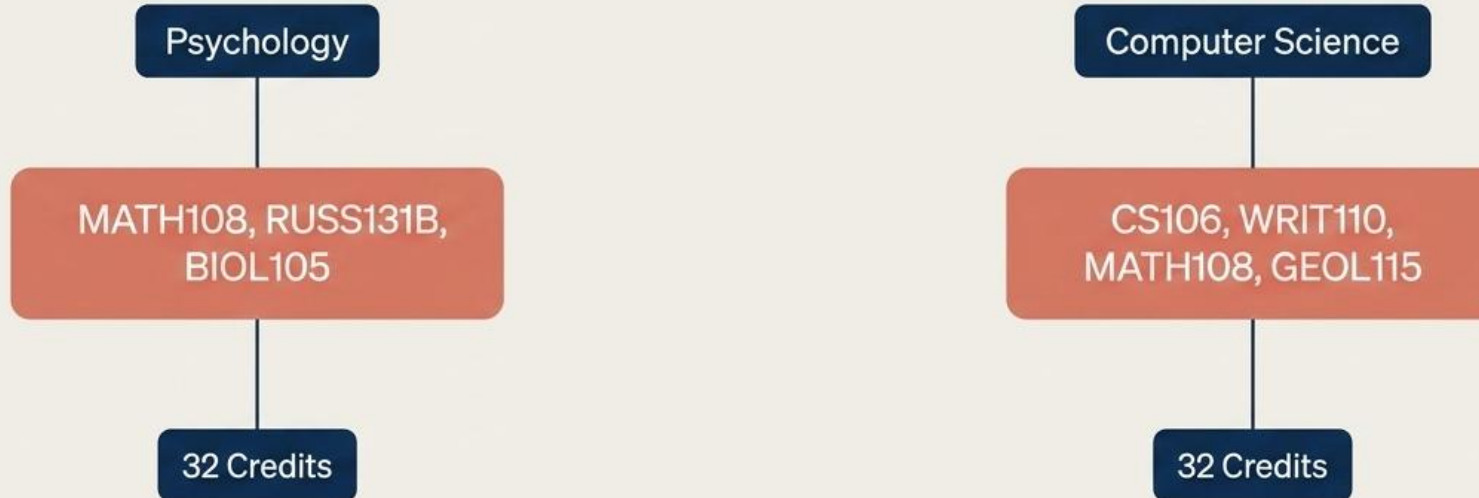


The data reveals a critical gap in critical thinking and quantitative reasoning translation. A student adept in Art Studio may face severe friction in STEM foundations, while Engineering students frequently stumble in writing-intensive humanities. The struggle is mutual, rooted in adapting to different academic cultures.

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Identifying the Most Challenging Combinations

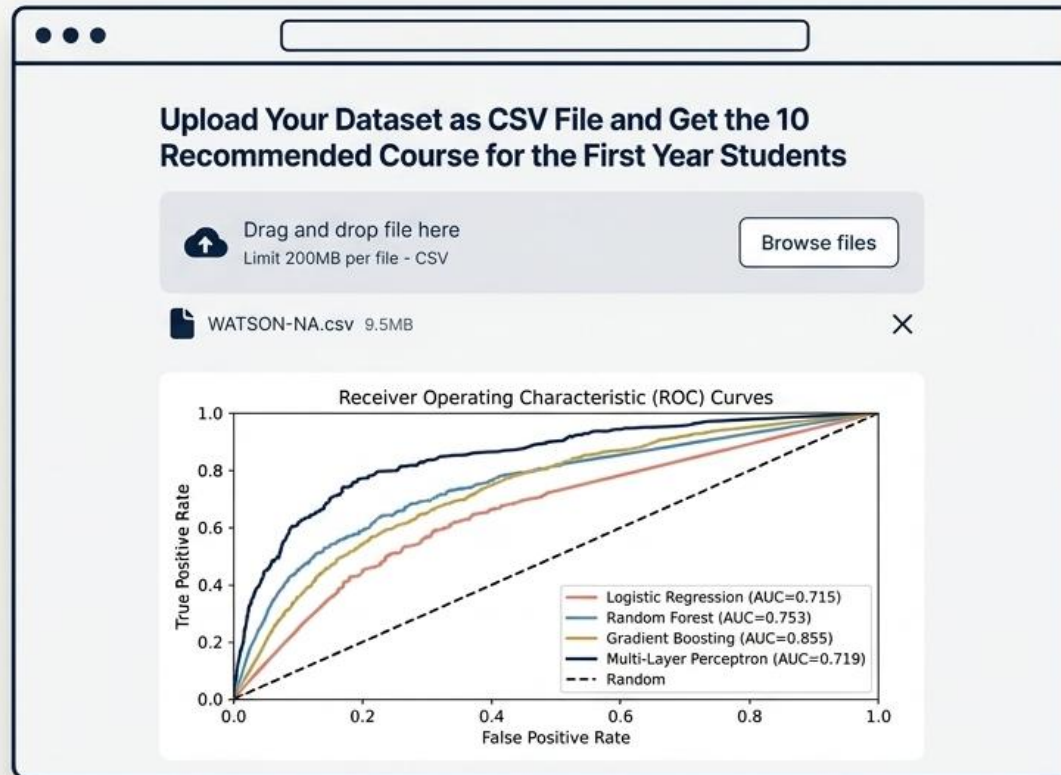


The model identifies hidden traps: overloading high-friction foundational courses within a single freshman semester drastically increases the probability of the student slipping below a 3.0 GPA.

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From Insight to Action: The Advisor Dashboard



1. INGEST

Advisors upload updated historical cohort data via CSV.

2. ANALYZE

The ML Engine runs predictive scoring and extracts feature importance in real-time.

3. NAVIGATE

The dashboard outputs the Top 10 recommended and top 10 most challenging course combinations to guide registration.

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Strategic Interventions for Student Success



Interdisciplinary Learning Communities

Grouping students from diverse majors who are tackling the same high-friction foundational courses to foster peer support and cross-disciplinary communication.



Curriculum Review & Adjustment

Identifying barriers in courses like MATH108 and WRIT110; integrating varied teaching methodologies and ensuring word problems/ examples span multiple fields of study.



Early Alert Systems

Deploying targeted interventions before the retention cliff is reached, utilizing continuous survey feedback and predictive flags for at-risk freshmen.

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Charting the Course Forward

Every year, 2,700 freshmen arrive to navigate a universe of 3,300 potential courses. By transforming historical data into predictive, interdisciplinary maps, we equip advisors with the tools to guide students safely past the retention cliff.



Machine learning doesn't replace the advisor; it illuminates the friction, allowing human guidance to chart the most successful pathway possible.

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Thank You!

