Bennet Goeckner

Contact Information

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Professional Experience

University of Washington

MSRI/Simons Postdoctoral Fellow, August 2021 – Present

Postdoctoral Scholar, September 2018 – Present

Education

University of Kansas

Ph.D. in Mathematics, 2018

- Advisor: Jeremy Martin

Washington University in St. Louis

A.B. in Mathematics, 2011

Research Interests

Geometric and topological combinatorics, especially simplicial complexes and polytopes; connections to commutative algebra and algebraic topology; combinatorics of words

Awards

2021–2022	MSRI/Simons Postdoctoral Fellowship
2019–2023	AMS-Simons Travel Grant
2018	Florence Black Award for Excellence in Teaching University of Kansas

Publications

Minkowski summands of cubes, with F. Castillo, J. Doolittle, M.S. Ross, and L. Ying. Bulletin of the London Mathematical Society, to appear. arXiv:2009.07252

Partition and Cohen–Macaulay extenders, with J. Doolittle and A. Lazar. European Journal of Combinatorics, to appear. arXiv:1911.12791

Resolving Stanley's conjecture on k-fold acyclic complexes, with J. Doolittle. Combinatorial Theory, to appear. arXiv:1811.08518

Lattice polytopes from Schur and symmetric Grothendieck polynomials, with M.M. Bayer, S. Hong, T. McAllister, M. Olsen, C. Pinckney, J. Vega, and M. Yip. Electronic Journal of Combinatorics, 28 (2021), no. 2, 36pp.

Manifold matching complexes, with M.M. Bayer and M. Jelić Milutinović. Mathematika 66(4), (2020), 973–1002.

Higher nerves of simplicial complexes, with H. Dao, J. Doolittle, K. Duna, B. Holmes, and J. Lyle. Algebraic Combinatorics, Volume 2 (2019) no. 5, 803–813.

Universal partial words over non-binary alphabets, with C. Groothuis, C. Hettle, B. Kell, P. Kirkpatrick, R. Kirsch, and R. Solava. Theoretical Computer Science 713 (2018), 56–65.

A non-partitionable Cohen–Macaulay simplicial complex, with A.M. Duval, C.J. Klivans, and J.L. Martin. Advances in Mathematics 299 (2016), 381–395.

Preprints

The symbol ∗ indicates an **undergraduate** coauthor.

A characterization of two-dimensional Buchsbaum matching complexes, with F. Herr∗, L. Jones∗, and R. Rowlands. arXiv:2110.11302

The existence and structure of universal partial cycles, with D. Fillmore, R. Kirsch, J. Martin, and D. McGinnis. Draft available upon request.

Teaching Experience

The symbol † indicates a course with a significant **active learning** component.

University of Washington

Course Instructor
- Math 300 (Introduction to Mathematical Reasoning) – Autumn 2019
- Math 308 (Matrix Algebra) – Autumn 2018, Winter 2019, Spring 2019†
- Math 407 (Linear Optimization) – Winter 2021
- Math 409 (Discrete Optimization) – Spring 2021
- Math 441 (Topology) – Summer 2019 (Co-instructed with Jonathan Beardsley)
- Math 445 (Geometry for Teachers) – Summer 2019†
- Math 461 (Combinatorial Theory I) – Winter 2020†
- Math 462 (Combinatorial Theory II) – Spring 2020
- Math 600 (Graduate Reading Course) – "Oriented Matroids" Winter 2020

Undergraduate Research Mentor
- "Matching graphs," two students, Fall 2019–Winter 2021
  - *Iterated matching graphs* by F. Herr and L. Jones (submitted)
  - *A characterization of two-dimensional Buchsbaum matching complexes*, joint with F. Herr, L. Jones, and R. Rowlands
- "Powers of higher nerves," three students, Spring 2019
  - `SageMath` code to efficiently compute powers of higher nerves

University of Kansas

Course Instructor
- Math 101 (College Algebra) – Spring 2013
- Math 115 (Calculus I) – Fall 2012, Spring 2014
- Math 121 (Calculus I) – Summer 2014, Fall 2015†

Teaching Assistant
- Math 121 (Calculus I) – Fall 2013, Fall 2014
- Math 122 (Calculus II) – Spring 2015
- Math 126 (Calculus II) – Spring 2016, Fall 2016, Spring 2018
- Math 127 (Calculus III) – Spring 2017
- Math 147 (Honors Calculus III) – Fall 2017

Graduate Research Consultant
- Math 145 (Honors Calculus I) – Fall 2017†
  - Developed a series of activities to introduce students to mathematical research

Invited Talks

Topology of matching complexes

- AMS Special Session on Recent Trends in Graph Theory, Purdue University, March 2022 (Upcoming)
- AMS Special Session on Research from the Rocky Mountain-Great Plains Graduate Research Workshop in Combinatorics, Joint Mathematics Meetings, Denver, Colorado, January 2020
- Mathematics Colloquium, Western Washington University, January 2020
- Mathematics Colloquium, Seattle University, November 2019

Minkowski summands of cubes

- Combinatorics Seminar, University of California, Berkeley, January 2022 (Upcoming)
- Combinatorics and Geometry Seminar, University of Washington, April 2021 (Online)
- Discrete Mathematics Seminar, Iowa State University, February 2021 (Online)
- AMS Special Session on Algebraic, Geometric and Topological Combinatorics, Fall Central Sectional Meeting, September 2020 (Online)

Partition and Cohen–Macaulay extenders

- AMS Special Session on Topological Methods in Discrete Mathematics, University of South Alabama, November 2021 (Upcoming, Online)
- Applied Combinatorial Topology Minisymposium, 8^{th} European Congress of Mathematics, June 2021 (Online)
- Combinatorics Seminar, University of Kansas, February 2020

Resolving Stanley's conjecture on k-fold acyclic complexes

- Combinatorics Seminar, University of Copenhagen, January 2021 (Online)
- AMS Special Session on Geometric and Topological Combinatorics, University of Florida, November 2019
- Discrete Math Seminar, University of British Columbia, September 2019
- AMS Special Session on Algebraic and Geometric Combinatorics, University of Hawaii, March 2019
- Combinatorics and Geometry Seminar, University of Washington, October 2018

Decompositions of simplicial complexes

- Undergraduate Mathematics Conference, Creighton University, October 2017
- AMS Special Session on Geometric and Combinatorial Commutative Algebra, University of North Texas, September 2017
- Combinatorics Seminar, Kansas State University, March 2017

A non-partitionable Cohen–Macaulay complex

- Algebra-Geometry-Combinatorics Seminar, University of Illinois, Urbana-Champaign, February 2017
- Discrete Math Seminar, University of Nebraska–Lincoln, September 2016
- Combinatorics Seminar, University of Miami, October 2015
- AMS Special Session on Enumerative and Algebraic Combinatorics, Loyola University Chicago, October 2015
- Convex Geometry Summer School, Berlin Mathematical School, June 2015

Conference Organization

Co-organizer of JMM Special Session on Geometric and topological combinatorics (with Anton Dochtermann, Steve Klee, and Gaku Liu), Joint Mathematics Meetings, Seattle, WA, January 2022. (Upcoming)

Co-organizer of AMS Special Session on Geometric and Topological Combinatorics and Their Applications (with Robert Davis), October 2021. (Online)

Co-organizer of Geometric and Topological Combinatorics Mini-symposium (with Isabella Novik), SIAM Conference on Discrete Mathematics 2020. (Canceled, COVID-19)

Organizing Committee Chair, Graduate Student Combinatorics Conference 2017
- Funded in part by NSF Grant DMS-1700464 ($17,000) and the Combinatorics Foundation ($5,000)
- 107 participants in attendance from 47 institutions

Service and Outreach

2021–Present	UW Math Circle
2020–2021	UW Math Department Graduate Admissions Committee
2020	Graduate Online Combinatorics Colloquium Panelist
2019–2021	UW Math Department Diversity Committee
2019–Present	UW Evidence-Based Teaching Program
2019	University of Washington Math Hour Olympiad Judge
2017–Present	Science Mentor, *Frontiers for Young Minds, Mathematics*
2016, 2017	Math Awareness Month Workshop Lead Organizer University of Kansas
2014–2017	Vice President of Mathematics Graduate Student Organization University of Kansas
2014, '15, '18	Math Awareness Month Workshop Volunteer University of Kansas