Connor Haynes

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RESEARCH INTERESTS

I am broadly interested in applying tools from algebra, algebraic geometry, and topology to solve problems in combinatorics, but I keep my mind open for interesting problems.

More specifically, I am interested in modern matroid theory (Baker-Bowler theory and Combinatorial Hodge Theory), polyhedral geometry, arrangements of varieties, and tropical geometry. My research experience is in polyhedral geometry.

PROJECTS

Polyhedral Geometry Research Project *Fall 2025*

Investigated conjectures on the deformation dimension of polytopes. Applied SageMath to compute deformation dimensions of arbitrary polytopes. Produced conjectures on the "dimension jump" when constructing zonotopes from vector configurations. Work done with Juliet Whidden under the supervision of Dr. Josephine Yu.

LSU RTG Workshop

Hyperplane Arrangements *Summer 2025*

Read Stanley's *An Introduction to Hyperplane Arrangements* under the supervision of Dr. Christin Bibby. Gave expository talks to fellow students on material. Presented with four students on computing the chromatic polynomial of a graph by the associated graphic ahyperplane arrangement.

Center for Mathematics at Notre Dame

Thematic Program in Discrete Groups in Topology and Algebraic Geometry *Summer 2025*

Investigated geometric group theory and moduli of elliptic curves with a group of students. Studied the relationships between moduli of elliptic curves, the braid group, and rational tangles following Dr. Nick Salter's *Ropes, Fractions, and Moduli Spaces*.

Directed Reading Program

Ehrhart Theory *Spring 2025*

Engaged in independent study of Beck and Robins' *Computing the Continuous Discretely*. Met with a graduate student weekly to discuss material. Worked on resolving several open questions posed in Beck and Robins. Presented to faculty and students on basics of Ehrhart Theory and progress towards resolution of open questions.

Tropical Geometry *Fall 2024*

Engaged in independent study of Maclagan and Sturmfels' *Introduction to Tropical Geometry*. Met with a graduate student weekly to discuss consequences and applications. Presented to faculty and students on synergies between analytic, combinatorial, and algebraic interpretations of tropical curves.

Number Theory *Fall 2023*

Met weekly with a graduate student to discuss topics in Number Theory. Engaged in studies of Abstract Algebra and Number Theory with a focus on Fermat's Last Theorem. Worked with another student to present on special cases of Fermat's Last Theorem.

MATH 6441 - Algebraic Topology

Moduli Spaces of Algebraic Curves Expository Paper *Spring 2025*

Worked with another student to research moduli spaces. Wrote a survey article designed to introduce undergraduates to the study of moduli spaces from algebraic and category-theoretic perspectives.

MATH 4803 - Nonlinear Algebra

Automatic Theorem Proving Project *Fall 2024*

Worked with a team of two other students to develop algorithms in Macaulay2 regarding the areas of cyclic polygons and Heron-Type Formulas. Utilized techniques from algebraic geometry to reproduce results of Robbins (1995). Presented to students and faculty on methods.

INVOLVEMENT

Georgia Tech Club Math
Treasurer *2025*
Managed finances for Georgia Tech's most prominent student mathematics organization. Ensured allocation of funding for student events was accessible and appropriately allocated. Compiled reports on club spending for Georgia Tech administration. Responsible for fundraising and bookkeeping.

Slackline at GT
Organizer *Fall 2023 - Spring 2026*
Organized, maintained, and hosted weekly slacklining events on campus.

EDUCATION

Georgia Institute of Technology
Bachelor of Science in Mathematics *2023-2026*
GPA: 3.82
Selected Coursework:
- MATH 8803 - Topics in Matroid Theory
- MATH 6441 - Algebraic Topology I
- MATH 4803 - Nonlinear Algebra
- MATH 4441 - Differential Geometry
- MATH 4317 - Analysis I
- MATH 4107 - Abstract Algebra I

TEACHING

School of Mathematics
Undergraduate Teaching Assistant *Fall 2024 - Spring 2025*
Led 20-30 person recitation classes focused on real-time practice and course-correction. Led large-scale (40-50 people) review sessions. Received the inaugural *Outstanding Undergraduate TA Lab Tutor* award.
- MATH 1554 - Linear Algebra
- MATH 1552 - Integral Calculus

MATH 3012 - Combinatorics Student Assistant *Summer 2025*
Wrote problems and solutions for Georgia Tech's undergraduate combinatorics course. Produced Python code to migrate TeX files to Canvas for distance instruction.

Knack Tutoring
Freelance Tutor *2023-Present*
Hosted one-on-one tutoring targeted at content review and practice. Successfully and consistently improved student outcomes.