# Eric Rowland

Department of Mathematics Hofstra University Hempstead, New York 11549-1000

https://ericrowland.github.io https://www.youtube.com/@EricRowland

Research Number theory, combinatorics, theoretical computer science.

Academic Hofstra University

Positions Associate Professor, Department of Mathematics,

Fall 2021 - present.

Hofstra University

Assistant Professor, Department of Mathematics,

Fall 2016 - Spring 2021.

University of Liège

Marie Curie Actions COFUND Postdoctoral Fellow, Department of Mathematics,

January 2014 – December 2015.

Supervisor: Michel Rigo

University of Québec at Montréal

Postdoctoral Fellow, LaCIM, January 2012 – December 2013.

Supervisors: Srecko Brlek and Christophe Reutenauer

University of Waterloo

Postdoctoral Fellow, School of Computer Science, Fall 2011.

Supervisor: Jeffrey Shallit

TULANE UNIVERSITY

NSF VIGRE Postdoctoral Researcher, Department of Mathematics, Fall 2009 – Spring 2011.

Supervisor: Victor Moll

Education RUTGERS UNIVERSITY, NEW BRUNSWICK

> Ph.D. in Mathematics, 2009. Advisor: Doron Zeilberger

University of California, Santa Cruz B.A. in Mathematics with Highest Honors, 2003.

**Publications** Natural bijections for contiguous pattern avoidance in words, with Julia Carrigan\* and Isaiah

Hollars\*,

submitted (14 pages).

The lexicographically least square-free word with a given prefix, with Siddharth Berera\*, Andrés Gómez-Colunga\*, Joey Lakerdas-Gayle\*, John López, Mauditra Matin\*, Daniel Roebuck\*,

Noam Scully\*, and Juliet Whidden\*,

submitted (44 pages).

Limiting density of the Fibonacci sequence modulo powers of p, with Nicholas Bragman\*,

submitted (20 pages).

Lucas' theorem modulo  $p^2$ ,

The American Mathematical Monthly 129 (2022) 846–855. Double-blinded.

<sup>\*</sup> Asterisks indicate undergraduates.

Ultimate periodicity problem for linear numeration systems, with Émilie Charlier, Adeline Massuir, and Michel Rigo,

International Journal of Algebra and Computation 32 (2022) 561–596. Single-blinded.

Lucas congruences for the Apéry numbers modulo  $p^2$ , with Reem Yassawi and Christian Krattenthaler,

Integers 21 (2021) A20 (15 pages). Single-blinded.

Automaticity and invariant measures of linear cellular automata, with Reem Yassawi, Canadian Journal of Mathematics 72 (2020) 1691–1726. Single-blinded.

Avoiding 5/4-powers on the alphabet of nonnegative integers, with Manon Stipulanti, *The Electronic Journal of Combinatorics* **27** (2020) #P3.42 (39 pages). Single-blinded.

Avoiding 5/4-powers on the alphabet of nonnegative integers (extended abstract), with Manon Stipulanti,

Developments in Language Theory, edited by N. Jonoska and D. Savchuk, *Lecture Notes in Computer Science* **12086** (2020) 280–293. Single-blinded.

A closed-form solution might be given by a tree: valuations of quadratic polynomials, with Leyda Almodóvar, Alyssa Byrnes\*, Julie Fink\*, Xiao Guan\*, Aashita Kesarwani, Gary Lavigne\*, Luis Medina, Victor Moll, Isabelle Nogues\*, Senthil Rajasekaran\*, and Amber Yuan\*, SCIENTIA, Series A: Mathematical Sciences 29 (2019) 11–28. Invited; no peer review.

Integer Sequences: a package for computing with k-regular sequences,

International Congress on Mathematical Software (ICMS 2018), Lecture Notes in Computer Science 10931 (2018) 414–421. Single-blinded.

Avoiding fractional powers over the natural numbers, with Lara Pudwell, The Electronic Journal of Combinatorics 25 (2018) #P2.27 (46 pages). Single-blinded.

A matrix generalization of a theorem of Fine, Integers 18A (2018) A18 (11 pages). Single-blinded.

Binomial coefficients, valuations, and words, Developments in Language Theory (DLT 2017), Lecture Notes in Computer Science 10396 (2017)

68–74. Invited; no peer review.

Periodicity in the *p*-adic valuation of a polynomial, with Luis Medina and Victor Moll, *Journal of Number Theory* **180** (2017) 139–153. Single-blinded.

p-adic asymptotic properties of constant-recursive sequences, with Reem Yassawi, Indagationes Mathematicae 28 (2017) 205–220. Single-blinded.

Profinite automata, with Reem Yassawi,

Advances in Applied Mathematics 85 (2017) 60-83. Single-blinded.

Decision algorithms for Fibonacci-automatic words, II: related sequences and avoidability, with Chen Fei Du, Hamoon Mousavi, Luke Schaeffer, and Jeffrey Shallit,

Theoretical Computer Science 657 (2017) 146–162. Single-blinded.

Infinite products arising in paperfolding, with Leyda Almodóvar, Victor Moll, Hadrian Quan\*, Fernando Roman\*, and Michole Washington\*,

Journal of Integer Sequences 19 (2016) 16.5.1 (18 pages). Single-blinded.

What's in YOUR wallet?, with Lara Pudwell,

The Mathematical Intelligencer 37 (2015) 54–60. Single-blinded.

p-regularity of the p-adic valuation of the Fibonacci sequence, with Luis Medina, The Fibonacci Quarterly **53** (2015) 265–271. Single-blinded.

Automatic sets of rational numbers, with Jeffrey Shallit,

International Journal of Foundations of Computer Science 26 (2015) 343-365. Single-blinded.

Automatic congruences for diagonals of rational functions, with Reem Yassawi,

Journal de Théorie des Nombres de Bordeaux 27 (2015) 245–288. Single-blinded.

Classification of automorphic conjugacy classes in the free group on two generators, with Bobbe Cooper,

Algorithmic Problems of Group Theory, Their Complexity, and Applications to Cryptography, edited by D. Kahrobaei and V. Shpilrain, *Contemporary Mathematics* **633** (2015) 13–40. Single-blinded.

What is an automatic sequence?,

Notices of the American Mathematical Society 62 (2015) 274–276. Single-blinded.

A new approach to the 2-regularity of the ℓ-abelian complexity of 2-automatic sequences, with Aline Parreau, Michel Rigo, and Élise Vandomme,

The Electronic Journal of Combinatorics 22 (2015) #P1.27 (44 pages). Single-blinded.

A characterization of p-automatic sequences as columns of linear cellular automata, with Reem Yassawi.

Advances in Applied Mathematics 63 (2015) 68-89. Single-blinded.

Structure and enumeration of (3 + 1)-free posets, with Mathieu Guay-Paquet and Alejandro Morales,

Annals of Combinatorics 18 (2014) 645-674. Single-blinded.

A case study in meta-automation: automatic generation of congruence automata for combinatorial sequences, with Doron Zeilberger,

Journal of Difference Equations and Applications 20 (2014) 973–988. Single-blinded.

The rational–transcendental dichotomy of Mahler functions, with Jason Bell and Michael Coons.

Journal of Integer Sequences 16 (2013) 13.2.10 (11 pages). Single-blinded.

Structure and enumeration of (3 + 1)-free posets (extended abstract), with Mathieu Guay-Paquet and Alejandro Morales,

25th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2013), Discrete Mathematics & Theoretical Computer Science Proceedings (2013) 253–264. Single-blinded.

Growing words in the free group on two generators, with Bobbe Cooper,

Illinois Journal of Mathematics 55 (2011) 417–426. Single-blinded.

Boundary growth in one-dimensional cellular automata, with Charles Brummitt, Complex Systems 21 (2012) 85–116. Single-blinded.

The iterated integrals of  $\ln(1+x^n)$ , with Tewodros Amdeberhan, Christoph Koutschan, and Victor Moll,

International Journal of Number Theory 8 (2012) 71–94. Single-blinded.

Avoiding 3/2-powers over the natural numbers, with Jeffrey Shallit,

Discrete Mathematics 312 (2012) 1282–1288. Single-blinded.

Toward a language theoretic proof of the four color theorem, with Bobbe Cooper and Doron Zeilberger,

Advances in Applied Mathematics 48 (2012) 414–431. Single-blinded.

k-automatic sets of rational numbers, with Jeffrey Shallit,

6th International Conference, Language and Automata Theory and Applications 2012, edited by A.-H. Dediu and C. Martín-Vide, *Lecture Notes in Computer Science* **7183** (2012) 490–501. Single-blinded.

The number of nonzero binomial coefficients modulo  $p^{\alpha}$ ,

Journal of Combinatorics and Number Theory 3 (2011) 15-25. Single-blinded.

Iterated primitives of logarithmic powers, with Luis Medina and Victor Moll,

International Journal of Number Theory 7 (2011) 623–634. Single-blinded.

Pattern avoidance in binary trees,

Journal of Combinatorial Theory, Series A 117 (2010) 741-758. Single-blinded.

Non-regularity of  $|\alpha + \log_k n|$ ,

Integers 10 (2010) 19-23. Single-blinded.

Counting interesting elections, with Lara Pudwell,

The American Mathematical Monthly 117 (2010) 167–174. Single-blinded.

Regularity versus complexity in the binary representation of  $3^n$ ,

Complex Systems 18 (2009) 367–377. Single-blinded.

A natural prime-generating recurrence,

Journal of Integer Sequences 11 (2008) 08.2.8 (13 pages). Single-blinded.

Local nested structure in rule 30,

Complex Systems 16 (2006) 239–258. Single-blinded.

# Educational Videos

3 YouTube videos about surprising pieces of number theory,

https://www.youtube.com/@EricRowland.

### Software Development

15 *Mathematica* packages for computation and automated theorem proving in a variety of areas, https://ericrowland.github.io/packages.html.

Wolfram Alpha

R&D Fellow / Consultant, 2006 – 2018.

Design and implementation of Wolfram Alpha's framework for answering geometry questions.

Additional functionality for number theory, cellular automata, music theory, graphs, polyhedra, etc.

# Grants and Awards

Honorable Mention (\$500) in the Summer of Math Exposition 2 for my video "1 Billion is Tiny in an Alternate Universe: Introduction to p-adic Numbers",

https://youtu.be/3gyHKCDq1YA, 2022.

HCLAS Faculty Research and Development Grant (\$3000),

Hofstra University, 2022.

2022 Polymath Jr Program, NSF award DMS-2218374 (\$47,728),

Senior Personnel; Principal Investigator: Adam Sheffer.

Award for Distinguished Teaching,

Metro New York Section of the Mathematical Association of America, 2021.

REU Site: New York City Discrete Mathematics REU, NSF award DMS-2051026 (\$259,200),

Senior Personnel; Principal Investigator: Adam Sheffer.

HCLAS Faculty Research and Development Grant (\$2380),

Hofstra University, 2020.

HCLAS Faculty Research and Development Grant (\$2285),

Hofstra University, 2018.

BeIPD-COFUND-IPD Grant (€21,000),

University of Liège and the European Union, January 2014 – December 2015.

NSF U.S. Junior Oberwolfach Fellow,

Travel grant to attend Combinatorics on Words workshop, Oberwolfach, Germany, August 2010.

Graduate Assistantship, Rutgers University, Spring 2009.

Teaching Excellence Award, Rutgers University, Spring 2006.

Henry C. Torrey Fellowship, Rutgers University, Fall 2003 – Spring 2005.

## Teaching Experience

HOFSTRA UNIVERSITY

Mathematical Excursions; Linear Mathematics and Matrices; Logic, Sets, and Probability; Precalculus; Analytic Geometry and Calculus I; Introduction to Higher Mathematics; Number Theory; Combinatorics and Graph Theory; Engineering Mathematics I; Experimental Mathematics

TULANE UNIVERSITY

Calculus II; Linear Algebra; Experimental Mathematics; Abstract Algebra I

RUTGERS UNIVERSITY

Calculus II for the Mathematical and Physical Sciences; Introductory Linear Algebra

Lecture Series University of Liège

Introduction to Programming in Mathematica,

Liège, Belgium, Fall 2015.

MSRI Undergraduate Program

Lectures on automatic sequences, regular sequences, p-adic numbers, valuations, and experimental mathematics,

MSRI, Berkeley, CA, Summer 2014.

Wolfram Science Summer School

Lectures on cellular automata, finite automata, randomness and complexity, experimental mathematics, and programming in *Mathematica*,

Seven summers 2007–2016 at University of Vermont, Burlington, VT; Istituto di Scienza e Tecnologie, Pisa, Italy; Curry College, Milton, MA; and Bentley University, Waltham, MA.

### Talks

PLENARY TALKS

Developments in Language Theory, Liège, Belgium (2017–8–11).

Spring Meeting of the Indiana Section of the Mathematical Association of America, Franklin, IN (2010-4-10).

INVITED CONFERENCE TALKS

Applications of Computer Algebra [online] (2021–07–24).

Joint Mathematics Meetings, Denver, CO (2020–1–15).

AMS Fall Southeastern Sectional Meeting, Gainesville, FL (2019–11–2).

International Congress on Mathematical Software, South Bend, IN (2018–7–27).

SIAM Conference on Discrete Mathematics, Denver, CO (2018–6–7).

Combinatorial and Additive Number Theory, New York, NY (2018–5–25).

Joint Mathematics Meetings, San Diego, CA (2018–1–10).

Applications of Computer Algebra, Jerusalem, Israel (2017–7–20).

AMS Spring Eastern Sectional Meeting, New York, NY (2017–5–6).

Bridges Between Automatic Sequences, Algebra, and Number Theory, Montréal, QC (2017–4–27).

SIAM Conference on Applied Algebraic Geometry, Daejeon, South Korea (2015–8–6).

Discrete Mathematics Day, Liège, Belgium (2015–1–8).

AMS Fall Eastern Sectional Meeting, Halifax, NS (2014–10–19).

Joint Mathematics Meetings, San Diego, CA (2013–1–9).

ISM Quebec Student Conference, Montréal, QC (2012–6–1).

Joint Mathematics Meetings, New Orleans, LA (2011–1–8).

Mini-Workshop: Combinatorics on Words, Oberwolfach, Germany (2010–8–27).

### SEMINAR TALKS

Hofstra University, Hempstead, NY [online] (2022–9–16).

The Open University, Milton Keynes, UK (2022–9–14).

Experimental Mathematics Seminar, Rutgers University, Piscataway, NJ [online] (2021–11–4).

Colloquium, Queen's University, Kingston, ON [online] (2021–9–24).

Hofstra University, Hempstead, NY (2021–9–8).

Discrete Math Seminar, University of Massachusetts Amherst [online] (2020–11–13).

One World Seminar on Combinatorics on Words [online] (2020–11–9).

Hofstra University, Hempstead, NY (2020-6-8).

New York Combinatorics Seminar, New York, NY (2018–12–7).

Séminaire de combinatoire du LaCIM, UQAM, Montréal, QC (2018-4-20).

Hofstra University, Hempstead, NY (2018–2–14).

New York Combinatorics Seminar, New York, NY (2017–12–22).

Valparaiso University, Valparaiso, IN (2017–1–20).

Hofstra University, Hempstead, NY (2016–10–26).

Experimental Mathematics Seminar, Rutgers University, Piscataway, NJ (2016–9–29).

Combinatorics Seminar, University of California, Los Angeles, CA (2016–2–11).

Colloquium, Tulane University, New Orleans, LA (2016–1–14).

Discrete Mathematics Seminar, Université de Liège, Belgium (2015–3–12).

Comprehensible Seminar, Université de Liège, Belgium (2015–2–20).

Séminaire de combinatoire du LaCIM, UQAM, Montréal, QC (2014–10–22).

Number Theory Seminar, University of Illinois, Urbana-Champaign, IL (2014–10–16).

Colloquium, Rutgers University, Piscataway, NJ (2013–9–27).

New York Applied Algebra Colloquium, New York, NY (2013–4–12).

Trent University, Peterborough, ON (2012–12–5).

Mathematical Physics & Probability Seminar, University of California, Davis, CA (2012–10–24).

REU Seminar, Valparaiso University, Valparaiso, IN (2012–6–22).

Experimental Mathematics Seminar, Rutgers University, Piscataway, NJ (2012–4–5).

RISC, Hagenberg, Austria (2011–9–8).

Algorithms Project Seminar, INRIA Rocquencourt, Le Chesnay, France (2011–9–5).

REU Seminar, Valparaiso University, Valparaiso, IN (2011–7–8).

REU Seminar, Valparaiso University, Valparaiso, IN (2010–6–17).

Seminar, William Paterson University, Wayne, NJ (2006–4–5).

OUTREACH TALKS

Columbia Grammar & Preparatory School, New York, NY (2014–10–8).

Princeton Friends School, Princeton, NJ (2008–11–15).

Guest "Problem of the Week" lecture, Princeton Friends School, Princeton, NJ (2005–4–29).

Postdoctoral Mentee Manon Stipulanti, Visiting Scholar,

Hofstra University, October 2019 – August 2020.

Graduate Student Philip Kopel, Master's thesis: Classical and recent advances in fast polynomial multiplication,

Tulane University, 2011.

Undergraduate Research

Julia Carrigan and Isaiah Hollars, Natural bijections for contiguous pattern avoidance in words,

New York City Discrete Mathematics REU, Baruch College, Summer 2022.

Joshua Crisafi, Honors Thesis: Lucas congruences modulo  $p^2$  for a variety of integer sequences, Hofstra University, Fall 2021 – Spring 2022.

22 students worldwide, The lexicographically least square-free word with a given prefix, Polymath Jr., Summer 2021.

Daniel Dimijian, Searching the Apéry numbers efficiently,

Hofstra University, Spring 2020 - Fall 2020.

Brandon Crofts, Honors Thesis: An exploration and generalization of the KRC sequence, Hofstra University, Fall 2019 – Spring 2020. Brandon's thesis won the university's 2020 Undergraduate Library Research Award in the sciences category.

Mike Chinbayar, Honors Thesis: Pascal's triangle and finding the expected value, Hofstra University, Fall 2019.

Kawkab Abid, The Collatz function in base 3,

Hofstra University, Spring 2019 - Fall 2019.

Nicholas Bragman, Limiting density of the Fibonacci sequence modulo powers of p, Hofstra University, Fall 2017 – Summer 2019.

Brian Zilli, Honors Thesis: Some properties of reversible cellular automaton rules, Hofstra University, Spring 2018.

6 undergraduate research teams (18 students), co-supervised with Victor Moll, MSRI-UP, Berkeley, CA, 2014.

34 individual research projects,

Wolfram Science Summer School, seven summers 2007–2016.

High School Student Research Jason Wu,

Hofstra University, Summer 2022 - present.

Yousuf Kidwai, A substitution system for cellular automaton rule 2230,

Hofstra University, Summer 2019.

Kevin Chen and Abel Varghese, Experimental determination of Sinkhorn limits, Hofstra University Summer Science Research Program, Summer 2019.

Jared Bank, An analysis of boundary growth rates in one-dimensional cellular automata, Hofstra University, Fall 2018. Jared's project won 1st place in the math category at the 2019 Long Island Science & Engineering Fair, and Jared went on to participate in the International Science and Engineering Fair.

Anna Finkelstein, Reversibility in cellular automata,

Hofstra University, Summer 2017.

University Service Hofstra University

Hiring Committee for Web and Mobile Developer position, Spring 2020.

Honor Board, Fall 2019 – present.

Bowling Club Content Advisor, Fall 2018 – present.

Academic Calendar Committee, Spring 2018 – present.

Mathematics Club Content Advisor, Fall 2017 – present.

Admission events (Admitted Student Day / Fall Open House / First-Year Student Fair),

February 2017, October 2017, October 2018, October 2019 (two), April 2020, November 2020,

January 2021, February 2022, April 2023.

Departmental Service

Departmental Hofstra University

Departmental Personnel Committee, Fall 2021.

Organizer, Mathematics Seminar, Fall 2019 – Spring 2020.

Mathematics Department Webmaster, Fall 2017 – present.

Mathematics Department Library Liaison, Spring 2017 – present.

Internship Committee, Spring 2017.

Hiring Committee, January–February 2017.

University of Waterloo

Organizer, Languages and Automata Theory Seminar, Fall 2011.

RUTGERS UNIVERSITY

Co-founding organizer, Round Table Discussions Seminar, Fall 2008 – Spring 2009.

Organizer, Directed Reading Program for undergraduates, Fall 2005 – Spring 2009.

Conference & Session Organization

Conference & Special Session on Experimental Mathematics in Number Theory and Combinatorics,

AMS Fall Southeastern Sectional Meeting, online, November 2021.

Annual Meetings of the Metro New York Section of the Mathematical Association of America,

online, May 2020, May 2021, and May 2022.

AMS Special Session on Sequences, Words, and Automata,

Joint Mathematics Meetings, Denver, CO, January 2020.

Annual Meeting of the Metro New York Section of the Mathematical Association of America, Hofstra University, May 2018.

AMS Special Session on Arithmetic Properties of Sequences from Number Theory and Combinatorics.

Joint Mathematics Meetings, Atlanta, GA, January 2017.

Workshop on Automatic Sequences,

University of Liège, May 2015.

This conference was funded by my BeIPD-COFUND-IPD grant and had 50 participants.

From A = B to Z = 60, a conference celebrating Doron Zeilberger's 60th birthday,

DIMACS, Rutgers University, May 2010.

Professional Service Thesis Committee for Adeline Massuir's Ph.D. Defense,

University of Liège, April 2021.

Prize Committee, Wolfram Rule 30 Prizes (totaling \$30,000),

2019 – present.

Webmaster, Metropolitan New York Section of the Mathematical Association of America, 2019 – present.

Editorial Board, Complex Systems, 2018 – present.

Wikipedia editor (700 edits, modifying 400 pages) and initial creator of the articles Alan Cobham (mathematician), Constant-recursive sequence, k-regular sequence, and Legendre's formula.

Programmatic checking and correcting of the OEIS database, Summer 2017 and Summer 2022.

Referee (88 articles).

Journals: Acta Arithmetica, Advances in Applied Mathematics, The American Mathematical Monthly, Annals of Combinatorics, Bulletin of the Australian Mathematical Society, Combinatorica, Complex Systems, Discrete Mathematics, Discrete Mathematics Letters, The Electronic Journal of Combinatorics, European Journal of Combinatorics, Functiones et Approximatio, Graphs and Combinatorics, Indagationes Mathematicae, Integers, Journal de Théorie des Nombres de Bordeaux, Journal of Algebraic Combinatorics, Journal of Combinatorial Theory Series A, Journal of Combinatorics and Number Theory, Journal of Difference Equations and Applications, Journal of Integer Sequences, Journal of Number Theory, The Mathematica Journal, Mathematics Exchange, Mathematics Magazine, Proceedings of the American Mathematical Society, Publicationes Mathematicae Debrecen, RAIRO Theoretical Informatics and Applications, Research in Number Theory, Séminaire Lotharingien de Combinatoire, Theoretical Computer Science.

Conferences: Developments in Language Theory (DLT), International Colloquium on Automata, Languages, and Programming (ICALP), International Congress on Mathematical Software (ICMS), International Symposium on Symbolic and Algebraic Computation (ISSAC), International Workshop on Combinatorial Algorithms (IWOCA), Language and Automata Theory and Applications (LATA).

Author, 32 reviews of articles for *Mathematical Reviews*.

Reviewer, 2 grants submitted to government funding agencies.

External reviewer, Best Paper Award of TU Vienna's Faculty of Mathematics.

Updated February 12, 2023