Swat Math/Stat Summer Opportunities

Summer 2027



How to use this document:

Faculty members in the math/stat department who may have summer research projects have each made a slide to give you a short overview of their work and potential ideas for what students could work on. Some have also included further reading and next steps for potential research assistants.

Take a look at the following slides, check out the linked resources, and reach out to any professors that you might be interested in working with!

The last slides have links to outside opportunities. If you know of more, let us know!

(Note: demand for math/stat summer research often far exceeds the supply of positions available, and most funding will be through the college's funding application, which happens in the spring semester)

The Summer Scholars Program is hiring S³P Mentors!

Are you passionate about teaching, mentorship, and student success in STEM?

S³P provides incoming first-generation, low-income, and underresourced students with a rigorous, on-campus STEM immersion experience during the summer before their first semester.

Mentors work side-by-side with Swarthmore faculty and staff to **gain teaching experience and leadership skills**. Mentors live in the residence halls with students and **foster a caring and inclusive STEM community.**



Dates: June 21 - July 31, 2027

$6,000

Summer Stipend

Hiring 2 Mentors per subject:

- 📐 **Math**
- 📝 **Writing**
- 💻 **Computer Science**

Applications open January 19th. Want to learn more? Scan the QR code or visit our website:

https://www.swarthmore.edu/summer-scholars-program/student-mentors

Questions? Email summerscholars@swarthmore.edu or Kyra Harvey-Broughton (kharvey1)

Career Services can help too!

- Advising - schedule through Handshake
- Resumes, Cover Letters, Interviews, Make Connections
- Handshake - internships, jobs, employers, events and programs.
- SwatWorks - Micro-internships offered over Winter Break (paid)
- Summer Funding
  - Career Services options for paid internship experiences: SFEP and CSSS
  - Summer Opportunities Fair - Dec 3 and 4 (12:30-1:10pm) on Zoom
- Consortia - Fairs and Recruiting Days
  - TCCF - January 30, 2026
  - LAUNCH - January 4 (app deadline); January 15 & 16 (virtual interviews)
  - Government, Education, Non-Profit Fair - February 2026 (virtual fair)

Applied Math and Network Dynamics– Victor Barranca



Overview:
I study the relationship between the structure of a network and its function, particularly for high dimensional systems with nonlinear dynamics. Much of my research uses mathematical approaches to investigate the neuronal computations underlying sensory processing and the role of neuronal network connectivity in facilitating brain function. More information can be found *here*.

This year's project will likely study how to classify the regular vs. random structure of a network, and how this may be useful for identifying neurological disorders. Implications on network function may be explored too.

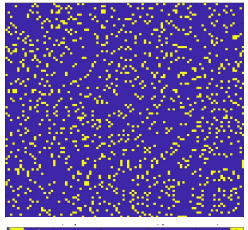
Projects Involve: *Nonlinear dynamics, modeling, signal processing, numerical computing, and network science*

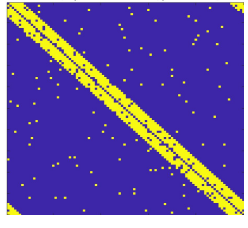
Prerequisites: Differential Equations (Math 43/44) and Programming Ability (CS 21 or equivalent)

Helpful, But Not Required, Additional Coursework Includes any of the Following:
Modeling (Math 56), Probability (Stat 51), Stochastic and Numerical Methods (Math 66)
No neuroscience experience needed: only interest in applications of math to biology is required

If Interested:
Contact Prof. Barranca at vbarran1@swarthmore.edu for more information. Please send along a short message explaining your interest in the research and relevant background.
Feel free to reach out with any questions!







Robbins '83 Chang Big Data/Social Change Lang Center Internship

The Lang Center for Civic and Social Responsibility offers summer funding for students, and one of our awards may be a good fit for Statistics students.

- **Robbins '83 Chang Big Data/Social Change Lang Center Internship:**
  - The David Robbins '83 Big Data/Social Change Lang Center Internship was established in 2017 by David Robbins '83. The fund shall be used to support student participation in fellowships, internships, and other summer opportunities that support our students' use of big data while working for social change.

How to apply: Students use a single application, for the Social Impact Summer Scholarship, to be considered for any of these awards.

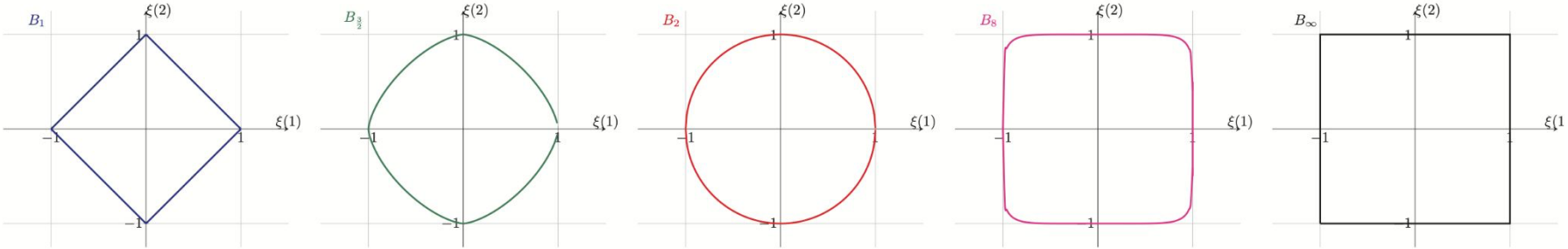
Applications open: January 20

Deadline: February 20

Recommended next step: We encourage interested students to meet with a Lang Center Associate before applying.

Operator Norms & Multiplier Algebras - Prof. Alonso Delfín

The classical *p*-norms give different metrics on $\mathbb{C}^n$, which in turn induce different *p*-operator norms on matrices with complex entries.



The multiplier algebra of a non-unital algebra *A* can be used to produce a unital algebra that contains *A*. In this project we will look at multiplier algebras of the algebra of strictly upper triangular matrices and determine if it is possible for these objects to be naturally represented by operators equipped with the *p*-operator norm. It is a well known fact the this is true when p=2, but unknown for p≠2. The math needed will be a good mix of linear algebra and real analysis and might require some numerical experiments.

Previous projects: Take a look at the outcomes of previous summer projects I have supervised: Summer 2024 and Summer 2025.

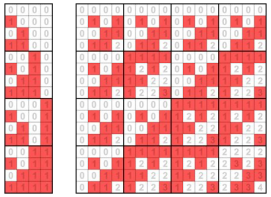
Prerequisites: Linear algebra (27 or 28) is required. Familiarity with proofs will be preferred (28, 39 will satisfy this requirement). At least one course in either Analysis (63) or Modern Algebra (67) will be prefered. Previous experience coding in either MATLAB, Mathematica, or Python will be helpful but not required.

Contact: Feel free to contact me via email: adelfin1@swarthmore.edu or to swing by my office (SC 136) to chat about the project in more depth.

Finite math! (proofs, games, probability, …) - Pat Devlin

Flavor: I have a wide interest in anything proofy and finite including discrete math, graph theory, games, theoretical computer science, probability, enumeration, algebra, geometry, …





Ideal students: anyone with a taste for math-venture!

Pre-requisites: The most important thing is *excitement about proofs*. Ideally, students have seen at least one proof-based class (e.g, 28, 39, 63, …), and students who have seen more advanced topics will have more cool options. Students will choose from a range of projects to match their interests, goals, and background

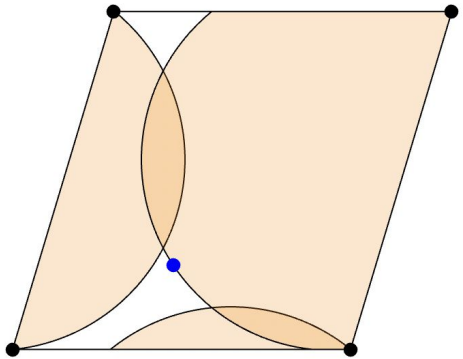
More information: Happy to chat with you about projects or discuss whatever interests you. Email (pdevlin2@swarthmore.edu) or swing by my office any time

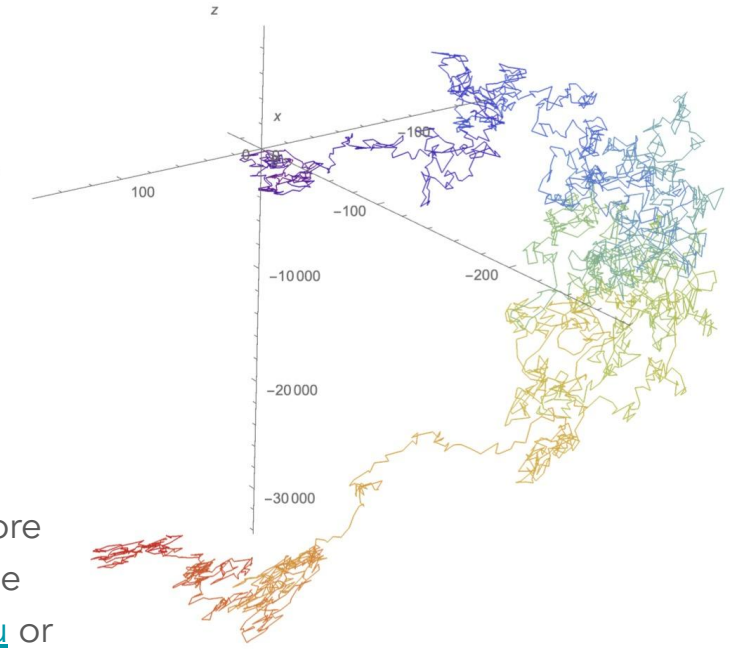


Projects in Metric Geometry – Nate Fisher

My research is in geometry and geometric group theory. Projects for undergraduate students which I have worked on in the past or hope to work on in the future include:

- The shape or geometry of random translation surfaces (polygons with parallel sides glued together)
- The asymptotic behavior of random walks in special types of groups
- Structure of the boundary (ways of going off to infinity) of simple normed spaces (Math 67 required)





Prerequisites: Math 63 and/or 67

For more information or to discuss more details about potential projects, please email me at nfisher2@swarthmore.edu or swing by Science Center 157

Applied mathematics and auditory neuroscience with Prof. Joshua Goldwyn



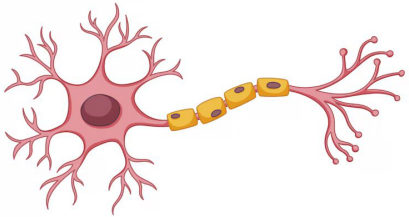
The sense of hearing relies on fascinating dynamics in neurons and brain areas.

Research projects this summer:

* use modeling and data analysis techniques to study perception and learning of sounds
* model the dynamics of single cells (neurons) that respond to sound

Mathematical topics:

* differential equations: modeling, numerical simulations, analysis
* data analysis: statistical modeling, machine learning, neural networks



Relevant (BUT NOT REQUIRED) coursework: any of Math 27, 44, 56, 66

* familiarity with Matlab and/or Python is preferred
* no required background in biology & neuroscience, but you should find it *interesting*



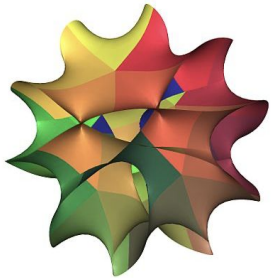
Additional information on my website:
https://www.swarthmore.edu/joshua-goldwyn/summer-projects

Email me with questions and interest,
or to discuss your own ideas for summer research in applied mathematics:
jgoldwyn@swarthmore.edu

Computations in Mirror Symmetry- Prof. Ralph R. Gomez

Research Project: The universe might very well be 10 dimensional (4 space-time plus 6 extra dimensions) although there is not yet any experimental evidence for this. However, there is a fascinating symmetry associated to these 6-dimensional spaces. That symmetry is called *mirror symmetry*. I would like to use some computational techniques and ideas from mirror symmetry to explore the creation of new mathematical spaces in odd dimensions for which the curvature of these spaces is very specific. We will likely specialize to dimensions five, seven and nine.





Background: A course in multivariable calculus (34 or 35) and if possible an upper level proof-based math class. No physics background needed!

Contact: Please email me at rgomez1@swarthmore.edu if you are interested or stop by my office if you have any questions!



Formalizing Mathematics in Lean

Prof. Cathy Hsu & Mal Dolorfino (UW PhD student)



Research project: Formalization in mathematics refers to the process of translating abstract mathematical concepts, definitions, theorems, and proofs into a machine-checkable language that follows specific syntax, axioms, and logical rules. In this summer project, we will formalize some results in modern algebra using the proof assistant Lean4.

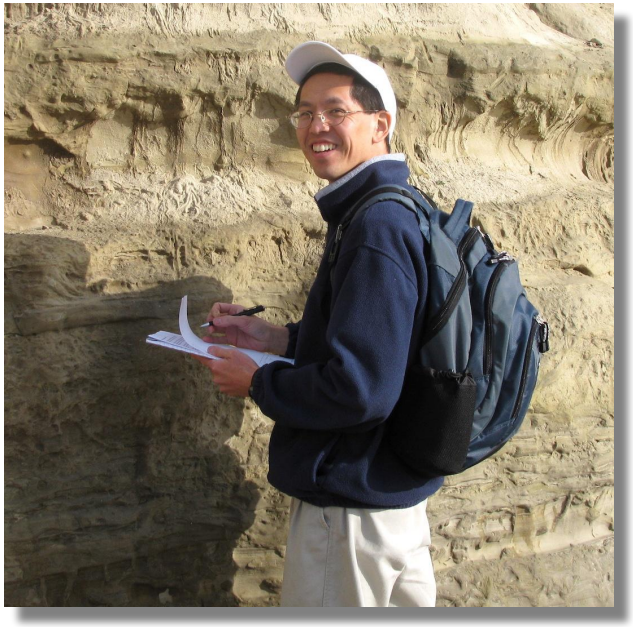
Prerequisites: Math 67 (required), Math 107 (preferred). No coding experience needed.

Students must agree to follow a strict no-AI policy for this project.

Email me (chsu2@swarthmore) with questions or interest, or with a suggestion for a math topic that you would like to formalize.

Statistical Paleontology — Prof. Steve Wang

I develop statistical methods for analyzing data from paleontology, mass extinctions, evolution, and conservation biology.



I am not yet sure what specific projects we'll be working on this summer, but you can read brief descriptions of work by previous students here: http://paleo.domains.swarthmore.edu/personnel.html

The most important qualities I am looking for are curiosity, persistence, perseverance, attention to detail, and skill in debugging. My work mainly involves computer programming, so you should have taken CS 21 or the equivalent.) The ideal statistical preparation would be Stat 11 and 51, but just Stat 11 might be sufficient. No experience in paleontology is expected.

If you're interested, please send a resume/CV to swang1@swarthmore.edu.

You can find more information on my research here: http://paleo.domains.swarthmore.edu/research.html

Feel free to ask if you have any questions!

External Math/Stat Research Opportunities

The NSF funds a number of REU's in the mathematical sciences and other fields across the US. (Note that NSF-funded positions are restricted to US citizens or permanent residents). The AMS also has a list of possible summer programs: https://www.ams.org//opportunities.

Students have told us they have found the following links helpful for finding REUs:

- https://sites.google.com/view/mathreu,
- https://reufinder.com/ or
- https://www.mathprograms.org/db/program

Summer@ICERM program at Brown University

The Summer Institute in Biostatistics and Data Science is an NIH-funded program across six different universities

Stanford Population Health Summer Research Program is a virtual program for under-represented and historically excluded students in the health sciences with a focus on quantitative methods for population health

The Division of Biostatistics at the University of Minnesota will be hosting a 10-week Summer Research Experience for Undergraduates

Data Science Corps program at **Georgetown University** is sponsored by the NSF. The program consists of a 6-week in-person research experience on the Georgetown University campus in Washington, DC, followed by a fall remote component.