Monroe Stephenson, Curriculum Vitae

stephenson@mis.mpg.de
https://monroestephenson.github.io
https://www.linkedin.com/in/mostephenreed/
Inselstraße 22, 04103 Leipzig, DE

Employment History

Fall 2023– **Fulbright Research Scholar** Max Planck Institute for Mathematics in the Sciences
At the MPI I am working under Bernd Sturmfels on projects in algebraic statistics, specifically looking at non-indepedent component analysis and graphical models.

Spring 2021–Spring 2023 **Math Drop-In Center Tutor** Reed College Office of Academic Support
Worked as a tutor in the drop-in center which offers free tutoring for any students enrolled in Math 111, 112, 113, 201, or 202.

Fall 2020–Spring 2023 **Individual Tutor** Reed College Office of Academic Support
Tutor for Physics 101/102, Math 112, Math 113, Math 201, Math 202, Math 311, Math 321, Math 332, Math 342, and Math 372.

Fall 2020 –Spring 2023 **TA/Grader for Math 111 ,113, 202, 311, 332, 372 courses** Reed College Mathematics Department
Graded for six different courses at Reed varying from calculus to algebraic combinatorics.

Fall 2020-Spring 2021 **Physics 101/102 Lab TA** Reed College Physics Department
Instructed and guided online lab sessions weekly and graded lab reports.

Research History

Fall 2023 **Block Independent Component Analysis** MPI MiS
In the context of Independent Component Analysis, we are looking beyond to the case where there could exist dependencies between variables. From Comon's work, the case of when all variables are independent is clear. However, for dependent variables, this is sparsely explored only appearing in Mesters and Zwiernik's recent work. This work is part of the Apprenticeship week at IMSI and will be submitted to *Algebraic Statistics* in early 2024.

Fall 2022–Spring 2023 **Senior Thesis** Reed College
In my senior year, I worked under Dave Perkinson where I worked on the log-concavity of Kazhdan-Lusztig Polynomials on representable matroids.

Summer 2022 **REU Participant: Combinatorial Hodge Theory** Einstein Institute of Mathematics
In the summer of 2022, I participated in the inaugural Hebrew University REU. Specifically, I worked under Karim Adiprasito on researching Lefschetz Properties in application to showing anisotropy in general characteristic specifically on the moment curve, implying the g-conjecture. Our current draft can be found here.

Spring 2022 **Independent Research: Algebraic Combinatorics** Reed College
In the spring of 2022, I worked with Dave Perkinson and a couple of fellow students on an open question regarding maximal chains in the k-Bruhat order over the symmetric group. I conducted this research as part of an independent study on the combinatorics of Coexter groups.

Research History (continued)

Summer 2021 — **REU Participant: Commutative Algebra** University of Michigan
In the summer of 2021, I participated in the REU at the University of Michigan under Jennifer Kenkel, Janet Page, and Daniel Smolkin. We explored the asymptotic behavior of differential powers of ideals, specifically relating simple $\mathcal{D}$-modules to the differential closure of ideals. Currently, you can find our REU paper here, and our pre-print is here.

Summer 2020 — **REU Participant: Computational Modeling** Portland State University
In the summer of 2020, I participated in the "altREU" at Portland State (since COVID-19 caused the NSF to drop funding, it was deemed the altREU). I worked with Bhavana Panchumarthi under Art Duval of UTEP, and later with Dave Perkinson of Reed, on the Abelian Sandpile Model and its applications to network topology and DDoS. Paper in progress on the results we found.

Summer 2019 — **Research Assistant** Texas Tech University
In the summer of 2019, I worked under Andrew Whitbeck within the Experimental High-Energy Particle department at TTU, working towards developing the LDMX project. My final writeup can be found here.

Education

Fall 2019 – Spring 2023 — **B.A. Mathematics, Reed College**

Spring 2022 — **Semester Abroad (Virtually) at Math in Moscow**
Enrolled in "Introduction to Commutative and Homological Algebra" and "Algebraic Geometry"

Fall 2020 — **Semester Abroad (Virtually) at Budapest Semester of Mathematics**
Enrolled in Real Functions and Measures

Research Publications

1. Garrote-López, M., & Stephenson, M. (2023). Partitioned Indepedent Component Analysis. *Submitting to the Algebraic Statistics Journal*, arXiv 2312.xxxxx.
2. Adiprasito, K., Hou, K., Kiyohara, D., Koizumi, D., & Stephenson, M. (2022). The moment curve suffices. *Submitting to the Duke Mathematical Journal*, arXiv 2312.xxxxx.
3. Kenkel, J., McPherson, L., Page, J., Smolkin, D., Stephenson, M., & Yang, F. (2021). Asymptotic behavior of differential powers. *Accepted to Involve*, arXiv 2111.15653.
4. Panchumarthi, B., & Stephenson, M. (2020). Analyzing Network Topology for DDoS Mitigation Using the Abelian Sandpile Model. *In Preparation*.

Skills

Languages — Native English, Conversational Spanish, Conversational German

Coding — LaTeX, Sage, Python, Java, Mathematica, Macaulay2

Miscellaneous Experience

Awards and Achievements

2023 — **Fulbright Research Scholarship to Germany**, Fully-funded year long research grant to the MPI MiS in Leipzig, DE working under Bernd Sturmfels.

Miscellaneous Experience (continued)

2022
- **Churchill Scholarship Nomination**, Full-ride scholarship for Churchill College, Cambridge nominations, only two students are nominated per institute.
- **Sperling Scholarship Finalist**, Full-ride scholarship for Cambridge upon admission to King's College, Cambridge.
- **Aubrey Watzek Scholarship** , A $\$35,000$ scholarship for an exceptional student at Reed College.

2019-2022
- **President's Commendation for Excellence 2019-2022**, The only academic honor given at Reed College, denoting those whom represent the top 5% of Reed's class in that year.

2021
- **Evans Scholarship**, A $\$10,000$ scholarship for an exceptional student at Reed College.

2020
- **Brodie Family Scholarship**, A $\$32,000$ scholarship for an exceptional student at Reed College.

2019
- **Don and Sybil Harrington Scholarship**, A $\$20,000$ scholarship for exceptional STEM students, funded by the Harrington Foundation started by Sybil Harrington, former Director of the Board of the Metropolitan Opera.
- **Texas Eastern Star Scholarship**, Statewide scholarship given to a single exceptional student in Texas with familial ties to the Eastern Star Organization, the sister organization of the Free Masons.

2018
- **AP Scholar**, Given by the College Board to distinguish students who succeed on their college level tests.

2017
- **Regional Finalist for UIL Mathematics**, Competed in the Texas UIL mathematics competition as a sophomore and advanced to Regionals. I earned a top score the Northern Texas Region (one of the 4 regions by UIL).

Organizations

Fall 2020-Spring 2023
- **SL(M) Leader** SL(M) is a student-run organization focusing on building community within the mathematics department. We also focus on facilitating communication between faculty and students, particularly by organizing faculty meetings with the SL(M) leaders. We also have developed the student colloquium where any student is welcome to present their recent mathematical work.

Spring 2020
- **Spring Symposium** I participated in the Spring Symposium which helps first-year students learn necessary college skills such as time management. Primarily, the group consisted of first-generation college students like myself, and other minority groups.

2019-2020
- **Equity and Social Justice Cohort (ESC)** I was part of the inaugural ESC, where we worked with on campus staff, and off campus organizations to benefit our community. We engaged in biweekly meetings and community service.

Funded Visits

February 2023
- **Berlin Mathematical School Days:** *Berlin, DE*
  Interviewed for BMS PhD program with funding to fly to Berlin and stay a week.

January 2023
- **Joint Mathematics Meeting:** *Boston, MA*
  Attended the JMM conference, funded by Reed College.

August 2022
- **Max Plank Institute for Mathematics in the Sciences:** *Leipzig, Germany*
  Invited to MPI to interview for Fulbright Fellowship Opportunity under Bernd Sturmfels with accommodations covered.

Miscellaneous Experience (continued)

Presentations

November 2022 — **Reed College Student Colloquium**
"*Anisotropy on the Moment Curve*"

October 2022 — **Reed College Mathematics Colloquium**
"*An Invitation to Combinatorial Hodge Theory*"

July 2022 — **Final Presentation for the REU at Hebrew University**
"*The Moment Curve Suffices*"

June 2022 — **Hebrew University Graduate Student Seminar**
"*Combinatorics of Coxeter Groups and their Applications to Geometry*"

April 2022 — **JMM Poster Session**
"*Characterization of Simple $\mathcal{D}$-modules by the Differential Closure Operator*"

September 2021 — **Reed College Mathematics Colloquium**
"*Characterization of Simple $\mathcal{D}$-modules by the Differential Closure Operator*"

August 2021 — **Final Presentation for the REU at the University of Michigan**
"*Characterization of Simple $\mathcal{D}$-modules by the Differential Closure Operator*"

October 2020 — **Reed College Mathematics Colloquium**
"*Analyzing Network Topology for DDoS Mitigation Using the Abelian Sandpile Model*"

September 2020 — **Reed College Student Physics Seminar**
"*Analyzing Network Topology for DDoS Mitigation Using the Abelian Sandpile Model*"

August 2020 — **Final Presentation for altREU at Portland State University**
"*Analyzing Network Topology for DDoS Mitigation Using the Abelian Sandpile Model*"