Jay Pantone

jay.pantone@gmail.com • jaypantone.com

Research Area

My research is focused on the development and application of **computational and experimental symbolic methods** to **combinatorics**. These methods incorporate techniques from a variety of areas, including **analytic and symbolic combinatorics**, **computer algebra**, and **statistical mechanics**.

Appointments and Visiting Positions

Marquette University — **Milwaukee, WI**
Assistant Professor — *August 2018 – present*

Dartmouth College — **Hanover, NH**
John Wesley Young Research Instructor — *July 2015 – August 2018*

University of Melbourne — **Melbourne, Australia**
NSF EAPSI Fellow — *June 2015 – August 2015*

Education

University of Florida — **Gainesville, FL**
PhD, Mathematics (2015), Advisor: Vincent Vatter — *2011 – 2015*
MS, Mathematics (2013)

University of Florida — **Gainesville, FL**
BS, Mathematics, Computer Science — *2007 – 2011*

Grants

The Conant 1879 Memorial Lectureship and the Robert 1931 and Ruth Fraser Fund — **$27,000**
Dartmouth College — *July 2018*

- A gift that supported the organization of Permutation Patterns 2018

National Science Foundation
East Asia and Pacific Summer Institutes, Award #1514825 — *June 2015 – August 2015*

- Joint program with the National Science Foundation and the Australian Academy of Science to fund a two-month visiting position at the University of Melbourne to collaborate with Tony Guttmann

Publications (in reverse chronological order)

All articles can be found at `jaypantone.com/publications/`.

[18] Pantone, J. and Vatter, V. Growth rates of permutation classes: categorization up to the uncountability threshold. *Israel J. Math. (to appear)* (2019+). arXiv:1605.04289.

[17] Albert, M. H., Pantone, J., and Vatter, V. On the growth of merges and staircases of permutation classes. *Rocky Mt. J. Math. (to appear)* (2019+).

[16] Miner, S. and Pantone, J. Completing the structural analysis of the 2×4 permutation classes. arXiv:1802.00483.

[15] Albert, M. H., Engen, M., Pantone, J., and Vatter, V. Universal layered permutations. *Electron. J. Combin.* 25.3 (2018), Paper 3.23, 5pp.

[14] Fidler, J., Glasscock, D., Miceli, B., Pantone, J., and Xu, M. Shift equivalence in the generalized factor order. *Arch. Math. (Basel)* 110.6 (2018), pp. 539–547.

[13] Albert, M. H., Homberger, C., Pantone, J., Shar, N., and Vatter, V. Generating permutations with restricted containers. *J. Combin. Theory Ser. A* 157 (2018), pp. 205–232.

[12] Bevan, D., Brignall, R., Elvey Price, A., and Pantone, J. A structural characterisation of $\mathrm{Av}(1324)$ and new bounds on its growth rate. arXiv:1711.10325.

[11] Pantone, J. The enumeration of permutations avoiding 3124 and 4312. *Ann. Comb.* 21.2 (2017), pp. 293–315.

[10] Pantone, J. The asymptotic number of simple singular vector tuples of a cubical tensor. *Online J. Anal. Comb.* 12 (2017), 11pp.

[9] Bevan, D., Levin, D., Nugent, P., Pantone, J., Pudwell, L., Riehl, M., and Tlachac, M. Pattern avoidance in forests of binary shrubs. *Discrete Math. Theor. Comput. Sci.* 18.2 (2016), Paper No. 8, 22pp.

[8] Guttmann, A. J., Jensen, I., Maillard, J.-M., and Pantone, J. Is the full susceptibility of the square-lattice Ising model a differentially algebraic function? *J. Phys. A* 49.50 (2016), p. 504002.

[7] Bóna, M., Homberger, C., Pantone, J., and Vatter, V. Pattern-avoiding involutions: exact and asymptotic enumeration. *Australas. J. Combin.* 64.1 (2016), pp. 88–119.

[6] Albert, M. H., Atkinson, M. D., Homberger, C., and Pantone, J. Deflatability of permutation classes. *Australas. J. Combin.* 64.1 (2016), pp. 252–276.

[5] Azarija, J., Klavžar, S., Lee, J., Pantone, J., and Rho, Y. On isomorphism classes of generalized Fibonacci cubes. *European J. Combin.* 51 (2016), pp. 372–379.

[4] Burstein, A. and Pantone, J. Two examples of unbalanced Wilf-equivalence. *J. Comb.* 6.1-2 (2015), pp. 55–67.

[3] Albert, M. H., Homberger, C., and Pantone, J. Equipopularity classes in the separable permutations. *Electron. J. Combin.* 22.2 (2015), Paper 2.2, 18pp.

[2] Pantone, J. and Vatter, V. On the Rearrangement Conjecture for generalized factor order over $\mathbb{P}$. In: *26th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2014)*. Discrete Math. Theor. Comput. Sci. Proc., AT. 2014, pp. 217–228.

Conference Articles

[1] Bevan, D., Brignall, R., Elvey Price, A., and Pantone, J. Staircases, dominoes, and the growth rate of 1324-avoiders. *Electron. Notes Discrete Math.* 61 (2017). The European Conference on Combinatorics, Graph Theory and Applications (EUROCOMB'17), pp. 123–129.

Scholarly Activities

Advising

- Christian Bean (PhD, Reykjavik University, 2018), External Examiner
- Tómas Ken Magnússon (MS, Reykjavik University, 2018), External Examiner
- Justin Troyka (PhD, Dartmouth College, 2018), Thesis Committee Member
- Everett Sullivan (PhD, Dartmouth College, 2017), Thesis Committee Member

Software Development

- Co-authored open-source Python library for handling large sets of permutations: `jaypantone.com/software/permpy/`

Conference Organization

- Permutation Patterns 2018 (Dartmouth College), Chair, Organizing Committee and Scientific Committee
- Formal Power Series and Algebraic Combinatorics 2018 (Dartmouth College), Organizing Committee
- Special Session on Applied and Computational Combinatorics (2018, AMS-MAA Joint Meetings), Co-organizer
- Discrete Math Day 2017 (Dartmouth College), Organizing Committee
- Permutation Patterns 2016 (Washington, D.C.), Scientific Committee
- Special Session on Enumerative Combinatorics (2015, AMS-MAA Joint Meetings), Co-organizer
- Bijective and Algebraic Combinatorics (2014), Organizing Committee

Journal Editing

- Online Encyclopedia of Integer Sequences, Associate Editor
- Discrete Mathematics and Theoretical Computer Science, Guest Editor for *Permutation Patterns 2016* special issue

Journal Refereeing

Advances in Applied Mathematics, Australasian Journal of Combinatorics, Discrete Applied Mathematics, Discrete Mathematics, Discrete Mathematics and Theoretical Computer Science, Electronic Journal of Combinatorics, European Journal of Combinatorics, FILOMAT, Journal of Combinatorial Theory A, Journal of Combinatorics, Journal of Mathematical Analysis and Applications, Theory of Computing Systems, Transactions on Mathematical Software

AMS Mathematical Reviews – 8 reviews written

Department Service

Combinatorics Seminar Organizer
Dartmouth College *2015 – 2018*

Association for Women in Mathematics, Essay Contest Judge
Dartmouth College *2017, 2018*

Invited Talks

How many chord diagrams have no short chords?
Special Session on Enumerative Combinatorics, 2019 Joint Math Meetings *January 2019*

Sorting with $\mathcal{C}$-Machines
Dagstuhl Seminar on Genomics and Statistical Mechanics *November 2018*

`guessfunc`: A new software package for the automated conjecturing of generating functions
International Congress on Mathematical Software – University of Notre Dame *July 2018*

Local Patterns in Chord Diagrams
University of Pennsylvania Probability Seminar *April 2018*

Sorting with $\mathcal{C}$-Machines
University of South Alabama, Department Colloquium *February 2018*

Sorting with $\mathcal{C}$-Machines
Marquette University, Department Colloquium *February 2018*

Šindel Sequences and Triangular Numbers: The Mathematics of the Orloj
Marquette University, Department Colloquium *February 2018*

Sorting with $\mathcal{C}$-Machines
Mississippi State University, Department Colloquium *February 2018*

Sorting with $\mathcal{C}$-Machines
University of Nebraska Omaha, Department Colloquium *February 2018*

Šindel Sequences and Triangular Numbers: The Mathematics of the Orloj
University of Nebraska Omaha, Department Colloquium *February 2018*

Sorting with $\mathcal{C}$-Machines
Rose-Hulman Institute of Technology, Department Colloquium *January 2018*

Patterns and Colorability in Chord Diagrams
Special Session on Applied and Computational Combinatorics, 2018 Joint Math Meetings *January 2018*

Sorting with $\mathcal{C}$-Machines
San Diego State University, Department Colloquium *November 2017*

Sorting with $\mathcal{C}$-Machines
Brandeis University Combinatorics Seminar *November 2017*

Sorting with $\mathcal{C}$-Machines
Erwin Schrödinger International Institute – Vienna, Austria *October 2017*

Exact and Asymptotic Analysis of Combinatorial Sequences
University of Florida Combinatorics Seminar *October 2017*

Combinatorial Exploration
University of Florida, Department Colloquium *October 2017*

The Method of Differential Approximation in Enumerative Combinatorics
SIAM Conference on Applied Algebraic Geometry *July 2017*

Experimental Analysis of Combinatorial Sequences
Georgia Tech Combinatorics Seminar — *February 2017*

On the Growth of Merges and Staircases of Permutation Classes
AMS Section Meeting – Minneapolis, Minnesota — *October 2016*

Sorting with $\mathcal{C}$-machines: Enumerative and Analytic Aspects
Banff International Research Station – Banff, Canada — *October 2016*

Approximate Asymptotic Analysis of Combinatorial Sequences
Rutgers Experimental Mathematics Seminar — *October 2016*

Exact and Asymptotic Analysis of Combinatorial Sequences
Dartmouth College, Department Colloquium — *May 2016*

The Method of Differential Approximants
Leibniz Center for Informatics – Warden, Germany — *February 2016*

The Method of Differential Approximants
AMS Section Meeting – Chicago, Illinois — *October 2015*

Sorting with $\mathcal{C}$-Machines
University of Melbourne Statistical Mechanics Seminar — *July 2015*

Equivalence of Words in the Generalized Factor Order
AMS Section Meeting – Washington, D.C. — *March 2015*

Equipopularity in the Separable Permutations
AMS Section Meeting – Eau Claire, Wisconsin — *September 2014*

Contributed Talks

Circuit Scramble – Using Algebra for Fun and Profit
Marquette University Pure Math Seminar — *October 2018*

On the Growth of Merges and Staircases of Permutation Classes
Permutation Patterns 2018 – Hanover, New Hampshire — *July 2018*

Growth Rates of Permutation Classes
Permutation Patterns 2016 – Washington, D.C. — *June 2016*

Sorting with $\mathcal{C}$-Machines
University of Florida Combinatorics Seminar — *December 2015*

Sorting with $\mathcal{C}$-Machines
Dartmouth College Combinatorics Seminar — *October 2015*

Pattern-Avoiding Involutions: Exact and Asymptotic Enumeration
Permutation Patterns 2014 – Johnson City, Tennessee — *July 2014*

The Rearrangement Conjecture, poster
Formal Power Series and Algebraic Combinatorics 2014 – Chicago, Illinois — *July 2014*

Introduction to LaTeX, parts 1 and 2
University of Florida LaTeX Seminar — *March 2014*

Checker Jumping, Coin Counting, and Cap Throwing: Why Generating Functions are Magic!
University of Florida Graduate Student Colloquium — *August 2013*

The Enumeration of Permutations Avoiding the Patterns 3124 and 4312
Permutation Patterns 2013 – Paris, France — *July 2013*

Enumeration of the Area Under Lattice Paths
University of Florida Combinatorics Seminar — *November 2012*

The History of π
University of Florida Pi Mu Epsilon Seminar *March 2012*

Teaching Experience

More detailed information about my teaching experience can be found at `jaypantone.com/teaching/`.

Instructor, Marquette University

Math 2100/2105/2350 – Discrete Mathematics / Foundations of Mathematics *Spring 2019, Fall 2018*
MSCS 6040 – Graduate Applied Linear Algebra *Spring 2019*

Instructor, Dartmouth College

Math 31 – Abstract Algebra *Summer 2017*
Math 20 – Probability *Summer 2017*
Math 118 – Graduate Combinatorics *Spring 2017*
Math 28 – Combinatorics *Winter 2017*
Math 13 – Multivariable Calculus *Fall 2016*
Math 22 – Linear Algebra with Applications *Spring 2016*
Math 118 – Graduate Combinatorics *Winter 2016*
Math 11 – Multivariable Calculus for Freshmen *Fall 2015*

Instructor, University of Florida

MAP 2302 – Differential Equations *Summer 2015*
MAC 2233 – Survey of Calculus 1 *Summer 2014*
MAC 1147 – Precalculus with Trigonometry *Summer 2012*

Technical Skills

- Extensive programming and computing experience with Python, PHP, Java, C++, Maple, Sage, GAP, and Singular
- Extensive web development experience with PHP, MySQL, and Javascript