

Charlotte Aten

✉ charlotte.aten@colorado.edu
🌐 aten.cool

Education

- 2017–2022 **PhD in Mathematics**, *University of Rochester*, Rochester, NY.
Thesis title: Finite Generation of Families of Structures Equipped with Compatible Group Actions
- 2014–2017 **Bachelor of Science in Mathematics (Honors)**, *University of Rochester*, Rochester, NY.
- 2012–2014 **Associate of Science in Mathematics**, *Monroe Community College*, Rochester, NY.
Awarded with honors

Research interests

My core interests tend to cycle around combinatorics, universal algebra, and category theory. I study functorial constructions of spaces from quasigroups, representation stability, and categorified invariant theory. I am also a proponent of applied category theory, in particular with respect to machine learning and formal verification.

Academic positions held

- 2024– **Burnett Meyer Instructor**, *University of Colorado Boulder*, Boulder, CO.
- 2022–2024 **Postdoctoral scholar**, *University of Denver*, Denver, CO.

Industry positions held

- 2022 **Research and development consultant**, *The Parker Avery Group*, Marietta, GA.

Publications and preprints

- Charlotte Aten. “Higher-dimensional book-spaces”. In: *arXiv e-prints* (Sept. 2024). arXiv: 2409.12923 [math.RA]
- Charlotte Aten. “Invariants of structures”. In: *arXiv e-prints* (Feb. 2024). arXiv: 2402.18063 [math.CT]
- Charlotte Aten. “A partition formula from idempotents”. In: *arXiv e-prints* (Aug. 2023). arXiv: 2308.10177 [math.CO]
- Charlotte Aten. “Discrete neural nets and polymorphic learning”. In: *arXiv e-prints* (July 2023). arXiv: 2308.00677 [cs.NE]
- Charlotte Aten. “Finite Generation of Families of Structures Equipped with Compatible Group Actions”. PhD thesis. 2022, p. 61. ISBN: 9798363518454
- Charlotte Aten and Alex Iosevich. “A multi-linear geometric estimate”. In: *arXiv e-prints* (Dec. 2021). arXiv: 2112.00810 [math.NT]
- Charlotte Aten and Semin Yoo. “Orientable triangulable manifolds are essentially quasigroups”. In: *arXiv e-prints* (Oct. 2021). arXiv: 2110.05660 [math.RA]
- Charlotte Aten. “Multiplayer rock-paper-scissors”. In: *Algebra universalis* 81.3 (2020)
- Charlotte Aten. “Multiplayer Rock-Paper-Scissors”. In: *Algebras and Lattices in Hawai’i*. Ed. by Kira Adaricheva, William DeMeo, and Jennifer Hyndman. Apr. 2018, pp. 12–19
- C. Aten et al. “Tiling sets and spectral sets over finite fields”. In: *Journal of Functional Analysis* (Sept. 2015)

Textbooks

- Charlotte Aten, William DeMeo, and Venanzio Capretta. *Category Theory: A Concise Course*. 2019.
URL: <https://categorytheory.gitlab.io/>

Reviewing services

Journal of Algebraic Combinatorics.
Algebras and Lattices in Hawai'i 2018.

Talks

- 2024 **Panglobal Algebra and Logic Seminar**, *University of Colorado Boulder*.
Higher-dimensional book-spaces
- 2024 **IBS-DIMAG Workshop on Combinatorics and Geometric Measure Theory**, *Institute for Basic Science, Daejeon, South Korea*.
A multi-linear geometric estimate
- 2024 **Rocky Mountain Algebraic Combinatorics Seminar**, *Colorado State University in Fort Collins*.
Quasigroups, manifolds, and the completion of partial Latin hypercubes
- 2024 **Joint Mathematics Meetings**, *San Francisco, California*.
Discrete neural nets and graph polymorphisms for learning
- 2023 **The New York City Category Theory Seminar**, *The City University of New York*.
A categorical semantics for neural networks
- 2023 **Logic and Semantics Seminar**, *University of Cambridge*.
A categorical semantics for neural networks
- 2023 **Algebra and Logic Seminar**, *University of Denver*.
Monoid representations and partitions
- 2023 **Machine Learning Seminar**, *University of Denver*.
Discrete neural nets and polymorphic learning (Part 2)
- 2023 **Machine Learning Seminar**, *University of Denver*.
Discrete neural nets and polymorphic learning (Part 1)
- 2023 **Panglobal Algebra and Logic Seminar**, *University of Colorado Boulder*.
Discrete neural nets and polymorphic learning
- 2023 **Online Machine Learning Seminar**, *University of Nottingham*.
Discrete neural nets and polymorphic learning
- 2023 **LOOPS'23**, *Bedlewo, Poland*.
On the construction of manifolds from n-ary quasigroups
- 2023 **Combinatorics Seminar**, *University of Rochester*.
On the construction of manifolds from n-ary quasigroups
- 2023 **Algebraic Logic Seminar**, *University of Denver*.
Categorical models of linear logic
- 2023 **Joint Mathematics Meetings**, *Boston, Massachusetts*.
Exploring Dialectica Categorical Constructions
- 2022 **Machine Learning Seminar**, *University of Denver*.
Perceptrons and the Fundamental Theorem of Statistical Learning

- 2022 **Machine Learning Seminar**, *University of Denver*.
PAC Learning
- 2022 **Algebra and Logic Seminar**, *University of Denver*.
Invariants of Structures
- 2022 **PhD thesis defense**, *University of Rochester*.
Finite Generation of Families of Structures Equipped with Compatible Group Actions
- 2022 **Joint Mathematics Meetings**.
Distributive lattices in rock-paper-scissors
- 2022 **Panglobal Algebra and Logic Seminar**, *University of Colorado Boulder*.
Orientable smooth manifolds are essentially quasigroups
- 2021 **Virginia Tech Analysis and Mathematical Physics Seminar**, *Virginia Tech*.
A multi-linear geometric estimate
- 2021 **Binghamton University's Graduate Conference in Algebra and Topology**, *Binghamton University*.
Orientable smooth manifolds are essentially quasigroups
- 2021 **SUMS Math Talk**, *University of Rochester*.
My Hawai'ian Earring
- 2021 **Lecture for MTH 549 Category Theory**, *University of Rochester*.
Algebraic theories
- 2021 **New York Combinatorics Seminar**, *The City University of New York*.
Multiplayer rock-paper-scissors
- 2021 **Rochester Combinatorics Seminar**, *University of Rochester*.
Universal algebra gives universal approximation for neural nets
- 2021 **Panglobal Algebra and Logic Seminar**, *University of Colorado Boulder*.
Multiplayer rock-paper-scissors
- 2020 **Binghamton University's Graduate Conference in Algebra and Topology**, *Binghamton University*.
Multiplayer rock-paper-scissors
- 2020 **SUMS Math Talk**, *University of Rochester*.
A High School Algebra Problem
- 2019 **Graduate Student Seminar**, *University of Rochester*.
More Multiplayer Rock-Paper-Scissors
- 2018 **Binghamton University's Graduate Conference in Algebra and Topology**, *Binghamton University*.
Topological Lattices and Book Spaces
- 2018 **Graduate Student Seminar**, *University of Rochester*.
Classifying Topological Magmas
- 2018 **Algebras and Lattices in Hawai'i**, *University of Hawai'i at Manoa*.
Multiplayer Rock-Paper-Scissors
- 2018 **Graduate Student Seminar**, *University of Rochester*.
Multiplayer Rock-Paper-Scissors
- 2017 **Binghamton University's Graduate Conference in Algebra and Topology**, *Binghamton University*.
Universal Algebra and Boolean Semilattices

- 2017 **Graduate Student Seminar**, *University of Rochester*.
A Brief Introduction to Universal Algebra
- 2017 **Senior thesis presentation**, *University of Rochester*.
The Topology of Magmas
- 2017 **Nebraska Conference for Undergraduate Women in Mathematics**, *University of Nebraska-Lincoln*.
Relational Structures as Directed Hypergraphs (poster presentation)
- 2016 **National Conference on Undergraduate Research**, *University of North Carolina at Asheville*.
The Topology of Magmas
- 2016 **National Conference for McNair Scholars**, *University of Maryland*.
Topological Algebra: On Viewing Operations as Simplicial Complexes
- 2015 **David T. Kearns Center Research Symposium**, *University of Rochester*.
Constructions of Geometric Objects Encoding Algebraic Structures
- 2014 **Scholars' Day**, *Monroe Community College*.
Division by Zero: Development of a Relevant Algebra with Historical Context
- 2013 **Math Awareness Month**, *Monroe Community College*.
An Introduction to Hyperspace with a Construction of the 4-Cube

Events hosted

- 2023 **Special Session on Applied Category Theory**, *Joint Mathematics Meetings 2023*.
Part of the AMS Mathematics Research Communities program
- 2019 **Pi Day**, *University of Rochester*.
Mathematical art exhibit and student poster session
- 2014 **Math Awareness Month**, *Monroe Community College*.
Interactive Math Day

Seminars hosted

- 2024– **Panglobal Algebra and Logic Seminar**, *University of Colorado Boulder*.
- 2022–2024 **Algebra and Logic Seminar**, *University of Denver*.

Honors and awards

- 2017 **Provost's Fellowship**, *University of Rochester*.
Fellowship awarded to broaden the diversity of graduate students at the university
- 2017 **Doris Ermine Smith Award**, *University of Rochester*.
Award given in recognition of students who show significant achievement in the areas of French and/or Mathematics
- 2015 **McNair Scholar**, *University of Rochester*.
United States federal program which prepares underrepresented undergraduate students for doctoral studies
- 2014 **Xerox STEM Scholarship**, *Monroe Community College*.
Scholarship created to support Monroe County residents who will pursue careers in STEM
- 2013 **Jan Z. Wiranowski Renaissance Scholarship**, *Monroe Community College*.
Scholarship created to assist high-achieving students who will pursue careers in mathematics or a mathematics-related field

Teaching

- Fall 2024 **Math 2130 Linear Algebra for Non-Math Majors**, *University of Colorado Boulder*.
- Spring 2024 **Math 1952 Calculus II**, *University of Denver*.
- Winter 2023 **Math 1150 Elementary School Mathematics from the Year 2100**, *University of Denver*.
- Fall 2023 **Math 2060 Elements of Linear Algebra**, *University of Denver*.
- Fall 2023 **Math 1951 Calculus I**, *University of Denver*.
- Spring 2023 **Advisor for senior thesis**, *University of Rochester*.
Advised Rachel Dennis's senior thesis project on discrete neural nets
- Spring 2023 **Math 1953 Calculus III**, *University of Denver*.
- Winter 2023 **Math 1150 Social Choice Theory**, *University of Denver*.
- Fall 2022 **Math 2060 Elements of Linear Algebra**, *University of Denver*.
- Fall 2022 **Math 1951 Calculus I**, *University of Denver*.
- Spring 2022 **Grader for Math 240 Topology**, *University of Rochester*.
- Fall 2021 **TA for Math 208 Operations Research**, *University of Rochester*.
- Summer 2021 **Instructor for Math 165 Linear Algebra with Differential Equations**, *University of Rochester*.
- Spring 2021 **Instructor for informal representation theory reading course**, *University of Rochester*.
Taught representation theory to undergraduate math student David Crnčević
- Spring 2021 **Workshop TA for Math 161 Calculus IA**, *University of Rochester*.
- Spring 2021 **Grader for Math 248 Graph Theory**, *University of Rochester*.
- Fall 2020 **Grader for Math 165 Linear Algebra with Differential Equations**, *University of Rochester*.
- Summer 2020 **Instructor for Math 162 Calculus IIA**, *University of Rochester*.
- Spring 2020 **Recitation TA for Math 162 Calculus IIA**, *University of Rochester*.
- Fall 2019 **Recitation TA for Math 164 Multidimensional Calculus**, *University of Rochester*.
- Spring 2019 **Grader for Math 248 Graph Theory**, *University of Rochester*.
- 2014–2016 **Tutor**, *University of Rochester Center for Excellence in Teaching and Learning*.
Peer tutor for mathematics courses

Outreach

- Summer 2023 **Co-organizer, instructor, and project supervisor for Tripods NSF REU/Grad for All 2023**, *University of Rochester/Cornell University*.
Taught a category theory mini-course, led Python programming sessions, and continued the neural nets and universal algebra project from the 2021 iteration of this program.
- Summer 2021 **Python instructor and project leader for Tripods NSF REU/Grad for All 2021**, *University of Rochester/Cornell University*.
Guided coding sessions and initiated an ongoing research project on a connection between neural nets and universal algebra.
- Summer 2020 **Python instructor and mentor for Tripods NSF REU/Grad for All 2020**, *University of Rochester/Cornell University*.
Guided coding sessions, wrote example code and exercises, and mentored undergraduates from underrepresented groups attending local colleges.

Summer 2018 **Teaching assistant for Grad STEM for All**, *University of Rochester*.
Lectured, guided problem sessions, and mentored undergraduates from underrepresented groups attending local colleges.

Fall 2017 **Tutor for Upward Bound**, *University of Rochester Kearns Center*.
Volunteer tutor for underrepresented high school students.

Organizations

2021–2022 **outGRADS Treasurer**, *University of Rochester*.

outGRADS is a queer graduate student affinity organization founded in 2021.

2018–2022 **AMS Graduate Student Chapter President**, *University of Rochester*.

2013–2014 **Math Club President**, *Monroe Community College*.

2012–2013 **Math Club Treasurer**, *Monroe Community College*.

Professional society memberships

American Mathematical Society.

Association for Symbolic Logic.

Association for Women in Mathematics.