

Nathaniel Thiem

<https://math.colorado.edu/~thiemn>

Education

1999–2004. University of Wisconsin–Madison, Ph.D. in mathematics, May 2004

Dissertation title: *Unipotent Hecke algebras*, Advisor: Arun Ram

Minor: Mathematics education.

1995–99. Macalester College, B.A. magna cum laude in mathematics, May 1999.

Appointments

2007–Present. University of Colorado **Boulder**,

Professor (Fall 2021–Present),

Associate Professor (Fall 2012–Summer 2021),

Assistant Professor (Fall 2007–Summer 2012).

Spring 2008. Mathematical Sciences Research Institute,

Postdoctoral scholar; *Combinatorial representation theory, Representation theory of finite groups*.

2004–07. Stanford University,

Szegö Assistant Professor.

Grants and awards

- . PI on a Simons Foundation collaboration grant, 426594, September 2016 – August 2022
The geometry and combinatorics of good supercharacter theories
Total Award: \$35,000 (Direct Costs: \$30,000).
- . UROP Team grant, Summer 2015
Random walks on unipotent groups
Total Award: \$2,400.
- . PI on a NSA Young Investigator Grant, H98230-13-1-0203, February 2013–April 2015
Families of Supercharacter Theories and their Combinatorics
Total Award: \$36,843 (Direct Costs: \$32,037).
- . PI on an NSF-FRG grant DMS-0854893, September 2009–August 2013
Characters, Liftings, and Types: Investigations in p -adic Representation Theory
Total Award: \$146,106 (Direct Costs: \$98,368).
- . Wisconsin mathematics Van Vleck research award, May 2004.
- . Vertical Integration of Research and Education (VIGRE) fellowship at Wisconsin, 2002–03.
- . VIGRE summer research assistantship, Summer 2000 and Summer 2001.

Research

General interests. Algebra and combinatorics (Math Subject Classification 2010: 20, 05).

Particular topics. Representation theory, character theory, supercharacters, groups of Lie type, Hecke algebras, symmetric functions, Hopf structures.

Citation conventions. In the citations below, authors are always listed in alphabetical order. Authors who were undergraduate students at the time of research are indicated with *.

Published works

24. F. Aliniaefard, N. Thiem, Hopf structures in the representation theory of direct products. *Electron. J. Combin.* **29**(4) (2022), #P4.39.
23. F. Aliniaefard, N. Thiem, A categorification of the Malvenuto–Reutenauer algebra via a tower of groups. *Adv. Math.* **383** (2021), 107675.
22. F. Aliniaefard, N. Thiem, The structure of normal lattice supercharacter theories. *Algebraic Combinatorics* **3** (2020), 1059–1078.
21. F. Aliniaefard, N. Thiem. Pattern groups and a poset based Hopf monoid. *J. Comb. Theory Ser. A* **172** (2020), 31 pages.
20. N. Thiem. Supercharacter theories of type A unipotent radicals and unipotent polytopes. *Algebraic Combinatorics* **1** (2018), 23–45.
19. S. Andrews, N. Thiem. The combinatorics of GL_n generalized Gelfand–Graev characters, *J. London Math. Soc.* **95** (2017), 475–499.
18. D. Bragg*, N. Thiem. Poset binomial coefficients and restrictions of supercharacters, *J. Algebra* **451** (2016), 357–400.
17. D. Baker-Jarvis*, N. Bergeron, N. Thiem. Antipode and primitive elements in the Hopf monoid of supercharacters, *J. Algebraic Combin.* **40** (2014), 903–938.
16. M. Aguiar, N. Bergeron, N. Thiem. Hopf monoids from class functions on unitriangular matrices, *Algebra Number Theory* **7** (2013), 1743–1779.
15. N. Bergeron, N. Thiem. A supercharacter table decomposition via power-sum symmetric functions, *Internat. J. Algebra Comput.* **23** (2013), 763–778.
14. M. Aguiar, C. André, C. Benedetti, N. Bergeron, Z. Chen, P. Diaconis, A. Hendrickson, S. Hsiao, I.M. Isaacs, A. Jedwab, K. Johnson, G. Karaali, A. Lauve, T. Le, S. Lewis, H. Li, K. Magaard, E. Marberg, J-C. Novelli, A. Pang, F. Saliola, L. Tevlin, J-Y. Thibon, N. Thiem, V. Venkateswaran, C.R. Vinroot, N. Yan, M. Zabrocki. Supercharacters, symmetric functions in noncommuting variables, and related Hopf algebras, *Adv. Math.* **229** (2012), 2310–2337.
13. S. Fu, V. Reiner, D. Stanton, N. Thiem. The negative q -binomial, *Electron. J. Combin.* **19**(1) Research Paper 36 (2012), 24 pages.
12. S. Lewis*, N. Thiem. Nonzero coefficients in restrictions and tensor products of supercharacters of $U_n(q)$, *Adv. Math.* **227** (2011), 40–72.
11. T. Halverson, N. Thiem. q -Partition algebra combinatorics, *J. Comb. Theory Ser. A* **117** (2010), 507–527.
10. N. Thiem. Branching rules in the ring of superclass functions of unipotent upper-triangular matrices, *J. Algebraic Combin.* **31** (2010), 267–298.
9. N. Thiem, V. Venkateswaran*. Restricting supercharacters of the finite group of unipotent upper-triangular matrices, *Electron. J. Combin.* **16**(1) Research Paper 23 (2009), 32 pages.
8. E. Marberg*, N. Thiem. Superinduction for pattern groups, *J. Algebra* **321** (2009), 3681–3703.
7. P. Diaconis, N. Thiem. Supercharacter formulas for pattern groups, *Trans. Amer. Math. Soc.* **361** (2009), 3501–3533.
6. N. Thiem and C.R. Vinroot. Gelfand–Graev characters for the finite unitary group, *Electron. J. Combin.* **16**(1) Research Paper 146 (2009), 37 pages.
5. N. Thiem, C.R. Vinroot. Values of character sums for finite unitary groups, *J. Algebra* **320** (2008), 1150–1173.
4. N. Thiem, C.R. Vinroot. On the characteristic map of finite unitary groups, *Adv. Math.* **210** (2007), 707–732.

3. N. Thiem. A skein-like multiplication algorithm for unipotent Hecke algebras, *Trans. Amer. Math. Soc.* **359** (2007), 1685–1724.
2. N. Thiem. Unipotent Hecke algebras of $GL_n(\mathbb{F}_q)$, *J. Algebra* **284** (2005), 559–577.
1. J. Swallow, N. Thiem*. Quadratic Corestriction, C_2 -embedding problems, and explicit construction, *Comm. Algebra* **30** (2002), 3227–3258.

Preprints, submitted and accepted works

1. F. Aliniaefard, N. Thiem, Stanley chromatic functions and a conjecture in the representation theory of unipotent groups (extended abstract), submitted to conference proceedings (2023).

Works in preparation

1. T. Halverson, N. Thiem, The q -partition algebra. In preparation.

Selected talks

- . Special session on “Combinatorial and Categorical Techniques in Representation Theory” AMS sectional meeting at Buffalo, New York, September 10, 2023.
- . Minisymposium on “Many perspectives on Hopf algebras in combinatorics” CanaDAM 2023, Winnipeg, June 8, 2023.
- . Special session on “Combinatorics and Representation Theory (associated with the Invited Address by Sami Assaf)” AMS sectional meeting at Fresno, California, May 6, 2023.
- . Arbeitsgemeinschaft Diskrete Mathematik, Technische Universität Wien, Austria, May 3, 2022.
- . The 87th Séminaire Lotharingien de Combinatoire, Domaine de la Barollière, France, April 4, 2022.
- . Algebra seminar, University of Oklahoma (remote), April 30, 2021.
- . Special Session on “Group Representations and Related Topics,” AMS (remote) sectional meeting, October 3, 2020.
- . Special session on “Representations of finite groups and related topics,” AMS sectional meeting at University of California Riverside, November 10, 2019.
- . Combinatorics seminar, University of Southern California, March 27, 2019.
- . Special session on “Lie Theory in the Representations of Groups and Related Structures - dedicated to the memory of Kay Magaard.” AMS sectional meeting at University of Hawaii, March 22, 2019.
- . Rocky mountain algebraic combinatorics seminar, CSU, April 6, 2018.
- . Applied Algebra Seminar, York University, Toronto, February 12, 2018.
- . Special session on “Combinatorial representation theory.” AMS sectional meeting at University of California Riverside, November 5, 2017.
- . Special session on “Algebraic and enumerative combinatorics.” PRIMA third congress, Oaxaca, August 15, 2017.
- . Special session on “Combinatorial representation theory.” AMS sectional meeting at University of St. Thomas, October 30, 2016.
- . Special session on “Groups and representation theory.” AMS sectional meeting at University of Denver, October 9, 2016.
- . Discrete Geometry and Combinatorics Seminar, Cornell University, Ithaca, October 26, 2015.
- . Special session on “Hopf Algebraic Combinatorics.” AMS sectional meeting at Loyola University, Chicago, October 3, 2015.
- . Special session on “Algebraic and enumerative combinatorics.” AMS sectional meeting at the University of Nevada - Las Vegas, April 19, 2015.
- . Great Plains Combinatorics Conference, University of Kansas, April 27, 2014.

- . DePaul University Colloquium, January 24, 2014.
- . Special session on “Algebraic combinatorics and representation theory.” AMS/MAA Joint Mathematics Meetings, January 11, 2013.
- . Special session on “Representations of groups and algebras.” AMS sectional meeting at the University of Arizona, October 28, 2012.
- . University of Wyoming colloquium, September 27, 2012.
- . Mini-course, “Characters, Liftings and Types,” FRG conference at American University, June 20 and 22, 2012.
- . Southwest Local Algebra Day, Texas Tech University, March 4, 2012.
- . Workshop and conference “Representation Theory of finite groups of Lie type: Deligne–Lusztig Theory,” Tata Institute of Fundamental Research, Mumbai, India, December 12–17, 2011.
- . Special session on “Species and Hopf algebraic combinatorics,” AMS Section meeting at Cornell University, September 10, 2011.
- . Special session on “Geometric and commutative algebra and applications,” AMS Sectional meeting in Iowa City, March 20, 2011.
- . Combinatorics Seminar, University of Texas A&M, December 3, 2010.
- . Special session on “Groups, representations, and characters,” AMS sectional meeting at Notre Dame, November 6, 2010.
- . Combinatorics Seminar, Massachusetts Institute of Technology, October 1, 2010.
- . Combinatorics Seminar, University of Washington at Seattle, April 28, 2010.
- . Special session on “Combinatorial representation theory,” AMS sectional meeting in Saint Paul, April 11, 2010.
- . Rocky mountain algebraic combinatorics seminar, Colorado State University, January 30, 2009.
- . Algebra, Number Theory, and Combinatorics Seminar, University of Texas at Austin, November 13, 2008.
- . Special session on “Geometric and combinatorial representation theory,” AMS sectional meeting at Louisiana State University–Baton Rouge, March 29, 2008.
- . Southwest Group Theory Day, University of Arizona-Tuscon, October 27, 2007.
- . Swarthmore Colloquium, September 25, 2007.
- . Banff, Algebraic Lie Theory Workshop, May 28, 2007.
- . University of Nice, May 23, 2007.
- . University of California at Davis, Discrete Mathematics Seminar, April 20, 2007.
- . Representation theory, geometry and combinatorics seminar, UC Berkeley, February 26, 2007.
- . Special session on “Combinatorial representation theory” AMS sectional meeting in Fayetteville, November 3, 2006.
- . Algebra and number theory seminar, University of Arizona-Tuscon, September 12, 2006.
- . Millican colloquium, University of Northern Texas. March 31, 2006.
- . *Flavors of Groups*. BIRS Workshop. November 19, 2005.
- . Combinatorics seminar, UC Berkeley, January 31, 2005.
- . Bay Area Discrete Mathematics Day, San Jose State University. April 9, 2005.
- . Graduate student seminar, UC Davis, December 8, 2004.
- . Combinatorics seminar, University of Minnesota, November 21, 2003.
- . Special session on “Algebras and their representations.” AMS sectional meeting in Chapel Hill, October 25, 2003.

Talks and posters with refereed submissions

- . Poster with F. Aliniaefard, Formal Power Series and Algebraic Combinatorics, Ljubljana, July 2, 2019.
- . Poster, Formal Power Series and Algebraic Combinatorics, London, July 9, 2017.
- . Talk, Formal Power Series and Algebraic Combinatorics, Paris, June 27, 2013.
- . Talk with H. Li, Formal Power Series and Algebraic Combinatorics, Iceland, June 15, 2011.
- . Poster with S. Lewis, Formal Power Series and Algebraic Combinatorics, San Francisco, August 3, 2010.
- . Talk, Formal Power Series and Algebraic Combinatorics, Austria, July 24, 2009.
- . Poster, Formal Power Series and Algebraic Combinatorics, Sicily, June 22, 2005.

Teaching

Classes

2007–Present. University of Colorado **Boulder**,

- . Undergraduate courses: *Discrete mathematics* (2001), *Calculus II* (2300), *Analysis 1* (3001), *Abstract algebra I* (3140), *Combinatorics* (3170), *Abstract Algebra II* (4140), *Introduction to complex variables* (4450).
- . Graduate courses: *Modern Algebra I* (6130), *Modern Algebra II* (6140), *Ring Theory* (6250), *Complex analysis* (6350), *Representation theory* (8174), *Lie algebras* (8174).

2004–07. Stanford University,

- . *Calculus II*; *Linear algebra and differential calculus of several variables*; *Matrix theory and its applications*; *Introduction to combinatorics and its applications*; *Modern algebra*; and *Group representations*.

1999–2004. University of Wisconsin,

- . Primary instructor: *Arithmetic problem solving* and *Mathematical models* for the Wisconsin K-8 teaching certificate program, and *Calculus II*.

Advising

- . Mentoring of faculty,
 - .. Flor Orosz Hunziker, Fall 2023–Present.
 - .. Al Bronstein, Spring 2017–Present.
 - .. Jonathan Wise, Fall 2012–Spring 2020.
- . Mentoring of postdocs,
 - .. Florencia Orosz Hunziger, Fall 2020–Spring 2021.
 - .. Farid Aliniaefard, Fall 2017–Spring 2019.
 - .. Rahbar Virk with R. Green, Fall 2011–Spring 2013.
- . Mentoring of incoming graduate students,
 - .. Jon Kim, Fall 2022–Present.
 - .. Gabriel Lopez and Justin Willson, Fall 2019–Fall 2021.
- . Ph.D. and Masters students
 - .. Jennifer Gensler, Spring 2022–Present.

- .. Breeann Wilson, Spring 2021–Present.
- .. Hunter Davenport, Spring 2021–Present.
- .. Chris Eblen, Fall 2020–Present.
- .. Lucas Gagnon (Ph.D. 2022), Fall 2018–Spring 2022.
- .. Tyler Schrock (Ph.D. 2019), joint with J. Grochow, Spring 2017–Fall 2019.
- .. Megan Ly (Ph.D. 2018), Fall 2014–Summer 2018.
- .. Jonathan Lamar (Ph.D. 2018), Summer 2014–Spring 2018.
- .. Shawn Burkett (Ph.D. 2018) , Spring 2014–Summer 2018.
- .. Scott Andrews (Ph.D. 2014), Spring 2011–Spring 2014.
- .. Justin Keller (Ph.D. 2014), Spring 2010–Spring 2014.
- .. Rachel Krieger (Masters 2009), Spring 2008–Spring 2009.

. Honors students

- .. Jesse Franklin, Summer 2018–Spring 2019, graduated magna cum laude.
- .. Justin Willson, Fall 2018–Spring 2019, graduated magna cum laude.
- .. Aaron Allen, Summer 2016–Spring 2017, graduated magna cum laude.
- .. Varodom Theplertboon, Spring 2014–Spring 2016, graduated summa cum laude.
- .. Duff Baker-Jarvis, Summer 2012–Spring 2013, graduated summa cum laude.
- .. Daniel Bragg, Summer 2011–Spring 2013, graduated summa cum laude.
- .. Stephen Lewis, Spring 2008–Summer 2009, graduated summa cum laude.
- .. Eric Marberg and Vidya Venkateswaran, with P. Diaconis, Summer 2006–Fall 2007.

. Other supervision of graduate research,

- .. Paige Robertson, James Woodcock, Summer 2023.
- .. Jennifer Gensler, Nicholas Jameson, Summer 2021.
- .. Rebecca Deland, Justin Willson, Breeann Wilson with L. Gagnon, Summer 2020.
- .. Hunter Davenport, Christopher Eblen, Mateo Muro, Summer 2019.
- .. Lucas Gagnon, Summer 2018.
- .. Jordan Dubeau, Summer 2017.
- .. Jun Hong and Athena Sparks, Summer 2015.
- .. Dalton Jones, Summer 2013–Fall 2013.

. Other supervision of undergraduate research,

- .. Quintin Babcock, Teo Johnson, Kaitlyn Marlowe, Shae Swerdfeger, Summer 2023.
- .. Fletcher Collins, Chase Schwarzman, Connor Weisburg, Evan Young, Summer 2021.
- .. Jacob Gaiter, Juliet Hawkes, Tom Kauffman, Adam Nelson with L. Gagnon, Summer 2020.
- .. Jenna Kishinevsky, Nicholas Miesch, Chaitan Walia, Summer 2019.
- .. Jonathan Bosnich, Nick Bossenbroek, Ram Ekstrom, and Josiah Martinez, Summer 2018.
- .. Henry Fontana, Summer 2017–Spring 2018.
- .. Bradley Sain, Summer 2017–Spring 2019.
- .. Joseph Evans, Summer 2016, Summer 2017.
- .. Kyle Murphy, Summer 2016.
- .. David Anthony, Summer 2015–Fall 2015.
- .. Dominic Kickbush, Summer 2015.
- .. Avery Wilson, Spring 2015.
- .. Harold Hausman, Fall 2013–Fall 2014.
- .. George Grell, Summer 2012.
- .. Elliot Kruskal, Summer 2011.
- .. Ilana Bellowe, Spring 2010–Spring 2011.
- .. Cary Goltermann, Summer 2010.

Course development (at CU)

- . Math 2001: *Discrete Mathematics* (a freshman/sophomore class for math majors that introduces students to the notion of proof in mathematics).

Professional development

- . Bringing Theory to Practice Seminar, *Be the Change: practicing inclusive excellence for student success and faculty well-being*, January 10, 2018.
- . FTEP workshop on *Achieving course goals: Gathering evidence about student learning*, Assessment Institute, May 11 – 13, 2015.

Service

Organizing

- . AMS-MAA joint meetings special session “Representations of finite groups and related structures” Denver, January 2020 (Co-organizer).
- . AMS Special Session on “Combinatorial avenues in representation theory,” Boulder, April 2013 (Co-organizer).
- . BIRS Focused Research Group on “Supercharacters and Hopf Monoids,” October 2012 (Co-organizer).
- . Characters, Liftings, and Types: Boulder, at University of Colorado **Boulder**, June 2011 (Local organizer).
- . Mini-symposium, “Combinatorial Representation Theory,” at SIAM Discrete Mathematics Conference, June 2010 (Organizer).
- . American Institute of Mathematics workshop, “Supercharacters and combinatorial Hopf algebras,” May 2010 (Co-organizer).
- . Algebraic Lie Theory Seminar at University of Colorado **Boulder**, Fall 2007–Present (Co-organizer).
- . Representation Theory Seminar at Stanford University, Fall 2004–07 (Co-organizer).
- . Bay Area Discrete (BAD) Math Day Fall 2004–07 (Organizing committee).

Standing Committees and administrative positions

- . Undergraduate associate chair, Spring 2015, Summer 2017–Fall 2021, Summer 2022–Present.
- . Executive committee, Fall 2016–Spring 2018.
- . Undergraduate committee, Fall 2007–Fall 2013, Fall 2014–Fall 2015, Fall 2017–Fall 2021, Fall 2022–Present.
- . Meyer committee, Fall 2012–Summer 2013.
- . Honors Council Representative for Mathematics, Spring 2010–Fall 2021, Fall 2022–Present.

Other committee work

- . Internal math REU organizing (chair), Summers 2014–Summer 2021, Summer 2023–Present.
- . Teaching quality framework Departmental Action Team and A&S adhoc committee, Spring 2017–Fall 2021.
- . Adhoc Departmental Action Team for evaluating our proofs classes, Spring 2016.
- . Hiring committees: Instructor hire (chair, Fall 2023), Tenure track position (chair, Fall 2022), Lecturers (2019, 2018, 2017), Director of Undergraduate Research (chair, Spring 2017), Instructor (Spring 2019, 2016).
- . Math Club faculty liaison, Fall 2008–Fall 2013.

- . Committee for evaluation of faculty evaluation and promotion (T-FERPT), Fall 2010–Fall 2012.
- . Primary unit evaluation committees: Lee Roberson promotion (2023), S. Casalaina-Martin promotion to full (2021), A. Bronstein reappointment (2017), K. Stange reappointment (2016), S. Casalaina-Martin tenure and promotion (2014) and reappointment (2012), C. Muir reappointment (2010).
- . Chair of Comprehensive Exam Committee: J. Gensler (2023), B. Wilson (2022), H. Davenport (2021), C. Eblen (2021), L. Gagnon (2019), T. Schrock (2017), M. Ly (2015), J. Lamar (2015), S. Burkett (2015), S. Andrews (2012), J. Keller (2010).
- . Algebra preliminary exam committee: January 2022, 2019, 2017, 2015, 2013, 2012, 2008; August 2023, 2020, 2010, 2009, 2008.
- . Ph.D. committees: C. Bridges (2023), J. Willson (2023), M. Ornstein (2023), L. Gagnon (2022), R. Dyer (2021), J. Van Meter (2021), A. Sparks (2020), T. Jack (2020), T. Schrock (2019), S. Burkett (2018), M. Ly (2018), J. Lamar (2018), E. Shannon (2016), S. Andrews (2014), J. Keller (2014), T. Gern (2013), Z. McGregor-Dorsey (2013), J. Harper (2011), M. Roy (2011), J. Wiscons (2011), H. Denoncourt (2009), D. Ernst (2008), B. Pohlmann (2008), G. Helleloid (2007), D. Ford (2006), J. Blitzstein (2006).

Refereeing/Reviewing

Grant awarding agencies. National Science Foundation, National Security Agency, Mathematical Association of America Rocky Mountain Section.

Journals. *Advances in Mathematics, Algebra and Number Theory, Algebraic Combinatorics, Algebras and Representation Theory, American Mathematical Monthly, Communications in Algebra, Electronic Journal of Combinatorics, Forum of Math: Sigma, International Journal of Algebra and Computation, International Mathematics Research Notices, Journal of Algebra, Journal of Algebraic Combinatorics, Journal of Combinatorial Theory A, Journal of the American Mathematical Society, Journal of Pure and Applied Algebra, Pacific Journal of Mathematics, Proceedings of Formal Power Series and Algebraic Combinatorics, Proceedings of the American Mathematical Society, Proceedings of the Isaacs Mathematics Conference, The Ramanujan Journal, Representation Theory, Results in Mathematics, Transactions of the American Mathematical Society, Turkish Journal of Mathematics.*

Competitions. Hang Lung Mathematics Award.

Professional organizations

- . Member of the American Mathematical Society.