

CURRICULUM VITAE

SPENCER BACKMAN

Address:

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1. EDUCATION AND EMPLOYMENT

- Associate Professor, Department of Mathematics and Statistics, University of Vermont (May 2025 - Present)
- Assistant Professor, Department of Mathematics and Statistics, University of Vermont (August 2019 - May 2025)
- Zuckerman STEM Postdoctoral Scholar, Einstein Institute for Mathematics, Hebrew University of Jerusalem (January 2018 - August 2019)
- Postdoctoral Researcher, Institute for Mathematics, Goethe University of Frankfurt SFB “Discretization and Geometry in Dynamics” A03 (April 2017 - December 2017)
- Postdoctoral Fellow, Hausdorff Center for Mathematics, University of Bonn, Germany (January 2016 - April 2017)
- Postdoctoral Researcher, Department of Computer Science, University of Rome “La Sapienza” (November 2014 - December 2015)
- Visiting Researcher, National Institute for Mathematical Sciences, Republic of Korea (May 2014 - August 2014)
- Ph.D., Algorithms, Combinatorics, and Optimization from the School of Mathematics at the Georgia Institute of Technology (Spring 2014)
- Visiting Student Researcher, Mathematics Department, University of California Berkeley (Fall 2011 - Fall 2012)
- Math in Moscow Program (Fall 2007)
- B.A., Oberlin College, with Honors in Mathematics (2007)
- Budapest Semesters in Mathematics Program (Spring 2006)

2. FELLOWSHIPS AND AWARDS

- NSF Grant (DMS-2246967) (2023-present) Amount: \$131,706
- Simons Foundation Collaborative Gift #854037 (2021) Amount: \$42,000
- OVPR Express Grant UVM (2020-2021) Amount: \$3,000

Date: May 29th, 2025.

- Zuckerman STEM Postdoctoral Fellowship hosted by Karim Adiprasito (2017-2019)
- DFG (Die Deutsche Forschungsgemeinschaft) SFB “Discretization and Geometry in Dynamics” A03 Fellowship hosted by Raman Sanyal (2017)
- Top Graduate Student Award from the School of Mathematics at the Georgia Institute of Technology (2014)
- Algorithms and Randomness Center Student Fellowship (Spring 2014)
- Georgia Institute of Technology Presidential Fellowship (2008-2012)
- Algorithms, Combinatorics, and Optimization Student Fellowship (2008-2009)

3. PUBLICATIONS

- Skeletal Generalizations of Parking Functions, Dyck Paths, and Chip-firing Games, with Cole Charbonneau, Nicholas A. Loehr, Patrick Mullins, Mazie O’Connor, and Gregory S. Warrington, *Combinatorial Theory* (accepted).
- A Regular Unimodular Triangulation of the Matroid Base Polytope, with Gaku Liu, *Duke Mathematical Journal* (to appear).
- Simplicial Generation of Chow Rings of Matroids, with Christopher Eur and Connor Simpson, *Journal of the European Mathematical Society*, 26, 4491–4535 (2024).
- Fan Valuations and Spherical Intrinsic Volumes, with Sebastian Manecke and Raman Sanyal, *Annals of Combinatorics*, (2024): 1-18.
- Matroid Chern-Schwartz-MacPherson Cycles and Tutte Activities, with Ahmed Ashraf, *Proceedings of the American Mathematical Society*, 151 (2023), 2303-2309.
- Tutte Activities Chapter for the Handbook of the Tutte polynomial and related topics. Ellis-Monaghan, Joanna A., and Iain Moffatt, eds. CRC Press, (2022).
- A Convolution Formula for Tutte Polynomials of Arithmetic Matroids and Other Combinatorial Structures, with Matthias Lenz, *Séminaire Lotharingien de Combinatoire*, [B78c] (2021), 17 pp.
- Geometric Bijections for Regular Matroids, Zonotopes, and Ehrhart Theory, with Matthew Baker and Chi Ho Yuen, *Forum of Mathematics, Sigma*, Volume 7, 2019, e45.
- Transfinite Ford-Fulkerson on a Finite Network, with Tony Huynh, *Computability*, Volume 7, Issue 4, January 2018, Pages 341-347.
- Fourientation Activities and the Tutte Polynomial, with Sam Hopkins and Lorenzo Traldi, *European Journal of Combinatorics*, Volume 67, January 2018, Pages 40-60.
- Fourientations and the Tutte Polynomial, with Sam Hopkins, *Research in the Mathematical Sciences*, December 2017.
- Partial Graph Orientations and the Tutte Polynomial, *Advances in Applied Mathematics*, Special Issue on the Tutte Polynomial, June 2017.
- Riemann-Roch Theory for Graph Orientations, *Advances in Mathematics*, Volume 309, pages 655-691, March 2017.
- Explicit Deformation of Lattice Ideals via Chip Firing Games on Directed Graphs, with Madhusudan Manjunath, *Journal of Algebraic Combinatorics*, Volume 42, Issue 4, December 2015, pages 1097D1110.
- Infinite Reduction of Divisors on Metric Graphs, *European Journal of Combinatorics*, Volume 35, January 2014, Pages 67-74.

- Sum-product inequalities with perturbation, with Ernie Croot, Mariah Hamel, and Derrick Hart, INTEGERS Volume 11A (2011) Proceedings of the Integers Conference 2009 in Honor of the Birthdays of Melvyn Nathanson and Carl Pomerance.

4. PREPRINTS

- Ford Spheres in the Clifford-Bianchi Setting, with Taylor Dupuy, Anton Hilado, and Veronika Potter
- Higher-Categorical Associahedra, with Nathaniel Bottman and Daria Poliakova
- Convex Geometry of Building Sets, with Rick Danner
- Extension-lifting Bijections for Oriented Matroids, with Francisco Santos and Chi Ho Yuen.
- Cone Angles, Gram's Relation, and Flag-Angles, with Sebastian Manecke and Raman Sanyal.
- A Bijection Between the Recurrent Configurations of a Hereditary Chip-Firing Model and Spanning Trees.
- Chip-Firing and Riemann-Roch Theory for Directed Graphs, with Arash Asadi.

5. RESEARCH TALKS

- Spring 2025, University of Michigan Combinatorics Seminar.
- Spring 2025, Michigan State Combinatorics Seminar.
- Winter 2025, Joint Mathematical Meetings, Seattle, Washington, Special Session on Geometric and Topological Combinatorics.
- Fall 2024, BUGCAT Conference, SUNY Binghamton.
- Spring 2024, Workshop on Flow Polytopes, Gentle Algebras and Associated Posets, UQAM, Montreal, Quebec.
- Spring 2024, Dartmouth-UVM Math Day, plenary talk.
- Fall 2023, Canadian Mathematical Society, Session Algebraic and Enumerative Combinatorics, Montreal, Quebec
- Fall 2023, Combinatorics Seminar, KTH Stockholm, Sweden
- Spring 2023, Matroids - Combinatorics, Algebra and Geometry Seminar, Fields Institute
- Fall 2022, Combinatorics Seminar, University of Massachusetts Amherst
- Fall 2022, AMS Sectional, Special Session on Geometric Aspects of Algebraic Combinatorics, University of Massachusetts Amherst
- Summer 2022 Joint Meetings of the EMS, AMS, and FSM, Special Session on Graph and Matroid Polynomials, University of Grenoble, France
- Summer 2022 Combinatorics and Geometry Seminar, University of Washington
- Spring 2022 Combinatorics Seminar, University of Amsterdam, The Netherlands
- Spring 2022 Combinatorics Seminar, Brandeis University
- Spring 2022 Combinatorics Seminar, Dartmouth College
- Spring 2022 Combinatorics Seminar, KTH Stockholm, Sweden
- Summer 2020 FPSAC Lecture (originally scheduled for Bar-Ilan University, Israel and moved online due to Covid19)

- Spring 2020 Invited Lecture at Unimodality, Log-concavity, and Beyond Conference at the Mittag-Leffler Institute in Stockholm, Sweden (canceled due to Covid19)
- Spring 2020 Geometry-Algebra-Singularities-Combinatorics Seminar, Northeastern University
- Fall 2019 Number Theory Seminar, University of Vermont
- Fall 2019 Combinatorics Seminar, University of Vermont
- Summer 2019 Vermont Summer Combo, University of Vermont
- Summer 2019 Discrete Geometry Seminar, University of Frankfurt, Germany
- Summer 2019 Arrangements at Western Workshop, University of Western Ontario, Canada
- Spring 2019 Discrete Geometry Seminar, Institut Henri Poincaré, Paris, France
- Fall 2018 Combinatorics Seminar, Hebrew University of Jerusalem, Israel
- Fall 2018 Combinatorial Geometries: Matroids, Oriented Matroids and Applications Conference, CIRM, Luminy, France
- Fall 2018 University of Vermont Mathematics Colloquium
- Fall 2018 MIT Combinatorics Seminar
- Summer 2018 FPSAC Lecture, Hanover, New Hampshire
- Fall 2017 MSRI Geometric and Topological Combinatorics Semester, MSRI Berkeley
- Summer 2017 Kombinatorik Seminar, Leipzig University
- Spring 2017 András Frank's Seminar, Eötvös Loránd University, Budapest, Hungary
- Spring 2017 Algebra Seminar, Renyi Institute, Budapest, Hungary
- Winter 2016, Discrete Mathematics, Geometry, and Optimization Seminar, University of Frankfurt
- Winter 2016, Representation Theory Seminar, Hausdorff Center for Mathematics, University of Bonn
- Fall 2016, Chip-firing and Divisors on Graphs and Complexes Special Session, AMS Sectional, Minneapolis, Minnesota
- Summer 2016, Summer Combo in Vermont, St. Michael's College.
- Spring 2016, Discrete Geometry Seminar, Freie Universität Berlin
- Spring 2016, Graph Polynomials: Towards a Comparative Theory, Dagstuhl Seminar, Schloss Dagstuhl – Leibniz Center for Informatics
- Fall 2015, Sandpile Groups Workshop, Casa Matemática Oaxaca - Banff International Research Station (CMO-BIRS), Oaxaca, Mexico.
- Fall 2015, Le Laboratoire d'Informatique, de Robotique et de Microélectronique de Montpellier (LIRMM), Montpellier, France.
- Fall 2015, Arrangements: Combinatorics and Topology Seminar, University of Fribourg, Switzerland.
- Fall 2015, Algebraic Geometry Seminar, Roma Tre University.
- Fall 2015, Joint Session of the 75th Sèminaire Lotharingien de Combinatoire and of the XX Incontro Italiano di Combinatoria Algebrica, Bertinoro, Italy.
- Summer 2015, Summer Combo in Vermont, St. Michael's College.
- Summer 2015, Workshop on New Directions for the Tutte Polynomial, Royal Holloway University of London, England.
- Spring 2015, Algebraic Geometry Seminar, Fluminense Federal University, Brazil.

- Spring 2015, Combinatorics Seminar, Georgia Tech.
- Spring 2015, Combinatorics Seminar, UC Berkeley.
- Fall 2014, Special Session on Combinatorics in Algebraic Geometry, AMS Western Sectional, SFSU.
- Fall 2014, Combinatorics Seminar, MIT.
- Summer 2014, Algebraic Geometry Seminar, Korean Institute of Advanced Study (KIAS).
- Summer 2014, Discrete Mathematics Seminar, Korean Advanced Institute of Science and Technology (KAIST).
- Spring 2014, Student Tropical Algebraic Geometry Seminar, Yale University.
- Spring 2014, Graph Theory Seminar, Georgia Tech.
- Spring 2014, Combinatorics Seminar, Georgia Tech.
- Fall 2013, Mathematics Colloquium, Reed College.
- Fall 2013, Algebra Seminar, Georgia Tech.
- Summer 2013, SIAM Conference on Applied Algebraic Geometry; Tropical Geometry and Combinatorics in Dynamical Systems Minisymposium.
- Fall 2012, Combinatorial Commutative Algebra Seminar, MSRI.
- Fall 2012, Combinatorics Seminar, Georgia Tech.
- Spring 2012, Joint University of Kaiserslautern & University of Saarlands Seminar.
- Spring 2012, Tropical Geometry Day, University of Warwick.
- Fall 2011, Chip-Firing Day, UC Berkeley.
- Fall 2011, European Conference on Combinatorics, Budapest, Hungary.
- Fall 2011, Combinatorics Seminar, University of Minnesota.

6. SERVICE

UVM Mathematics and Statistics Department Committees and Service:

- RPT Committee (Chair)
- Tenure-track Search Committee (2024) (Chair)
- Graduate Program Committee (2023-present)
- Mathematics Major Recruitment Committee (2022-present)
- Organizer for UVM Combinatorics Seminar (2021-present)
- Mathematics Colloquium Committee (2021 & 2022)
- Putnam Exam Committee (2020 & 2021)
- Undergraduate Curriculum Committee (2020 & 2021)

Refereeing Service:

- Advances in Mathematics
- Annals of Combinatorics
- Combinatorial Theory
- Discrete Mathematics
- Discrete and Computational Geometry
- Electronic Journal of Combinatorics
- European Journal of Combinatorics
- Journal of Combinatorial Theory Series A

- Journal of Combinatorial Theory Series B
- New York Journal of Mathematics
- Proceedings of the AMS
- Selecta Mathematica

Boards:

- Vermont Statement Mathematics Coalition (since 2020)

Conference Organizing:

- UVM-Dartmouth Math Day, April 27th, 2025 at the University of Vermont (Organizer)
- Mostly Matroids, August 19th-23rd 2024 at the Institute for Basic Science, Daejeon, South Korea (Organizer)
- Formal Power Series and Algebraic Combinatorics, July 22nd-26th, 2024 Bochum, Germany (Program Committee Member)

7. TEACHING

Lead Instructor:

- Spring 2025 Real Analysis in Several Variables 2, Math 3472, University of Vermont
- Fall 2024 Discrete Structures, CS 1640, University of Vermont
- Spring 2024 Real Analysis in Several Variables 1, Math 3468, University of Vermont
- Fall 2023, Combinatorial Graph Theory, Math 5678, University of Vermont
- Fall 2023, Basic Combinatorial Theory, Math 2678, University of Vermont
- Spring 2023, Topics in Combinatorics, Math 373: Matroids and Polytopes, University of Vermont
- Fall 2022, Discrete Structures, CS 064, University of Vermont
- Fall 2022, Real Analysis in Several Variables 1, Math 241, University of Vermont
- Spring 2022, Real Analysis in Several Variables 1, Math 241, University of Vermont
- Fall 2021, Discrete Structures, CS 064, University of Vermont
- Fall 2021, Fundamentals of Mathematics, Math 052, University of Vermont
- Spring 2021, Topology, Math 295 & 395, University of Vermont
- Fall 2020, Basic Combinatorial Theory, Math 173, University of Vermont
- Spring 2020, Topics in Combinatorics, Math 373: Matroids and Polytopes, University of Vermont
- Fall 2019, Combinatorial Graph Theory, Math 273, University of Vermont
- Spring 2013, Finite Mathematics, 1711, Georgia Tech

PhD Students:

- Richard Danner (2022-present)
- Sienna Unter (2024-present)

Masters Students

- Spring 2020, Patrick Mullins

Emory-Tibet Science Initiative

- Summer 2013, Emory-Tibet Science Initiative Mathematics Lecturer, Sarah College, Dharamsala, India
- Summer 2012, Emory-Tibet Science Initiative Mathematics Lecturer, Sarah College, Dharamsala, India

Substitute Instructor

- Fall 2011 UC Berkeley, Undergraduate Algebraic Geometry

Teaching Assistant

- Fall 2010, Calculus 3, 2401
- Fall 2009, Linear and Discrete Mathematics, 2602
- Summer 2009, Linear and Discrete Mathematics, 2602
- Fall 2008, Calculus 1, 1501