

# Andrew Hardt

Office: 69B Computer Applications Building ◊ 605 E Springfield Ave. ◊ Champaign, IL 61820  
ahardt@illinois.edu ◊ <https://andyhardt.github.io/index.html>

(CV last updated January 2025)

## EDUCATION

---

- **University of Minnesota** *September 2016 - August 2022*  
Ph. D. in Mathematics, 2022  
Thesis Advisor: Prof. Ben Brubaker  
Dissertation Title: Algebraic Operations via Solvable Lattice Models  
M. S. in Mathematics, 2019
- **Carleton College** *September 2009 - June 2013*  
B.A. in Mathematics, 2013  
Magna Cum Laude, GPA: 3.89

## EMPLOYMENT

---

- **University of Illinois Urbana-Champaign** *August 2023 - present*  
RTG Postdoctoral Research Fellow (Mathematics, Combinatorics RTG grant)
- **Stanford University** *September 2022 - August 2023*  
Szégo Assistant Professor of Mathematics

## RESEARCH

---

### Papers and Preprints

- *Stability of products of double Grothendieck polynomials* (with D. Wallach), 2025, [arXiv:????.?????](#).
- *When do Schubert polynomial products stabilize?* (with D. Wallach), 2024, [arXiv:2412.06976](#).
- *Factorial Fock free fermions* (with D. Bump and T. Scrimshaw), 2024, [arXiv:2410.06582](#).
- *Solving the  $n$ -color ice model* (as mentor for 2022 Polymath Jr. program), [arXiv:2212.06404](#).
- *Lattice Models, Hamiltonian Operators, and Symmetric Functions*, submitted for publication, [arXiv:2109.14597](#).
- *Frozen Pipes: Lattice Models for Grothendieck Polynomials* (with B Brubaker, C. Frechette, E. Tibor, and K. Weber), *Algebr. Comb.* 6 (2023), no.3, 789833. [arXiv:2007.04310](#).
- *Arborescences of Covering Graphs* (with S. Chepuri, C.J. Dowd, G. Michel, S. Zhang, and V. Zhang), *Algebr. Comb.* 5 (2022), no. 2, 319-346.
- *Characters of Renner Monoids and Their Hecke Algebras* (with J. Marx-Kuo, V. McDonald, J. O'Brien, and A. Vetter), *Internat. J. Algebra Comput.* 30 (2020), no. 7, 1505-1535.
- *Restricted Symmetric Signed Permutations* (with J. Troyka), *Pure Math. Appl.*, 23 (2012) 179–217.

### Other Documents

- Algebraic Operations via Solvable Lattice Models, University of Minnesota Dissertation, 2022, [Proquest link](#). (119 pages)

- Finite Hecke Algebras and Their Characters, University of Minnesota Oral Exam Paper, 2019, [link](#). (44 pages)
- Combinatorial Species and Graph Enumeration (with P. McNeely, J. Troyka, and T. Phan), 2013, Carleton College Comprehensive Senior Project, [arXiv:1312.0542](#) (39 pages)

## CONFERENCES AND SEMINARS ORGANIZED

---

- University of Illinois Algebra-Geometry-Combinatorics Seminar (with (subsets of) I. Cavey, S. Gao, D. Keating, E. Kelley, and A. Yong), UIUC, 2023-present.
- Early-Career Conference in Combinatorics (with J. Balogh, P. Bradshaw, I. Cavey, E. Kelley, E. White, M. Wigal, and A. Yong), UIUC, June 2024.
- University of Illinois RTG 2024 Summer School in Combinatorial Lie Theory (with A. Yong), UIUC, June 2024.
- AMS-AWM Special Session on Solvable Lattice Models and their Applications Associated with the Noether Lecture, Joint Math Meetings (with A. Aggarwal, B. Brubaker, D. Bump, S. Naprienko, L. Petrov, and A. Schilling), San Francisco, January 2024.
- Schubert Summer School, (with R. Hodges, E. Kelley, A. St. Dizier, and A. Yong), UIUC, June 2023.
- University of Minnesota Student Number Theory Seminar (with J. Dickenson), 2019-20.

## TALKS

---

- University of Toronto Combinatorics Seminar (*will be February 2025*)
- Factorial Schur functions and the boson-fermion correspondence, University of Illinois Algebra-Geometry-Combinatorics Seminar, UIUC (October 2024)
- A factorial analogue of the boson-fermion correspondence, Quantum Groups and Representation Theory Conference in honor of Kailash Misra's 70th birthday, NC State, (October 2024)
- Solvable lattice models and the boson-fermion correspondence, Early-Career Conference in Combinatorics, UIUC (June 2024)
- Solvable lattice models for motivic Chern classes of Schubert cells, Trinity College, Conference on Solvable Lattice Models, Number Theory and Combinatorics Conference, Trinity College, Dublin (June 2024)
- Solvable lattice models and the boson-fermion correspondence, Purdue Mathematical Physics Seminar, Purdue (April 2024)
- Lattice models for motivic Chern classes of Schubert varieties, AMS-AWM Special Session on Solvable Lattice Models and their Applications Associated with the Noether Lecture, Joint Math Meetings, San Francisco (January 2024)
- Solvable lattice models and Grothendieck polynomials, University of Illinois Algebra-Geometry-Combinatorics Seminar, UIUC (August 2023)
- Solvable lattice models and the boson-fermion correspondence, Integrable Systems & Symmetric Functions Workshop, University of Glasgow (March 2023, remote)

- (Super)symmetric Functions from Solvable Lattice Models and Discrete-Time Hamiltonian Operators, University of Minnesota Combinatorics Seminar (February 2022)
- Solvable lattice models from representations of quantum groups, Academia Sinica, Taipei, (December 2021, remote)
- Hamiltonian Operators and Free Fermionic Lattice Models, Solvable Lattice Models Seminar (June 2021)
- Solvable Lattice Models, Statistical Mechanics, and Symmetric Functions, Carleton College Colloquium (June 2021)

---

### AWARDS

- Joint Mathematics Meetings Travel Grant, 2022 (\$1,300; meetings went virtual)
- Doctoral Dissertation Fellowship, awarded to “the University’s most accomplished PhD candidates” to pursue an “outstanding research project”, University of Minnesota, 2021-22 (\$25,000 award)
- Nominated for Doctoral Dissertation Fellowship, University of Minnesota Mathematics Department, 2021
- Outstanding Teaching Assistant Award (\$500 award), University of Minnesota Mathematics Department, 2018-19
- First Year Summer Fellowship, University of Minnesota Mathematics Department, Summer 2017 (\$2,000)
- Phi Beta Kappa, Carleton College, 2013
- Distinction on Comprehensive Senior Project, Carleton College, 2013

---

### UIUC TEACHING

- Spring 2025 – Math 418, Abstract Algebra II
- Fall 2024 – Math 213, Introduction to Discrete Mathematics
- Spring 2024 – Math 418, Abstract Algebra II
- Fall 2023 – Math 412, Graph Theory

---

### STANFORD TEACHING

- Spring 2023 – Math 21, Calculus
- Winter 2023 – Math 121, Galois Theory
- Fall 2022 – Math 51, Linear Algebra, Multivariable Calculus, and Modern Applications

---

### MINNESOTA TEACHING

- Spring 2021 – Math 1001, Excursions in Mathematics (*sole lecturer*)  
*Controlled course structure, topics covered, lectures, and assessments; managed 1 TA*  
*Lecture videos posted [here](#).*
- Fall 2020 – Math 3283W, Sequences, Series, and Foundations (*TA*)

- Spring 2020 – Math 3283W, Sequences, Series, and Foundations (*TA*)
- Fall 2019 – Math 1031, College Algebra (*lecturer and course coordinator*)  
*Controlled course structure, topics covered, lectures, and assessments*  
*Coordinated 3 total lecturers and 7 total TAs; directly managed 2 TAs*
- Spring 2019 – Math 1031, College Algebra (*lecturer and course coordinator*)  
*Controlled course structure, topics covered, lectures, and assessments*  
*Coordinated 2 total lecturers and 3 total TAs; directly managed 2 TAs*
- Fall 2018 – Math 1031, College Algebra (*lecturer*)  
*Managed 1 TA*
- Spring 2018 – Math 2574H, Honors Calculus IV (*TA*)
- Fall 2017 – Math 2573H, Honors Calculus III (*TA*)
- Fall 2017 – Designed and taught course at Osher Lifetime Learning Institute (OLLI) for older adults entitled *Math and Proofs*
- Spring 2017 – Math 1272, Calculus II (*TA*)
- Fall 2016 – Math 1271, Calculus I (*TA*)
- Spring 2013 – Carleton College Math 352, Abstract Algebra II (*grader*)

---

## UNDERGRADUATE RESEARCH MENTORING

---

*(Preprints/publications associated with this mentoring are indicated)*

- I was the research co-mentor for D. Wallach at UIUC from 2023-24. ([arXiv:2412.06976](#), [arXiv:?????.?????](#))

I was the assistant mentor for the following projects in the Polymath Jr. program (2021-22):

- Solvable lattice models, 2022 ([arXiv:2212.06404](#)).
- Gelfand-Tsetlin Polytopes, 2021.

I was the mentor (project leader) for the following project in the University of Minnesota Combinatorics and Algebra REU in 2020:

- Alcove Walks and Whittaker Functions (N. Borade, M. Huynh, H. Twiss)

I was a TA (assistant mentor) for the following projects in the University of Minnesota Combinatorics and Algebra REU (2018-19):

- Arborescences of Covering Graphs (2019; C.J Dowd, V. Zhang, S. Zhang), [arXiv:1912.01060](#).
- Dihedral Sieving on Cluster Complexes (2019; Z. Stier, J. Wellman, Z. Xu), [arXiv:2011.11885](#).
- Homomesy and Rowmotion on the Trapezoid Poset (2019; Q. Dao, J. Wellman, C. Yost-Wolff, S. Zhang), [arXiv:2002.04810](#).
- Metaplectic Analogues of Gelfand-Graev Models (2019; Q. Dao, N. Kenshur, F. Lin, C. Meng, Z. Stier, C. Yost-Wolff)
- Characters of Renner Monoids and Their Hecke Algebras (2018; J. Marx-Kuo, V. McDonald, J. O'Brien, A. Vetter), [arXiv:1811.12343](#).

- Generating Functions for  $f$ -Vectors and the  $cd$ -Index of Weight Polytopes (2018; J. Gao, V. McDonald)

---

## OUTREACH

---

- Gave a talk on lattice models at Palo Alto High School math club, November 2022
- Instructor at MathCEP Saturday Morning Math, fun math sessions for 6th-8th graders, Spring 2022
- Panelist for session on Advocacy for Mathematics and Science Policy, Joint Mathematics Meetings, April 2022
- Counsellor for the Minnesota Program in Mathematics (MPM), a program for underrepresented undergraduates in mathematics, Winter 2021
- Met with staffers for Sen. Smith (MN) and Rep. Omar (MN-5) on the topic of immigration policy as part of a group of Minnesota graduate students, facilitated by the AMS Office of Governmental Relations, November 2020

---

## PROFESSIONAL SERVICE

---

- Have been a referee for:
  - Communications of the AMS, Spring 2022
  - Minnesota Journal of Undergraduate Mathematics, Spring 2021
- Paper reviewer, zbMATH, 2020-22
- Session chair at
  - Joint Math Meetings, Contributed Paper Session on Lattices and Geometries II, Spring 2022
  - Graduate Student Combinatorics Conference, Spring 2021

---

## UNIVERSITY SERVICE

---

- Supervised Casey Appleton in a reading course on integrable systems, Fall 2024
- Committee Member for Ce Chen's oral exam (UIUC), Spring 2024
- Committee Member for Slava Naprienko's Ph.D. Dissertation Defense (Stanford), Spring 2023
- Paper reader for Jackson Hampton's Senior Honor's Thesis (Minnesota), Spring 2021
- Co-organizer for a series of department Town Halls where graduate students had a chance to meet candidates for Department Head (Minnesota), Fall 2020
- Facilitator for the teacher training portion of the new graduate student orientation (Minnesota), Fall 2020
- Mentor, Directed Reading Program, 2017-21
- Peer Mentor (Minnesota), 2017-18
- I have written recommendation letters for dozens of students I have taught or mentored, ranging from summer internships to fellowships to undergraduate and graduate programs, including Ph. D. programs in mathematics.

## PROFESSIONAL DEVELOPMENT

---

- Teaching Assistant and Postdoc Professional Development Program Certificate; attended a series of 6 lectures, and wrote a capstone 3 page teaching reflection paper.
- Attendee at *Speaking Sciences* Conference, University of Minnesota, January 2019

## OTHER EXPERIENCE

---

- Swimming Commentator, 2018-present
- Contributing Writer, SwimSwam.com, 2018-19
- Interim Co-President, UMN Triathlon Team, 2017
- ACT/SAT Tutor, 2015-18
- Assistant Swim Coach, University of St. Thomas, 2013-16