

Yan Zhuang

Dept. of Mathematics and Computer Science, P.O. Box 7129, Davidson College, Davidson, NC 28035
www.yanzhuang.name • (704) 894-2317 • yazhuang@davidson.edu

Appointments

(Last Updated: August 31, 2019)

Davidson College , Davidson, NC Assistant Professor of Mathematics and Computer Science	2018–present
---	--------------

Education

Brandeis University , Waltham, MA Ph.D., Mathematics Dissertation: <i>Noncommutative Symmetric Functions and Permutation Enumeration</i> Advisor: Ira M. Gessel	2013–2018
Goucher College , Baltimore, MD B.A., Mathematics and Philosophy. <i>Summa cum laude</i> . Phi Beta Kappa. Departmental Honors in Mathematics and Philosophy.	2009–2013

Research Interests

Enumerative and algebraic combinatorics: permutation enumeration, permutation statistics, permutation pattern avoidance; symmetric functions, quasisymmetric functions, noncommutative symmetric functions; combinatorial Hopf algebras.

Papers

All papers published in (or submitted to) peer-reviewed venues. Names marked with an asterisk (*) indicate undergraduate student co-authors.

11. **On the joint distribution of cyclic valleys and excedances over conjugacy classes of \mathfrak{S}_n** , with M. Crossan Cooper* and William S. Jones*. Submitted. [arXiv:1906.05191]
10. **Hopping from Chebyshev polynomials to permutation statistics**, with Jordan O. Tirrell. *Electronic Journal of Combinatorics* 26(3): Paper #P3.27, 17 pp., 2019. [Link to E.J.C.]
9. **Homomorphisms on noncommutative symmetric functions and permutation enumeration**, with Ira M. Gessel. Proceedings of the 31st International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), *Séminaire Lotharingien de Combinatoire* 82B: Article #6, 12 pp., 2019. [Link to FPSAC]
8. **Shuffle-compatible descent statistics and quotients of quasisymmetric functions**, with Ira M. Gessel. Proceedings of the 30th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), *Séminaire Lotharingien de Combinatoire* 80B: Article #5, 12 pp., 2018. [Link to S.L.C.]

7. **Shuffle-compatible permutation statistics**, with Ira M. Gessel.
Advances in Mathematics 332: 85–141, 2018. [arXiv:1706.00750]
6. **A generalized Goulden–Jackson cluster method and lattice path enumeration**.
Discrete Mathematics 341(2): 358–379, 2018. [arXiv:1508.02793]
5. **Eulerian polynomials and descent statistics**.
Advances in Applied Mathematics 90: 86–144, 2017. [arXiv:1610.07218]
4. **Counting permutations by runs**.
Journal of Combinatorial Theory, Series A 142: 147–176, 2016. [arXiv:1505.02308]
3. **Logarithmic representability of integers as k -sums**, with Anant P. Godbole, Samuel Gutekunst, and Vince Lyzinski.
Proceedings of Integers 2013: The Erdős Centennial Conference, *Integers: The Electronic Journal of Combinatorial Number Theory* 15A: Paper #A5, 15 pp., 2015. [Link to Integers]
2. **Counting permutations by alternating descents**, with Ira M. Gessel.
Electronic Journal of Combinatorics 21(4): Paper #P4.23, 21 pp., 2014. [Link to E.J.C.]
1. **Shattering thresholds for random systems of sets, words, and permutations**, with Anant P. Godbole and Samantha Pinella.
Proceedings of the 10th International Conference on Permutation Patterns, *Pure Mathematics and Applications* 24(2): 125–142, 2013. [Link to P.U.M.A.]

Presentations

Presentations listed under the same title may not have had the same title at time of presentation, but covered roughly the same material.

Invited Research Talks

- **Shuffle-Compatible Permutation Statistics**

- *Algebra and Discrete Mathematics Seminar*, Clemson University, Clemson, SC Nov. 2018
- *Combinatorics Seminar*, University of Southern California, Los Angeles, CA Apr. 2018
- *Combinatorics Seminar*, University of California San Diego, La Jolla, CA Apr. 2018
- *Combinatorics Seminar*, University of Washington, Seattle, WA Feb. 2018
- *Algebra and Combinatorics Seminar*, DePaul University, Chicago, IL May 2017
- *Combinatorics Seminar*, Massachusetts Institute of Technology, Cambridge, MA Apr. 2017
- *Combinatorics Seminar*, Dartmouth College, Hanover, NH Apr. 2016

Contributed Research Talks

- **Homomorphisms on Noncommutative Symmetric Functions and Permutation Enumeration** July 2018
16th International Conference on Permutation Patterns
Dartmouth College, Hanover, NH

- **Shuffle-Compatible Permutation Statistics**

- *AMS Contributed Paper Session on Partitions, Paths, and Permutations* Jan. 2018
2018 Joint Mathematics Meetings, San Diego, CA
- *26th British Combinatorial Conference* July 2017
University of Strathclyde, Glasgow, Scotland, UK
- *14th International Conference on Permutation Patterns* June 2016
Howard University, Washington, DC
- *Graduate Student Combinatorics Conference 2016* Apr. 2016
Clemson University, Clemson, SC

- **Peaks, Descents, and Pattern Avoidance**

- *15th International Conference on Permutation Patterns* June 2017
Reykjavík University, Reykjavík, Iceland
- *Graduate Student Combinatorics Conference 2017* Apr. 2017
University of Kansas, Lawrence, KS

- **The Goulden–Jackson Cluster Method for Monoid Networks and an Application to Lattice Path Enumeration**

8th International Conference on Lattice Path Combinatorics and Applications
California State Polytechnic University, Pomona, Pomona, CA

Aug. 2015

- **The VC Dimension of Random Set Systems, Word Sets, and Permutation Sets**

AMS Session on Combinatorics, I
2013 Joint Mathematics Meetings, San Diego, CA

Jan. 2013

Research Poster Presentations

- **Homomorphisms on Noncommutative Symmetric Functions and Permutation Enumeration**

31st International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), University of Ljubljana, Ljubljana, Slovenia

July 2019

- **Shuffle-Compatible Descent Statistics and Quotients of Quasisymmetric Functions**

30th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Dartmouth College, Hanover, NH

July 2018

Invited Talks for an Undergraduate Audience

- **Counting Permutations Using Valley-Hopping**

- *Math/Stat Colloquium*, Swarthmore College, Swarthmore, PA Feb. 2018
- *Special Seminar*, University of Hartford, West Hartford, CT Feb. 2018
- *Math Colloquium*, Hamilton College, Clinton, NY Feb. 2018
- *Math/CS Coffee*, Davidson College, Davidson, NC Feb. 2018

- **Combinatorics, Generating Functions, and a Permutation Counting Problem** Sept. 2014
Special Seminar, Goucher College, Baltimore, MD

Local Talks

- 1 *Special Seminar* talk (for an undergraduate audience), Brandeis University Jan. 2018
- 7 talks given at the *Combinatorics Seminar*, Brandeis University 2014–2018
- 6 talks given at the *Graduate Student Seminar*, Brandeis University 2014–2017

Teaching

Davidson College

- MAT 108: **Cryptology Through History** Spring 2019
- MAT 255: **Number Theory** Spring 2019
- MAT 320: **Combinatorics** Fall 2018
- MAT 340: **Probability** Fall 2018, Fall 2019
- MAT 355: **Abstract Algebra I** Fall 2019
- MAT 491: **Independent Study**
 - Gamma-Positivity in Permutation Enumeration Spring 2019

Brandeis University

- MATH 8a: **Introduction to Probability and Statistics** Summer 2016
- MATH 10a: **Techniques of Calculus (a)** Fall 2015, Spring 2016
- MATH 10b: **Techniques of Calculus (b)** Fall 2014, Spring 2015
- MATH 14b: **Cryptology** Fall 2017
- MATH 298a: **Independent Study**
 - Linear Algebra for Secondary Education Summer 2015

Student Research Mentoring

Davidson College

- Jacob D'Aurizio ('20) Summer 2019
Supervised research project on lattice path enumeration.
- Crossan Cooper ('20) and Will Jones ('19) Spring 2019
Supervised research project on gamma-positivity.

- Savannah Williams ('19) Fall 2018–Spring 2019
Second reader for honors thesis on zero forcing polynomials.

MIT PRIMES (High School Research Program)

- Richard Zhou (Lexington High School '18) Spring 2017–Fall 2017
Supervised research project on permutation pattern avoidance.

Selected Conferences and Research Workshops

- MAA MathFest 2019 July–Aug. 2019
Cincinnati, OH
- 31st International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC) July 2019
University of Ljubljana, Ljubljana, Slovenia
- 2019 Joint Mathematics Meetings Jan. 2019
Baltimore, MD
- MAA MathFest 2018 Aug. 2018
Denver, CO
- 30th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC) July 2018
Dartmouth College, Hanover, NH
- 16th International Conference on Permutation Patterns July 2018
Dartmouth College, Hanover, NH
- 2018 Joint Mathematics Meetings Jan. 2018
San Diego, CA
- 29th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC) July 2017
Queen Mary University of London, London, England, UK
- 26th British Combinatorial Conference July 2017
University of Strathclyde, Glasgow, Scotland, UK
- 15th International Conference on Permutation Patterns June–July 2017
Reykjavík University, Reykjavík, Iceland
- 14th International Conference on Permutation Patterns June 2016
Howard University, Washington, DC
- 8th International Conference on Lattice Path Combinatorics and Applications Aug. 2015
California State Polytechnic University, Pomona, Pomona, CA
- 12th International Conference on Permutation Patterns July 2014
East Tennessee State University, Johnson City, TN

- Stanley@70 June 2014
Massachusetts Institute of Technology, Cambridge, MA

Selected Professional Development and Teaching Workshops

- **FIRST** (Workshops, Journal Clubs, Book Discussions, STEM Education Hours) Jan. 2019–Present
Davidson College, Davidson, NC
- **Project NExT Workshops** at:
 - MAA MathFest 2019, Cincinnati, OH July–Aug. 2019
 - 2019 Joint Mathematics Meetings, Baltimore, MD Jan. 2019
 - MAA MathFest 2018, Denver, CO July–Aug. 2018
- **ACS FOCUS Institute** June 2019
Hendrix College, Conway, AR
- **Pedagogy Workshop** May 2018
Graduate School of Arts and Sciences, Brandeis University, Waltham, MA
- **Graduate Students with Teaching Responsibilities** (Workshop Series) Jan.–May 2017
Center for Teaching and Learning, Brandeis University, Waltham, MA

Selected Awards, Grants, and Honors

National

- **MAA Project NExT Fellow** 2018–2019

Davidson College

- **Faculty Study and Research Grant** 2019
Awarded \$4,000 to sponsor a summer research student.

Brandeis University

- **Jerome Levine Thesis Prize** 2018
Awarded annually to a graduate student in the Mathematics Department for an outstanding Ph.D. dissertation.
- **University Prize Instructorship** 2017
Awarded \$6,000 by the Graduate School of Arts and Sciences to design and teach an undergraduate course in cryptology.
- **Outstanding Teaching Fellow Award** 2016
Awarded annually to best graduate student instructors in the Graduate School of Arts and Sciences.
- **Teaching Innovation Grant: Flipping the Calculus Classroom** 2015
Worked with Rebecca Torrey (PI) to implement a partial flipped classroom structure in Brandeis University calculus classes.

- **Graduate Student Teaching Prize** 2015
Awarded annually to a graduate student in the Mathematics Department for skill and dedication in teaching.

Selected Service and Professional Activities

Profession

- **Referee** for the following journals: 2018–Present
 - *Advances in Applied Mathematics*
 - *Electronic Journal of Combinatorics*
 - *Journal of Combinatorial Theory, Series A*
 - *Journal of Combinatorics*
 - *Proceedings of the American Mathematical Society*
 - *SIAM Journal on Discrete Mathematics*
- **Reviewer**, *Mathematical Reviews* 2018–Present
- **Co-organizer**, Project NExT Workshop: *Mentoring Undergraduate Research for Beginners*, 2019 Joint Mathematics Meetings 2019

Davidson College

- **Major Advisor** for 3 students 2019–Present
- **Co-organizer**, Math/CS Coffee (departmental colloquium series) 2019–Present
- **Committee Member**, Campus and Religious Life 2019–Present
- **Faculty Member**, Phi Beta Kappa (Gamma of North Carolina Chapter) 2019–Present
- **Member**, Faculty of Color Caucus 2018–Present
- **Member**, Junior Faculty Network 2018–Present
- **Faculty Speaker**, International Student Pre-Orientation 2018
Spoke to incoming international students about social identity, belonging, and mental health.

Brandeis University

- **Co-organizer**, Combinatorics Seminar 2016–2018
- **Workshop Faciliator**, Mathematics Department Teaching Practicum 2016
Developed and facilitated a teaching workshop for graduate student instructors on the topic of countering stereotype threat in the classroom.
- **Panelist**, Mathematics Department Introductory Graduate Student Panel 2014, 2015, 2017

Community Outreach

- **Volunteer**, Charlotte Mathematics Club 2018
Assisted in the supervision of mathematical enrichment activities for middle school and high school students.