

# Pat Devlin

## Curriculum Vitae

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### Employment

- 2020–present **Lecturer**, *Yale University*, Connecticut.  
2017–2020 **Gibbs Assistant Professor**, *Yale University*, Connecticut.  
Post-doctoral research and teaching position

### Education and Professional Development

- 2017–2018 **Project NExT Fellowship**, *Mathematics Association of America*.  
Selection to the 2017 cohort of this national teaching development program
- 2011–2017 **PhD in Mathematics**, *Rutgers University*, New Jersey.  
Advisor: Jeff Kahn      Dissertation: *Stability results and extremal combinatorics*
- 2010 **MSc in Mathematical Sciences**, *University of Delaware*, Delaware.  
Advisor: Wenbo Li
- 2008–2010 **BSc in Mathematical Sciences**, *University of Delaware*, Delaware.  
Magna cum laude; minor in computer science

### Research Interests

Combinatorics and theoretical computer science, especially probabilistic and extremal aspects

### Publications and Preprints

- [1] Ross Berkowitz and Pat Devlin. Central limit theorem for majority dynamics: bribing three voters suffices. 2021+. Preprint, arXiv:2010.08172.
- [2] Deepak Bal, Ross Berkowitz, Pat Devlin, and Mathias Schacht. Hamiltonian berge cycles in random hypergraphs. *Combinatorics, Probability and Computing*, 30(2):228–238, 2021.
- [3] Pat Devlin, Jeremy Kepner, Ashley Luo, and Erin Meger. Hybrid power-law models of network traffic. *IEEE International Parallel and Distributed Processing Symposium Workshops*, pages 280–287, June 2021.
- [4] Matija Bucic, Pat Devlin, Mo Hendon, Dru Horne, and Ben Lund. Perfect matchings and derangements on graphs. *Journal of Graph Theory*, 97(2):340–354, 2021.
- [5] Kira Adaricheva, Benjamin Brubaker, Pat Devlin, Steven Miller, Victor Reiner, Alexandra Seceleanu, Adam Sheffer, and Yunus Zeytuncu. When life gives you lemons, make mathematicians! *Notices of the AMS*, pages 375–378, March 2021.
- [6] Dagur Tómas Ásgeirsson and Pat Devlin. Palindromes in finite groups and the explorer-director game. *International Journal of Algebra and Computation*, 31(03):491–499, 2021.
- [7] Pat Devlin, Erin Meger, Abigail Raz, and Polly-Matthew REU. Explorer-director game on finite graphs. 2021+. Preprint, arXiv:2104.09451.

- [8] Pat Devlin and Tony Zeng. Maximum distances in the four-digit Kaprekar process. *Integers*, 21, 2021.
- [9] Aaron Berger, Ross Berkowitz, Pat Devlin, and Van Vu. Universality for real roots of random polynomials. 2021+. Preprint available on request.
- [10] Ross Berkowitz, Pat Devlin, Michael Doppelt, Sonali Durham, Tessa Murthy, and Harish Vemuri. Connected-intersecting graph families. 2019+. Preprint, arXiv:1901.01616.
- [11] Ross Berkowitz, Pat Devlin, Catherine Lee, Henry Reichard, and David Townley. Expected chromatic number of random subgraphs. 2019+. Preprint, arXiv:1811.02018.
- [12] Hüseyin Acan, Pat Devlin, and Jeff Kahn. Proof of an entropy conjecture of Leighton and Moitra. *Journal of Combinatorial Theory, Series A*, 161:299–308, 2019.
- [13] David Brandfonbrener, Pat Devlin, Netanel Friedenberg, Yuxuan Ke, Steffen Marcus, Henry Reichard, and Ethan Sciamma. Two-vertex generators of Jacobians of graphs. *The Electronic Journal of Combinatorics*, 25, 2018.
- [14] Ross Berkowitz and Pat Devlin. A stability result using the matrix norm to bound the permanent. *Israel Journal of Mathematics*, 224(1):437–454, 2018.
- [15] Pat Devlin and Jeff Kahn. Perfect fractional matchings in  $k$ -out hypergraphs. *The Electronic Journal of Combinatorics*, 24(3), 2017.
- [16] Pat Devlin and Jeff Kahn. On stability in the Erdős-Ko-Rado Theorem. *SIAM J. Discrete Math.*, 30(2):1283–1289, 2015.
- [17] Pat Devlin and Edinah K Gngang. Primes Appearing in Prime Tower Factorization. 2014.
- [18] Pat Devlin and Howard J Nuer. A strange family of Calabi-Yau 3-folds. *String-Math 2014*, 93:245, 2014.
- [19] Pat Devlin and Edinah K Gngang. Some integer formula encodings and related algorithms. *Advances in Applied Mathematics*, 51(4):536–541, 2013.
- [20] Pat Devlin. Integer Subsets with High Volume and Low Perimeter. *Integers*, 12, 2012.

### Supervised student work

- [21] Pat Devlin and Tony Zeng. Fractals in the five-digit Kaprekar process. 2021. Student thesis.
- [22] Chris West. Stressing the virtual memory subsystem with modified PARSEC benchmarks. 2021. Student thesis.
- [23] Lilly Gold. Machine learning approaches for real-time monitoring of road traffic. 2021. Student thesis.
- [24] Pat Devlin and Stephen Newman. The curling conjecture. 2020. Student thesis.
- [25] Joy Qiu. Inductive learning and writing proofs: student experiences in advanced university mathematics. 2020. Student thesis.
- [26] Sanelma Heinonen. Discrete convexity with applications to maximizing user satisfaction in bike sharing systems. 2020. Student thesis.

- [27] Andre Moura. Classification of local fields. 2020. Student thesis.
- [28] Pat Devlin and Sabrina Evans. Joy ride: how subway structure affects citizen happiness. 2019. Student thesis.
- [29] Maxime Lukianchikov. Mathematics and magic. 2019. Student thesis.
- [30] Sage Lazzaro. We solved an MTV reality show weeks before the finale using simple math – mathematical spoilers ahead. *The Observer*, November 2014.
- [31] Yunus Tunçbilek. Rare graphs and anti-Ramsey multiplicities. 2018. Student thesis.
- [32] Pat Devlin and Henry Reichard. Codes on the space of hypergraphs. 2018. Student thesis.
- [33] David Brandfonbrener and Pat Devlin. Algebraic graph theory, strongly regular graphs, and Conway’s 99 problem. 2017. Student thesis.

### Selected Presentations and Invited Talks

- 2021 Yale University distinguished address - *Math as a Collaborative art*
- 2021 University of Nebraska–Lincoln - *Limit laws for majority dynamics*
- 2020 McGill University - *Anti-concentration results for the symmetric group*
- 2019 Massachusetts Institute of Technology - *Real roots of random polynomials*
- 2017 Wesleyan University - *Topological methods in combinatorics*
- 2017 University of Pennsylvania - *An entropy conjecture of Leighton and Moitra*
- 2016 Princeton University - *Matrices with large permanent*

### Awards and Honors

- |              |   |  |
|--------------|---|--|
| 2017–present | Over \$50,000 of various internal Yale grants awarded   | Yale University                        |
| 2021         | Richard H. Brodhead ’68 Prize for Teaching Excellence<br><i>Annual university-wide award for non-ladder track faculty</i> | Yale University                        |
| 2018         | OZY Educator Award<br><i>Nominated and won for Math as a Creative Art (Yale, spring 2018)</i>                             |  |
| 2018         | Excellence in Teaching with Technology  | Yale University                        |
| 2017         | Project NExT Fellowship   | Mathematics Association of America     |
| 2017         | Best math seminar presentation<br>Title: <i>Things I learned from my students (humorous and otherwise)</i>                | Rutgers University                     |
| 2016         | TA Teaching Excellence Award  | Rutgers University Math Department     |
| 2011         | GAANN Fellowship  | Rutgers University                     |
| 2010         | Barry M Goldwater Scholarship   |  |
| 2010         | Wolf Scholarship  | University of Delaware Math Department |
| 2009         | Rees Scholarship  | University of Delaware Math Department |

### Advising Undergraduate Research

- Polymath Jr. Research Program: project mentor and program co-organizer Summer 2020, 2021
  - Helped develop and implement radically inclusive, remote, large-format REU-style program

- Co-authored description of program in *Notices of the AMS* [5]
- Co-director of Yale's summer math research program (SUMRY) Summer 2018
- Theses advised: at Yale [9, 21, 22, 23, 25, 26, 27, 28, 31, 32, 33]; at University of Iceland [6]
- Other student research led [3, 7, 8, 10, 11, 13, 24, 29, 30]

## Equity and Outreach

- Invited member of advisory committee on diversity, equity, and inclusion (Yale) 2021
  - Generated college-wide reports for the deans and university president
- Founding member of departmental Climate Committee (Yale math) 2020–present
- Member of Diversity, Equity, and Inclusion Committee (Yale math) 2020
  - Coauthored sixty-page report formally endorsed and adopted by department
- I-RISE Summer Math Program 2019
  - Designed and implemented remedial math program meeting three times a week
  - For teenage refugee students with severely limited or interrupted education opportunities
- *Uniform Convergence* by Corrine Yap 2017, 2018
  - Organized performances of this one-woman play at Yale and MathFest
  - Play explores cultural and societal barriers facing women and non-white mathematicians
- *Dimensions* (AWM student chapter) faculty mentor (Yale) 2017–present
- Yale Girls in Math High School Competition 2017–present
- Yale Undergraduate Math Society faculty mentor 2017–present
- MathCounts faculty mentor (Yale) 2017–present
  - Student-led outreach program for local primary schools
- Member and faculty mentor for *Math Alliance* 2017–present
- Center for Social Justice Education (Rutgers) 2016–2017
- Volunteer workshop facilitator for McNair scholars program (Rutgers) Spring 2016
- Young Scholars Program (Rutgers) Summer 2015–2019, 2021
  - Four-week summer math program for talented high school students
  - Resident instructor and co-director (2016, 2017)
- Volunteer at Youth Empowerment Services, New Brunswick 2012–2014
  - Outreach and tutoring program for low-income primary-school students.

## Evidence of Inclusive Teaching Practices

- Instructor for primary transition-to-proofs sequence (Yale math 230/231) 2017–present
  - Rigorous sequence whose reputation had become prohibitively exclusive
  - Increased retention drastically, particularly among historically underrepresented groups
  - Fall 2020, enrolling over 10% of Yale's entire first-year cohort (132 of 1267)
- Nominated by students to discuss my course design at Yale-wide symposium 2018
  - Title: *Fostering community through Canvas: inclusivity through online tools*
- Putnam seminar coordinator *Rutgers 2015–2016, Yale 2017–present*
  - Initiated weekly problem-solving seminar with emphasis on inclusivity
  - Historic participation in Putnam exam at Yale
    - Average 107 participants each year since 2017 (previous Yale record 27; average 18.4)
    - Over 2.5% of undergraduate student body took Putnam in 2018
    - Particularly increased representation among students less confident in or newer to math
  - Presented MathFest 2019 talk titled *Community, belonging, and the Putnam*

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## Teaching Experience

*The symbol • indicates new courses I developed*

- Linear algebra (with proofs) Yale math 225 - Fall 2021
- Problem solving seminar (Putnam preparation) Yale - Fall 2017, 2018, 2019, 2020, 2021
- Enumerative combinatorics Young Scholars Program – Summer 2021
- Estimation and error Yale math 108 - Spring 2021
- Multivariate calculus and linear algebra I Yale math 230 - Fall 2017, 2018, 2019, 2020
- Multivariate calculus and linear algebra II Yale math 231 - Spring 2018, 2019, 2020, 2021  
- Intensive introduction to proofs. Online from spring 2020 to spring 2021
- I-RISE math program Summer 2019
- Algorithms and complexity theory Young Scholars Program – Summer 2016, 2017, 2019
- Extremal combinatorics (graduate level) Yale math 674 - Spring 2019
- Math as a creative art Yale math 77 - Spring 2018
- Problem solving seminar (Putnam preparation) Rutgers math 491 – Fall 2015, 2016
- Undergraduate honors seminar Rutgers math 492 – Spring 2016
- Probability Young Scholars Program – Summer 2015
- Probability Rutgers math 477 – Summer 2015
- Math for liberal arts majors (honors) Rutgers math 103 – Fall 2014
- Calculus 1 for majors Rutgers math 151 – Summer 2014
- Linear algebra with MATLAB component Rutgers math 250.c – Fall 2013
- Calculus 2 for majors Rutgers math 152 – Summer 2013
- Linear algebra Rutgers math 250 – Spring 2013

### Teaching Assistant

- Linear algebra Rutgers math 250 – Fall 2015  
- Chosen to pioneer the first departmental use of online office hours.
- Calculus 1 for non-majors Rutgers math 135 – Spring 2015
- Calculus 3 for majors Rutgers math 251 – Spring 2014
- Calculus 1 for majors Rutgers math 151 – Fall 2012

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## Professional Service

- Journal referee (various) and book referee (Yale University Press)
- Committee member for curricular redesign in Yale math department 2020
- Organizer for Yale combinatorics seminar 2017–present
- Volunteer to modernize Yale math department web page 2017–2018
- Organizer for Rutgers discrete math seminar 2015–2017
- Math Teachers' Circle facilitator: New Brunswick, NJ 2016–2017
- North Jersey Regional Science Fair judge 2013–present
- Rutgers Arresty Research Symposium judge 2014, 2017
- Co-founder of Rutgers applied game theory seminar 2013
- Organizer for Rutgers graduate student pizza seminar 2012