Andrew Hardt

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(CV last updated September 2025)

EMPLOYMENT

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

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 with distinction, 2013
  Magna Cum Laude, GPA: 3.88

RESEARCH

Publications and Preprints

11. **Lattice Models for Double Whittaker Polynomials and Motivic Chern Classes**
    with B. Brubaker, D. Bump, and H. Spink
    Preprint arXiv:2509.17312.
10. **On the Boson–Fermion Correspondence for Factorial Schur Functions**
    with D. Bump and T. Scrimshaw
    Preprint arXiv:2502.02841.
9. **Stability of products of double Grothendieck polynomials**
    with D. Wallach
    Preprint arXiv:2501.14691.
8. **When do Schubert polynomial products stabilize?**
    with D. Wallach
    Preprint arXiv:2412.06976.
7. **Factorial Fock free fermions**
    with D. Bump and T. Scrimshaw
    Preprint arXiv:2410.06582.
6. **Solving the n–color ice model**
    with P. Addona, E. Bockenhauer, B. Brubaker, M. Cauthorn, C. Conefrey–Shinozaki, D. Donze, W. Dudarov, J. Dukes, C. Li, J. Li, Y. Liu, N. Puthanveetil, Z. Qudsi, J. Simons, J. Sullivan, and A. Young
    Ann. Comb. (2025). arXiv:2212.06404.

5. **Lattice Models, Hamiltonian Operators, and Symmetric Functions**
   Preprint arXiv:2109.14597.

4. **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.

3. **Arborescences of Covering Graphs**
   with S. Chepuri, C. Dowd, G. Michel, S. Zhang, and V. Zhang
   Algebr. Comb. 5 (2022), no. 2, 319-346. arXiv:1912.01060.

2. **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. arXiv:1811.12343.

1. **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
  https://www.proquest.com/pqdtglobal/docview/2716630374.

- **Finite Hecke Algebras and Their Characters**
  University of Minnesota Oral Exam Paper, 2019
  https://andyhardt.github.io/OralExamPaper.pdf

- **Combinatorial Species and Graph Enumeration**
  with P. McNeely, J. Troyka, and T. Phan
  Carleton College Comprehensive Senior Project, 2013; arXiv:1312.0542

AWARDS

- List of Teachers Ranked as Excellent by Their Students, Spring 2025 (UIUC)
- Joint Mathematics Meetings Travel Grant, 2022 ($1,300)
- 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)
- Outstanding Teaching Assistant Award ($500), 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

CONFERENCES AND SEMINARS ORGANIZED

- **University of Illinois Algebra–Geometry–Combinatorics Seminar**, UIUC, 2023–present, with (subsets of) I. Cavey, S. Gao, D. Keating, E. Kelley, A. Stelzer, and A. Yong

- **University of Illinois RTG 2025 Summer School in Combinatorial Representation Theory** (including a Symposium on Convexity in Algebraic Combinatorics), UIUC, May–June 2025, with I. Cavey and A. Yong
- **Early–Career Conference in Combinatorics**, UIUC, June 2024, with J. Balogh, P. Bradshaw, I. Cavey, E. Kelley, E. White, M. Wigal, and A. Yong
- **University of Illinois RTG 2024 Summer School in Combinatorial Lie Theory**, UIUC, June 2024, with A. Yong
- **AMS–AWM Special Session on Solvable Lattice Models and their Applications** Joint Math Meetings, Associated with the Noether Lecture, San Francisco, January 2024, with A. Aggarwal, B. Brubaker, D. Bump, S. Naprienko, L. Petrov, and A. Schilling
- **Schubert Summer School**, UIUC, June 2023, with R. Hodges, E. Kelley, A. St. Dizier, and A. Yong
- **University of Minnesota Student Number Theory Seminar**, UMN, 2019–20, with J. Dickenson

TALKS

- AMS 2025 Fall Central Sectional, Special session on Interactions between geometry, combinatorics, and flag varieties, St. Louis (October 2025)
  Schubert calculus stability
- AMS 2025 Fall Southeastern Sectional, Special session on Combinatorics and Geometry Related to Representation Theory, New Orleans (October 2025)
  Characters of type A quiver varieties
- AMS 2025 Fall Western Sectional, Special session on Geometry, Integrability, Symmetry, and Physics, Denver (August 2025)
  A factorial analogue of the boson–fermion correspondence
- Schubert Seminar (March 2025)
  Schubert calculus stability
- University of Toronto Combinatorics Seminar, Toronto (February 2025)
  Solvable lattice models in cohomology and K–theory
- University of Illinois Algebra–Geometry–Combinatorics Seminar, UIUC (October 2024)
  Factorial Schur functions and the boson–fermion correspondence
- Quantum Groups and Representation Theory Conference in honor of Kailash Misras 70th birthday, NC State (October 2024)
  A factorial analogue of the boson–fermion correspondence (contributed talk)
- Early–Career Conference in Combinatorics, UIUC (June 2024)
  Solvable lattice models and the boson–fermion correspondence
- Conference on Solvable Lattice Models, Number Theory and Combinatorics Conference, Trinity College, Dublin (June 2024)
  Solvable lattice models for motivic Chern classes of Schubert cells
- Purdue Mathematical Physics Seminar, Purdue (April 2024)
  Solvable lattice models and the boson–fermion correspondence

- AMS–AWM Special Session on Solvable Lattice Models and their Applications Associated with the Noether Lecture, Joint Math Meetings, San Francisco (January 2024)
  Lattice models for motivic Chern classes of Schubert varieties
- University of Illinois Algebra–Geometry–Combinatorics Seminar, UIUC (August 2023)
  Solvable lattice models and Grothendieck polynomials
- Integrable Systems & Symmetric Functions Workshop, University of Glasgow (March 2023, remote)
  Solvable lattice models and the boson–fermion correspondence
- Palo Alto High School Math Club, Palo Alto (November 2022)
  Lattice models (introductory/outreach talk)
- University of Minnesota Combinatorics Seminar (February 2022)
  (Super)symmetric Functions from Solvable Lattice Models and Discrete–Time Hamiltonian Operators
- Academia Sinica Seminar in Representation Theory, Taipei, (December 2021, remote)
  Solvable lattice models from representations of quantum groups
- Solvable Lattice Models Seminar (June 2021)
  Hamiltonian Operators and Free Fermionic Lattice Models
- Carleton College Colloquium (June 2021)
  Solvable Lattice Models, Statistical Mechanics, and Symmetric Functions

UIUC TEACHING

- Spring 2025 – Math 418, Abstract Algebra II
- Fall 2024 – Math 213, Introduction to Discrete Mathematics
- Fall 2024 – Math 597, Reading Course on Integrable Systems (C. Appleton)
- Spring 2024 – Math 418, Abstract Algebra II
- Fall 2023 – Math 412, Graph Theory

STANFORD TEACHING

- Spring 2023 – Math 21, Calculus *(lecturer and course coordinator)*
  Coordinated 2 lecturers, 3 TAs, and 3 graders
- 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
- 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)

- Research co–mentor for D. Wallach at UIUC through the ICLUE program, 2023–24 (arXiv:2412.06976, arXiv:2501.14691).
- Assistant mentor for the Polymath Jr. program, 2021–22:
  - Solvable lattice models, 2022 (arXiv:2212.06404).
  - Gelfand–Tsetlin Polytopes, 2021.
- Mentor (project leader) for the UMN Combinatorics and Algebra REU, 2020:
  - Alcove Walks and Whittaker Functions (N. Borade, M. Huynh, H. Twiss)
- TA (assistant mentor) for the UMN Combinatorics and Algebra REU (2018–19):
  - Arborescences of Covering Graphs (C.J Dowd, V. Zhang, S. Zhang), 2019 (arXiv:1912.01060).
  - Dihedral Sieving on Cluster Complexes (Z. Stier, J. Wellman, Z. Xu), 2019 (arXiv:2011.11885).
  - Homomesy and Rowmotion on the Trapezoid Poset (Q. Dao, J. Wellman, C. Yost–Wolff, S. Zhang), 2019 (arXiv:2002.04810).
  - Metaplectic Analogues of Gelfand–Graev Models (Q. Dao, N. Kenshur, F. Lin, C. Meng, Z. Stier, C. Yost–Wolff), 2019.
  - Characters of Renner Monoids and Their Hecke Algebras (J. Marx–Kuo, V. McDonald, J. O'Brien, A. Vetter), 2018 (arXiv:1811.12343, arXiv:1811.04334).
  - Generating Functions for f–Vectors and the cd–Index of Weight Polytopes (J. Gao, V. McDonald), 2018.

OUTREACH

- Brief interview video with the AMS, to be posted on their website, August 2025
- 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
- Blog post (joint with M. Sayrafi) on the AMS Capital Currents blog entitled "In order to prevent an exodus of international PhD students, we must stand together", November 2020
- Helped write/edit a letter of the Minnesota Attorney General on policy changes towards student visas, October 2020

SERVICE

- Referee for:
  - Selecta Mathematica
  - Communications of the AMS
  - Minnesota Journal of Undergraduate Mathematics
- 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
- 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 (Minnesota), 2017–21
- Peer Mentor (Minnesota), 2017–18