

CURRICULUM VITAE OF DAVID GALVIN

JUNE 23, 2020

Department of Mathematics, University of Notre Dame
255 Hurley Hall, Notre Dame IN 46556
dgalvin1@nd.edu

<http://nd.edu/~dgalvin1/>

RESEARCH INTERESTS

- Discrete probability, combinatorics and graph theory; in particular, extremal enumerative problems, set partitions, and the applications of combinatorial and probabilistic ideas to the study of phase transitions in statistical physics models and long-range correlations in discrete random structures

EDUCATION

- Ph.D. in Mathematics, Rutgers, The State University of New Jersey
October 2002 (advisor: Jeff Kahn)
- Part III of Mathematical Tripos (M. Math.), Peterhouse, University of Cambridge
June 1996
- B.A. in Mathematics, Peterhouse, University of Cambridge
June 1995

EMPLOYMENT

Regular positions.

- Professor, Department of Mathematics, University of Notre Dame
July 2020 – present
- Associate Professor, Department of Mathematics, University of Notre Dame
July 2013 – June 2020
- Assistant Professor, Department of Mathematics, University of Notre Dame
July 2007 – June 2013
- Lecturer, Department of Mathematics, University of Pennsylvania
July 2005 – June 2007 (mentor: Robin Pemantle)
- Member, School of Mathematics, Institute for Advanced Study, Princeton
September 2004 – August 2005 (group leader: Avi Wigderson)
- Postdoctoral Researcher, Theory Group, Microsoft Research
July 2002 – July 2004 (managers: Jennifer Chayes & Christian Borgs)

Visiting positions.

- REGS (Research Experience for Graduate Students) official visitor, Department of Mathematics, University of Illinois at Urbana-Champaign
June 2011
- Visiting Fellow, Isaac Newton Institute, University of Cambridge
June 2008
- Member, Mathematical Sciences Research Institute, Berkeley

January – February 2005

- Auxiliary Faculty, Department of Mathematics, University of Washington
August – December 2003

RESEARCH PAPERS

Numbering. Numbering for all research papers follows that used at <https://www3.nd.edu/~dgalvin1/research.html> where pdf copies may be found. Unless otherwise specified, all articles listed below are posted on the arXiv preprint server at [http://arxiv.org:443/find/math/1/au:+Galvin_D/0/1/0/all/0/1](http://arxiv.org/443/find/math/1/au:+Galvin_D/0/1/0/all/0/1)

Legend.

- (*) — Notre Dame undergraduate at time of research
- (**) — undergraduate at another institution
- (+) — Notre Dame graduate student
- (++) – graduate student at another institution
- (@) – Notre Dame postdoctoral researcher
- (@@) – postdoctoral researcher at another institution

Papers submitted.

- [43] On the independent set sequence of a tree (with A. Basit(@)), arXiv.2006.12562
- [42] Independent set and matching permutations (with T. Ball(+), K. Hyry(*) and K. Weingartner(*)), submitted February 2019

Refereed papers.

2020

- [41] Cutting lemma and Zarankiewicz’s problem in distal structures (with A. Chernikov & S. Starchenko, *Selecta Math. (N.S.)* **26**, article #25)
- [40] Total non-negativity of some combinatorial matrices (with A. Pacurar(+)), *J. Combin. Theory Ser. A* **172** (2020), article #105179)

2019

- [39] Phase Coexistence for the Hard-Core Model on \mathbb{Z}^2 (with A. Blanca(@@), Y. Chen(*), D. Randall & P. Tetali), *Combin. Probab. Comput.* **28** (2019), 1–22
- [38] The game of plates and olives (with T. Carroll), *Electron. J. Combin.* **26** (2019), P1.18
- [37] Restricted Stirling and Lah number matrices and their inverses (with J. Engbers & C. Smyth), *J. Combin. Theory Ser. A* **161** (2019), 271–298

2018

- [35] The independent set sequence of some families of trees (with J. Hilyard(+)), *Australas. J. Combin.* **70** (2018), 236–252

2017

- [34] Extremal H -colorings of trees and 2-connected graphs (with J. Engbers), *J. Combin. Theory Ser. B* **122** (2017), 800–814

2016

- [32] On the independence ratio of distance graphs (with J. Carraher(++), S. Hartke,

- J. Radcliffe & D. Stolee(++), *Discrete Math.* **339** (2016), 3058–3072
- [31] Asymptotic normality of some graph sequences,
Graphs Combin. **32** (2016), 639–647
- 2015
- [30] Phase coexistence and torpid mixing in the 3-coloring model on \mathbb{Z}^d (with J. Kahn, D. Randall & G. Sorkin), *SIAM J. Discrete Math.* **29** (2015), 1223–1244
- [29] Counting colorings of a regular graph,
Graphs Combin. **31** (2015), 629–638
- [28] Combinatorially interpreting generalized Stirling numbers (with J. Engbers(+) & J. Hilyard(+)), *European J. Combin.* **43** (2015), 32–54
- 2014
- [26] Counting independent sets of a fixed size in graphs with a given minimum degree (with J. Engbers(+)), *J. Graph Theory* **76** (2014), 149–168
- 2013
- [25] Phase Coexistence and Slow Mixing for the Hard-Core Model on \mathbb{Z}^2 (with A. Blanca(++), D. Randall & P. Tetali), *Lecture Notes in Comput. Sci.* **8096** (*Proc. APPROX/RANDOM 2013*) (2013), 379–394
- [24] Stirling numbers of forests and cycles (with D. T. Thanh(*)),
Electron. J. Combin. **20** (2013), #P73
- [23] Maximizing H -colorings of a regular graph,
J. Graph Theory **73** (2013), 66–84
- 2012
- [22] H -coloring tori (with J. Engbers(+)),
J. Combin. Theory Ser. B **102** (2012), 1110–1133
- [21] The independent set sequence of regular bipartite graphs,
Discrete Math. **312** (2012), 2881–2892
- [20] H -colouring bipartite graphs (with J. Engbers(+)),
J. Combin. Theory Ser. B **102** (2012), 726–742
- [19] Reverse Mathematics and infinite traceable graphs (with P. Cholak & R. Solomon),
Math. Log. Q. **58** (2012), 18–28
- 2011
- [18] Two problems on independent sets in graphs,
Discrete Math. **311** (2011), 2105–2112
- [17] The multi-state hard core model on a regular tree (with F. Martinelli, K. Ramanan & P. Tetali), *SIAM J. Discrete Math.* **25** (2011), 894–916
- [16] The number of independent sets in a graph with small maximum degree (with Y. Zhao(**)), *Graphs Combin.* **27** (2011), 177–186
- [15] A threshold phenomenon for random independent sets in the discrete hypercube,
Combin. Probab. Comput. **20** (2011), 27–51
- 2002 – 2010
- [14] An upper bound for the number of independent sets in regular graphs,
Discrete Math. **309** (2009), 6635–6640

- [13] Matchings and Independent Sets of a Fixed Size in Regular Graphs (with T. Carroll(++) & P. Tetali), *J. Combin. Theory Ser. A* **116** (2009), 1219–1227
- [12] Sampling independent sets on the discrete torus, *Random Structures Algorithms* **33** (2008), 356–376
- [11] Sampling 3-colourings of regular bipartite graphs, *Electron. J. Probab.* **12** (2007), 481–497
- [10] Torpid Mixing of Local Markov Chains on 3-Colorings of the Discrete Torus (with D. Randall), *Proc. ACM–SIAM SODA* (2007), 376–384
- [9] Bounding the partition function of spin systems, *Electron. J. Combin.* **13** (2006), #R72
- [8] Slow mixing of Glauber dynamics for the hard-core model on regular bipartite graphs (with P. Tetali), *Random Structures Algorithms* **28** (2006), 427–443
- [7] Global connectivity from local geometric constraints for sensor networks with various wireless footprints (with R. D’Souza(@@), C. Moore & D. Randall), *Proc. ACM–IEEE IPSN* (2006), 19–26
- [6] On weighted graph homomorphisms (with P. Tetali), *DIMACS Ser. Discrete Math. Theoret. Comput. Sci.* **63** (2004) *Graphs, Morphisms and Statistical Physics*, 97–104
- [5] On phase transition in the hard-core model on \mathbb{Z}^d (with J. Kahn), *Combin. Probab. Comput.* **13** (2004), 137–164
- [4] Slow mixing of Glauber dynamics for the hard-core model on the hypercube (with P. Tetali), *Proc. ACM–SIAM SODA* (2004), 459–460
- [2] On homomorphisms from the Hamming cube to \mathbb{Z} , *Israel J. Math.* **138** (2003), 189–213

Unrefereed papers.

- [36] Independent sets in the discrete hypercube (expository article, arXiv only), arXiv:1901.01991 (2019)
- [33] Guest editors’ foreword (with D. Chakrabarty), *Theory Comput.* **12** (2016), *Special issue: APPROX-RANDOM 2014*, Article 8
- [27] Three tutorial lectures on entropy and counting (expository article, arXiv only), arXiv:1406.7872 (2014)
- [3] Entropy and graph homomorphisms (extended abstract of presentation), *Oberwolfach Rep.* **1** (2004), 30–32
- [1] Two problems involving the notion of phase transition (Ph.D. dissertation), *ProQuest Dissertations and Theses* (2002)

GRANTS

Current.

- Principal investigator, Simons Foundation Collaboration Grant for Mathematicians *Exploring H-colorings of graphs*
September 2015 – August 2020
- Senior Personnel, NSF Focussed research grant

Collaborative Research: Computability-Theoretic Aspects of Combinatorics
July 2019 – June 2022

Previous.

- Co-Principal investigator, NSF Conferences and Workshops in the Mathematical Sciences
6th Lake Michigan Workshop on Combinatorics and Graph Theory
March 2019 – March 2020
- Co-Principal investigator, NSF Conferences and Workshops in the Mathematical Sciences
5th Lake Michigan Workshop on Combinatorics and Graph Theory
January 2018 – December 2018
- Co-Principal investigator, IMA Participating Institution Conferences
5th Lake Michigan Workshop on Combinatorics and Graph Theory
April 2018
- Co-Principal investigator, NSF Conferences and Workshops in the Mathematical Sciences
Lake Michigan Workshops on Combinatorics and Graph Theory
January 2017 – December 2018
(Collaborative grant with Western Michigan University; initially only 2017 workshop at Western Michigan was funded)
- Co-Principal investigator, NSF Conferences and Workshops in the Mathematical Sciences
3rd–5th Lake Michigan Workshop on Combinatorics and Graph Theory
January 2016 – December 2018
(Collaborative grant with Western Michigan University and Purdue University; initially only 2016 workshop at Purdue was funded)
- Co-Principal investigator, NSF Conferences and Workshops in the Mathematical Sciences
2nd Lake Michigan Workshop on Combinatorics and Graph Theory
February 2015 – February 2016
- Principal investigator, NSA Mathematical Sciences Program (Young Investigators Grant),
Structural and enumerative aspects of graph homomorphisms
May 2013 – May 2015
- Principal investigator, Simons Foundation Collaboration Grant for Mathematicians
Structural and enumerative aspects of graph homomorphisms
September 2012 – August 2013
(five year grant terminated after one year due to receipt of NSA grant)
- Principal investigator, NSA Mathematical Sciences Program (Young Investigators Grant)
Phase transitions for spin models on percolation clusters
March 2010 – March 2012

HONORS AND AWARDS

- Rev. Edmund P. Joyce C.S.C. Award for Excellence in Undergraduate Teaching,
University of Notre Dame, May 2017
- Father James L. Shilts/Doris and Gene Leonard Teaching Award, College of Science,
University of Notre Dame, May 2016
- Good Teaching Award, Department of Mathematics, University of Pennsylvania,
December 2006

- Graduate School Fellowship, Rutgers, The State University of New Jersey, August 2001 – July 2002
- Scholar of Peterhouse, University of Cambridge, September 1993 – June 1995
- Represented Ireland at International Mathematical Olympiad, July 1990

INVITED RESEARCH PRESENTATIONS SINCE JULY 2007

Plenary talks.

- 58th Midwest Graph Theory Conference, Grand Valley State University (2 talks)
October 6 2017, *Equilateral and almost-equilateral sets in \mathbb{R}^n*
October 7 2017, *Plates, olives, and Morse theory*
- 1st Lake Michigan Workshop on Combinatorics and Graph Theory, Western Michigan University (3 talks)
March 16 2014, *Entropy & Counting Part I* (tutorial lecture)
March 16 2014, *Entropy & Counting Part II* (tutorial lecture)
March 16 2014, *Entropy & Counting Part III* (tutorial lecture)

Colloquia.

- **Coronacancelled (postponed to 2021)** Department of Mathematics, Kalamazoo College
April 21, 2020, *The other 4-color conjecture*
- Department of Mathematics, University of South Carolina
February 20, 2020, *Stirling numbers and the normal order problem*
- Department of Mathematics and Statistics, Georgia State University
April 19 2019, *Plates, olives, and Morse theory*
- Department of Mathematics, University of Nebraska
October 20 2017, *Plates, olives, and Morse theory*
- Department of Mathematics, University of South Carolina
March 16 2017, *Independent sets in regular graphs* (Combinatorics “Super Seminar”)
- Department of Mathematics and Statistics, Loyola University
October 26 2015, *Envy-free division* (undergraduate colloquium)
- Department of Mathematics, Iowa State University
November 4 2014, *Generalized Stirling numbers and the normal ordering problem*
- Department of Mathematics and Statistics, University of North Carolina at Greensboro
January 11 2013, *Taxi walks and the hardcore distribution on \mathbb{Z}^2*
- Department of Mathematics, University of Nebraska
March 2 2012, *Unimodality, log-concavity and asymptotic normality of combinatorial sequences*
- Department of Mathematics, Western Michigan University
April 14 2011, *Counting graph homomorphisms: some results and questions*
- Department of Applied Mathematics, Illinois Institute of Technology
April 11 2011, *Hard-constraint spin systems: some results and questions*

Conference presentations.

- **Coronacancelled (postponed to TBD)** 16th Annual Conference of the

Academy of Discrete Mathematics & Applications, Mangalore, India
 June 2020, *Talk title TBD*

- AMS–MAA Joint Mathematics Meetings, Denver
 Special Session on Analytic and Probabilistic Combinatorics
 January 16 2020, *Inverses and reciprocals of thinned exponential series*
- AMS Sectional Meeting, University of Florida, Gainesville
 Special Session on Extremal and Probabilistic Combinatorics
 November 2 2019, *Matching permutations*
- AMS Sectional Meeting, University of Wisconsin – Madison
 Special Session on Extremal Graph Theory
 September 14 2019, *Independent set permutations and matching permutations*
- International Conference on Advances in Interdisciplinary Statistics and Combinatorics,
 University of North Carolina at Greensboro
 Session on Recent Results in Combinatorics
 October 6 2018, *Total Non-negativity of Some Combinatorial Matrices*
- AMS Sectional Meeting, The Ohio State University
 Special Session on Probabilistic and Extremal Graph Theory
 March 18 2018, *Chordal graphs, Stirling numbers and total non-negativity*
- AMS–MAA Joint Mathematics Meetings, San Diego
 Special Session on Emergent Phenomena in Discrete Models
 January 12 2018, *The non-locality of graph coloring*
- AMS Sectional Meeting, University of St. Thomas (Minneapolis)
 Special Session on Probabilistic and Extremal Combinatorics
 October 29 2016, *Restricted Stirling and Lah numbers, and their inverses*
- Banff International Research Station Workshops
 Workshop in Analytic and Probabilistic Combinatorics
 October 27 2016, *Restricted Stirling and Lah numbers, and their inverses*
- AMS Sectional Meeting, North Dakota State University (2 talks)
 Special Session on Extremal and Probabilistic Combinatorics
 April 17 2016, *Long-range influence in colorings of the cube*
 Special Session on Extremal Graph Theory
 April 16 2016, *Maximizing colorings of a regular graph — results and questions*
 (40-minute talk)
- AMS Sectional Meeting, University of Memphis
 Special Session on Probabilistic Combinatorics
 October 17 2015, *Asymptotic normality of restricted Stirling numbers*
- AMS Sectional Meeting, University of Nevada, Las Vegas
 Special Session on Extremal and Structural Graph Theory
 April 19 2015, *The extremal enumerative question for colouring* (45 minute talk)
- AMS Sectional Meeting, Michigan State University
 Special Session on Extremal Graph Theory: Hypergraphs, Directed Graphs, and
 Other Generalizations
 March 15 2015, *H-colouring trees*
- 2013 – 14 Warwick EPSRC Symposium on Statistical Mechanics, University of Warwick

- Workshop on Phase transitions in discrete structures and computational problems
 May 8 2014, *Taxi Walks and the Hard Core Model on \mathbb{Z}^2*
- AMS Sectional Meeting, University of Louisville
 Special Session on Extremal Graph Theory
 October 5 2013, *Stirling numbers of graphs, and the normal ordering problem*
 - 17th International Workshop on Randomization and Computation (RANDOM'2013),
 University of California – Berkeley
 August 22 2013, *Phase Coexistence and Slow Mixing for the Hard-Core Model on \mathbb{Z}^2*
 - 4th Canadian Discrete and Algorithmic Mathematics Conference,
 Memorial University of Newfoundland
 Minisymposium on Probabilistic Combinatorics
 June 12 2013, *Colouring regular bipartite graphs, cubes and grids*
 - AMS Sectional Meeting, Iowa State University
 Special Session on Graphs, Hypergraphs and Counting
 April 27 2013, *Counting colorings of a regular graph*
 - AMS Sectional Meeting, University of Colorado Boulder
 Special Session on Extremal Graph Theory
 April 13 2013, *Some extremal questions for independent sets*
 - EXCILL2: Extremal Combinatorics at Illinois, University of Illinois at Urbana-Champaign
 March 17 2013, *Some extremal questions for coloring*
 - SIAM Conference on Discrete Mathematics (DM12), Dalhousie University (Halifax,
 Nova Scotia)
 Minisymposium on Graph Coloring
 June 20 2012, *Graph Stirling numbers*
 - Workshop on Computation and Phase Transitions, Georgia Institute of Technology
 June 5 2012, *Proper q -colourings of the cube*
 - AMS Sectional Meeting, University of South Florida
 Special Session on Extremal Combinatorics
 March 10 2012, *The independent set profile in graphs with given minimum degree*
 - AMS Sectional Meeting, University of Nebraska
 Special Session on Extremal and Probabilistic Combinatorics
 October 16 2011, *Counting graph homomorphisms*
 - AMS Sectional Meeting, Wake Forest University
 Special Session on New Developments in Graph Theory
 September 25 2011, *Graph Stirling numbers*
 - AMS Sectional Meeting, University of Iowa
 Special Session on Graph Theory
 March 18 2011, *Unimodality of the independent set sequence of a graph*
 - AMS Sectional Meeting, Syracuse University
 Special Session on Analytic Combinatorics
 October 2 2010, *Unimodality (and otherwise) of some graph theoretic sequences*
 - AMS Sectional Meeting, New Jersey Institute of Technology
 Special Session on Graph Theory
 May 23 2010, *The typical structure of H -colourings of regular bipartite graphs*

- AMS Sectional Meeting, Florida Atlantic University
Special Session on Graph Theory
October 30 2009, *The number of independent sets in graphs with small maximum degree*
- DIMACS Workshop on Discrete Mathematics and Statistical Mechanics,
Rutgers, The State University of New Jersey
December 18 2008, *A threshold phenomenon for independent sets in the hypercube*
- AMS Sectional Meeting, Indiana University
Special Session on Probability and Spatial Systems
April 6 2008, *Sampling 3-colourings of the discrete torus*

Seminars.

- Discrete Math Seminar, Rutgers, The State University of New Jersey
March 9 2020, *Matching permutations and independent set permutations*
- Discrete Mathematics Seminar, University of South Carolina
February 21 2020, *Total non-negativity of some combinatorial matrices*
- Pi Mu Epsilon (math club) talk, University of South Carolina
February 21 2020, *The other 4-color conjecture*
- Combinatorics Seminar, University of Michigan
October 4 2019, *Total non-negativity of some combinatorial matrices*
- Graph Theory Seminar, Georgia Institute of Technology
April 18 2019, *Independent set permutations, and matching permutations*
- Combinatorics Seminar, Western Michigan University
November 8 2018, *Total non-negativity of generalized Stirling matrices*
- Mathematical Computer Science Seminar, University of Illinois at Chicago
October 29 2018, *Total non-negativity of generalized Stirling matrices*
- Math Club talk, University of Nebraska
October 19 2017, *Equilateral and almost equilateral sets*
- Combinatorics Seminar, University of South Carolina
March 17 2017, *Taxi walks and the hard-core model on \mathbb{Z}^2*
- Combinatorics Seminar, Michigan State University
November 22 2016, *Restricted Stirling and Lah numbers, and their inverses*
- Graph Theory Seminar, Western Michigan University
November 2 2016, *Restricted Stirling and Lah numbers, and their inverses*
- Graph Theory Seminar, Western Michigan University
December 4 2015, *The cube-indexed random walk*
- Mathematics Seminar, Grand Valley State University
October 30 2014, *300 years of Stirling numbers*
- Combinatorics seminar, Michigan State University
April 22 2014, *Generalized Stirling numbers and the normal ordering problem*
- Combinatorics and Probability Seminar, The Ohio State University
February 13 2014, *Entropy and Counting*
- Graph Theory Seminar, Western Michigan University
February 6 2013, *Asymptotic normality and graph Stirling numbers*
- Probability Seminar, Purdue University

- September 25 2012, *Taxi walks and the hardcore distribution on \mathbb{Z}^2*
- Analytic Combinatorics Seminar, Purdue University
April 6 2012, *Graph Stirling Numbers*
- Graph Theory Seminar, Western Michigan University
November 29 2011, *An extremal problem for independent sets*
- Graph Theory & Combinatorics Seminar, University of Illinois at Urbana-Champaign
(2 talks)
June 29 2011, *Entropy and Counting*
June 27 2011, *Unimodality of combinatorial sequences*
- Graduate Student Seminar, Illinois Institute of Technology
April 11 2011, *Brégman's theorem and extensions*
- Discrete Mathematics Seminar, University of Delaware
March 2 2011, *Unimodality (and otherwise) of some graph theoretic sequences*
- Combinatorics Seminar, Georgia Institute of Technology
December 15 2010, *Unimodality (and otherwise) of some graph theoretic sequences*
- Graph Theory & Combinatorics Seminar, University of Illinois at Urbana-Champaign
April 27 2010, *The typical appearance of colourings of regular bipartite graphs*
- Combinatorics Seminar, University of Illinois at Chicago
March 11 2009, *A threshold phenomenon for independent sets in the hypercube*
- Combinatorics, Optimization & Algorithms Seminar, Carnegie Mellon University
December 4 2008, *Counting matchings and independent sets of a fixed size*

OTHER RESEARCH PRESENTATIONS SINCE JULY 2007

Contributed conference presentations.

- 19th British Combinatorial Conference, University of Birmingham (UK)
July 31 2019, *Independent set permutations and matching permutations*
- 43rd Annual Mathematics Conference (Combinatorics and its Applications),
Miami University (Ohio)
September 26 2015, *Asymptotic Normality of Restricted Stirling Numbers*
- AMS Sectional Meeting, University of North Carolina at Greensboro
Special Session on Recent Developments in Graph Theory and Hypergraph Theory
November 9 2014, *The independent set sequence of trees*
- 56th Midwest Graph Theory Conference, Purdue University Fort Wayne
October 4 2014, *The independent set sequence of trees*
- 54th Midwest Graph Theory Conference, Miami University (Ohio)
April 6 2013, *Twin conventions and graph Stirling numbers*
- 53rd Midwest Graph Theory Conference, Iowa State University
September 22 2012, *Taxi walks and the hard-core distribution on \mathbb{Z}^2*
- 52nd Midwest Graph Theory Conference, Indiana State University
April 11 2012, *Counting colorings of regular graphs*
- 15th International Conference on Random Structures and Algorithms, Emory University
May 27 2011, *The typical appearance of a colouring of a regular bipartite graph*
- 24th Cumberland Conference on Graph Theory, Combinatorics and Computing,
University of Louisville

- May 12 2011, *Independent sets in graphs with given minimum degree*
- SIAM Conference on Discrete Mathematics (DM10), Austin
Session on Probabilistic Combinatorics
June 17 2010, *H-Colouring Regular Bipartite Graphs*
- 22nd Cumberland Conference on Graph Theory, Combinatorics and Computing,
Western Kentucky University
May 22 2009, *Counting independent sets in regular graphs*
- 47th Midwest Graph Theory Conference, Illinois Institute of Technology
November 8 2008, *Is the independent set sequence of the hypercube unimodal?*

Research presentations at Notre Dame.

- Graduate student seminar
October 14, 2019, *Matchings in graphs*
- Graduate student seminar
October 1, 2018, *Total non-negativity of generalized Stirling matrices*
- Math for Everyone
February 22 2018, *Envy-free division*
- Felix Klein seminar
September 14 2017, *Plates, olives and Morse theory*
- Discrete Mathematics seminar
September 7 2017, *Equilateral and almost equilateral sets*
- Graduate Student Seminar
March 6 2017, *Independent sets in regular graphs*
- Mathematical Research Seminar
February 19 2016, *Equilateral and almost-equilateral sets in \mathbb{R}^n*
- Mathematical Research Seminar
April 4 2014, *Stirling numbers of the first and second kinds*
- Discrete Mathematics seminar
September 16 2013, *A fair selection process that rarely works*
- Discrete Mathematics seminar
April 18 2013, *Stirling numbers and generalizations*
- Mathematical Research Seminar
October 5 2012, *How do I love thee? Let me count the ways*
- Discrete Mathematics seminar
September 4 2012, *Taxi walks and the hard-core distribution on \mathbb{Z}^2*
- Combinatorics and Logic seminar (3 talks)
February 3 2011, *Szemerédi's regularity lemma I*
February 10 2011, *Szemerédi's regularity lemma II*
February 17 2011, *Szemerédi's regularity lemma III*
- Mathematical Research Seminar
October 8 2010, *Unimodality, log-concavity and the real roots property*
- Felix Klein Seminar (2 talks)
February 18 2010, *A topological approach to evasiveness I*
February 25 2010, *A topological approach to evasiveness II*
- Combinatorics and Logic seminar (3 talks)

- September 4 2009, *Ultrafilters, with applications I*
- September 8 2009, *Ultrafilters, with applications II*
- September 15 2009, *Ultrafilters, with applications III*
- Mathematical Physics/Physical Mathematics Seminar
 - October 16 2008, *Combinatorics and Probability in Statistical Mechanics*
- Mathematical Research Seminar
 - September 26 2008, *Graph colouring*
- Graduate Student Seminar
 - September 1 2008, *The “Happy End” Problem — A Mathematical Love Story*
- Applied Mathematics Colloquium
 - April 28 2008, *Independent sets in graphs*

SERVICE AND OUTREACH PRESENTATIONS SINCE JULY 2007

All talks given at Notre Dame unless specified

- **Coronacancelled (postponed to 2021)** George Kitchen Memorial Lecture, Kalamazoo College
 - April 21 2020, *Sharing secrets secretly*
- Talk for admitted graduate students
 - March 2020, *Combinatorics & counting*
- Junior parents weekend presentation
 - February 15 2020, *Sharing secrets secretly*
- TalkScience (Scientia seminar series)
 - February 28 2019, *Easy as 1, 2, 3 — The Art of Counting*
- Junior parents weekend presentation
 - February 16 2019, *Coloring maps*
- Science Exploration Series
 - November 10 2018, *Envy-free division*
- Junior parents weekend presentation
 - February 17 2018, *Coloring maps*
- Junior parents weekend presentation
 - February 18 2017, *The patterns of mathematics*
- Shilts/Leonard award ceremony
 - December 5 2016, *Reflections on teaching*
- College of Science alumni tailgate (2 talks)
 - November 19 2016, *The patterns of mathematics*
- CAST 2016 (Science Teachers Association of Texas 2016 Conference for the Advancement of Science Teaching), San Antonio
 - November 10 2016, *Understanding mathematical patterns in our world*
- A Moment of Science, San Antonio
 - November 10 2016, *Understanding mathematical patterns in our world*
- New graduate students orientation
 - August 19 2016, *What is combinatorics?*
- Mathematics Teaching Seminar
 - February 9 2016, *Supervising Undergraduate Research*

- Notre Dame–Navy Research Forum
October 28 2011, poster presentation
- Talk for admitted graduate students
April 4 2009, *Ramsey Theory*

SELECTED PRESENTATIONS BEFORE JULY 2007

Invited conference presentations.

- 1st Canadian Discrete and Algorithmic Mathematics Conference, Banff
Minisymposium on Problems at the interface of discrete mathematics and statistical physics
May 29 2007, *Counting matchings and independent sets of a fixed size*
- ACM–SIAM Symposium on Discrete Algorithms, New Orleans
January 7 2007, *Sampling 3-colourings of the discrete torus*
- DIMACS–DIMATIA–Renyi Partnership Meeting, Rutgers,
The State University of New Jersey
Algebraic and Geometric Methods in Combinatorics
November 8 2005, *Bounding the partition function of spin-systems*
- INFORMS Applied Probability Conference, Ottawa
Special Session on Spatial Dependence in Stochastic Networks
July 8 2005, *Long-range influence in the hard-core model*
- Canadian Mathematical Society Summer Meeting, University of Waterloo
Special Session on Random Graphs and their applications
June 4 2005, *Bounding the partition function of spin-systems*
- MSRI Program on Probability, Algorithms and Statistical Physics
Workshop on Mixing of Markov Chains in Physics and Algorithms
February 3 2005, *Slow mixing of local dynamics for 3-colourings on regular bipartite graphs*
- ACM–SIAM Symposium on Discrete Algorithms, New Orleans
January 12 2004, *Slow mixing of Glauber dynamics for the hard-core model on the hypercube*
- Mathematisches Forschungsinstitut Oberwolfach
Workshop in Combinatorics
January 9 2004, *Entropy and graph homomorphisms*
- Banff International Research Station Focused Research Groups
Problems in Discrete Probability
July 14 2003, *Asymptotically enumerating graph homomorphisms*
- AMS Sectional Meeting, Indiana University
Special Session on Probability
April 5 2003, *Entropy and graph homomorphisms*
- DIMACS–DIMATIA–Renyi Partnership Meeting (HOMONOLO 02), Prague
Workshop on Graph Homomorphisms
December 17 2002, *Counting weighted graph homomorphisms*
- Isaac Newton Institute programme on Computation, Combinatorics and Probability,
Cambridge (UK)
Workshop on Combinatorial and Computational aspects of Statistical Physics
August 28 2002, *Homomorphisms from the Hamming cube to \mathbb{Z}*

Colloquia.

- Department of Mathematics, Lehigh University
November 15 2006, *Spin models: Gibbs measures and mixing times*
- Department of Mathematics, George Washington University
November 14 2003, *The hard-core model: where statistical physics, communications networks and computer science meet*

Seminars.

- Discrete Mathematics Seminar, Princeton University
November 29 2006, *Global connectivity from local conditions*
- Combinatorics Seminar, University of Delaware
October 6 2006, *Counting colourings*
- Combinatorics Seminar, Georgia Institute of Technology
March 10 2006, *Bounding the partition function of spin-systems*
- Combinatorics Seminar, Graduate Center, City University of New York
March 9 2005, *Entropy and graph homomorphisms*
- Combinatorics Seminar, University of Pennsylvania
February 22 2005, *Entropy and graph homomorphisms*
- Probability Seminar, University of California, Berkeley
January 26 2005, *Homomorphisms from the Hamming cube to \mathbb{Z}*
- Probability Seminar, Stanford University
January 24 2005, *Entropy and graph homomorphisms*
- Probability and Algorithms Seminar, University of Pennsylvania
December 9 2004, *Slow mixing of local dynamics for uniform colourings and independent sets*
- Discrete Mathematics Seminar, Princeton University
December 1 2004, *Homomorphisms from the Hamming cube to \mathbb{Z}*
- Combinatorics, Optimization & Algorithms Seminar, Carnegie Mellon University
February 12 2004, *The entropy method in combinatorics*
- Probability Seminar, University of Washington
February 2 2004, *The entropy method in combinatorics*
- Nonlinear Systems Seminar, Stevens Institute of Technology
December 16 2003, *The hard-core model: where statistical physics, communications networks and computer science meet*
- Combinatorics Seminar, Georgia Institute of Technology
September 16 2003, *Slow mixing of Glauber dynamics for the hard-core model on the hypercube*
- Probability Seminar, University of Washington
April 21 2003, *Gibbs measures for independent set models*
- Combinatorics Seminar, University of Washington
January 29 2003, *Counting functions on the discrete cube*
- Combinatorics Seminar, Massachusetts Institute of Technology
February 8 2002, *Phase transition in the hard-core model on \mathbb{Z}^d*
- Combinatorics Seminar, Georgia Institute of Technology
January 18 2002, *Phase transition in the hard-core model on \mathbb{Z}^d*

- Discrete Mathematics Seminar, Institute for Advanced Study, Princeton
October 24 2001, *Phase transition in the hard-core model on \mathbb{Z}^d*

CONFERENCE ORGANIZATION

- AMS 2020 Fall Western Section Meeting
Special Session on Topics in graphs, hypergraphs and set systems
(with J. Engbers and C. Smyth), University of Utah, October 24–25 2020
- 6th Lake Michigan Workshop on Combinatorics and Graph Theory
(with P. Bennett and A. Dudek), Western Michigan University, April 6–7 2019
- AMS 2018 Fall Central Section Meeting
Special Session on Probabilistic Methods in Combinatorics
(with P. Bennett and A. Dudek), University of Michigan, October 20–21 2018
- 5th Lake Michigan Workshop on Combinatorics and Graph Theory
(with P. Bennett and A. Dudek), University of Notre Dame, April 21–22 2018
- 4th Lake Michigan Workshop on Combinatorics and Graph Theory
(with P. Bennett and A. Dudek), Western Michigan University, April 15–16 2017
- AMS 2017 Spring Central Section Meeting
Special Session on Extremal, probabilistic and structural graph theory
(with J. Engbers), Indiana University, April 1–2 2017
- AMS 2016 Fall Southeastern Section Meeting
Special Session on Graph Theory, Hypergraphs and Set Systems
(with C. Smyth), North Carolina State University, November 12–13 2016
- Algebra, Geometry and Combinatorics Day (ALGECOM 13)
(with A. Diaz, S. Evens and M. Gekhtman), University of Notre Dame, April 30 2016
- Triangle Lectures in Combinatorics
(with C. Smyth), University of North Carolina at Greensboro, February 27 2016
- AMS 2015 Fall Central Section Meeting
Special Session on Graph Theory, Hypergraphs and Set Systems
(with J. Engbers), Loyola University, October 2–4 2015
- 2nd Lake Michigan Workshop on Combinatorics and Graph Theory
(with A. Dudek), University of Notre Dame, March 7–8 2015
- AMS 2014 Fall Southeastern Section Meeting
Special Session on Recent Developments in Graph Theory and Hypergraph Theory
(with C. Smyth), University of North Carolina at Greensboro, November 8–9 2014
- AMS 2010 Fall Central Section Meeting
Special Session on Graphs and hypergraphs
(with H. Kaul), University of Notre Dame, November 5–7 2010
- 1st Canadian Discrete and Algorithmic Mathematics Conference
Minisymposium on Problems at the interface of discrete mathematics and statistical physics
Banff, May 29 2007

STUDENTS SUPERVISED

Graduate students.

- Adrian Pacurar, May 2015 – May 2018

Left Notre Dame due to non-academic reasons

- Justin Hilyard, April 2010 – December 2014
Ph.D. dissertation: *Various results on enumerations of graph homomorphisms*
Went to Epic Systems, Wisconsin
- John Engbers, April 2009 – May 2013
Ph.D. dissertation: *Some problems involving H -colorings of graphs*
Went to tenure-track position in Department of Mathematics, Statistics and Computer Science, Marquette University

Undergraduate senior theses.

- Kyle Weingartner, May 2020 – present
Property testing
- Camille Taltas, May 2018 – May 2019
Markov Chains and mixing times on colorings
- Yuyuan (Ethan) Chen, February 2015 – May 2016
Self-avoiding walks (resulted in paper, item [39] in section Research Papers)
- Monica Gorman, January 2015 – May 2016
Modeling the Spread of Infection on Stochastic Networks
- Luke Sernau, January 2013 – May 2014
Count graph homomorphisms (resulted in paper: L. Sernau, Graph operations and upper bounds on graph homomorphism counts, *J. Graph Th.* **87** (2018), 149–163)
- Sean Meehan, February 2012 – April 2013
On the Topic of Ramsey Theory
- Nick Seewald, February 2012 – April 2013
Entropy and counting
- Bethany Herwaladt, April 2009 – April 2010
Primality testing algorithms (published as: B. Herwaladt, Prime Numbers And Information Security, *Scientia* **1** (Spring 2010), 19–30)
- Andrew McConvey, April 2009 – April 2010
The stable marriage problem
- Meagan Pitluck, November 2007 – April 2009
An Introduction to Voting Systems: Flaws, Failures, and Potential Solutions

Other undergraduate supervision.

- Kateri Budo, January 2020 – May 2020
Directed reading, *Game theory in economics*
- Henry Glunz, October 2019 – May 2020
Directed reading, *Khinchin's Three Pearls of Number Theory*
- Alexander Ju, fall 2019
Directed reading, *Convex optimization*
- Michael Vanover (Purdue University), May 2019 – September 2019
Summer research, *Independent set sequence of trees*
- Katie Hyry and Kyle Weingartner, June – December 2018
Research Experience for Undergraduates and independent research,
Independent set and matching permutations

- (resulted in paper: item [42] in section Research Papers)
- Jonathan Baker, Gregory Conti and Kevin Latimer, January – May 2018
Directed reading, *Combinatorial optimization*
 - Ariel Navotas, January – May 2017
Directed reading, *Combinatorial optimization*
 - Mary Humphrey, August 2016 – May 2017
Directed reading, *Stanley-Wilf conjecture*
 - James Miller, October – December 2015
Independent research, *Secret santa schemes*
 - Pedro Soto (Florida International University), June – August 2015
Summer research, *Ramsey Theory*
 - Hannah Porter, June – December 2014
Summer research, *Generalizing Stirling cycle numbers*
 - Do Trong Thanh, June 2013 – January 2014
Directed reading, *Sampling colorings*
 - Do Trong Thanh, June – December 2011
Glynn Family Honors Program Summer Research, *Graph Stirling numbers*
(resulted in paper: item [24] in section Research Papers)

TEACHING

University of Notre Dame.

(*) indicates course chair

- Math 20850 (Honors Calculus III)
[fall 2020]
- Math 43900 (Problem Solving in Math)
[fall 2020], fall 2019, fall 2015, fall 2014, fall 2013
- Math 48900 (Senior Thesis)
spring 2020
- Math 10860 (Honors Calculus II)
spring 2020, spring 2019, spring 2018
- Math 10850 (Honors Calculus I)
fall 2019, fall 2018, fall 2017
- Math 30530 (Introduction to Probability)
spring 2019, fall 2013, fall 2012, fall 2011(*), fall 2009
- Math 10120 (Finite Mathematics)
spring 2018(*), spring 2017(*), spring 2016(*), spring 2014(*), spring 2013
- Math 60610 (Discrete Mathematics, graduate class)
spring 2017, spring 2015, spring 2009
- Math 60850 (Probability, graduate class)
spring 2016
- Math 40210 (Basic Combinatorics)
fall 2015, spring 2015, spring 2014, fall 2012, spring 2012
- Math 30210 (Introduction to Operations Research)

- fall 2014, fall 2007
- Math 10550 (Calculus I)
fall 2011
- Math 30440 (Introduction to Probability and Statistics)
spring 2010(*), spring 2009(*), spring 2008
- Math 20340 (Probability and Statistics for Life Sciences)
fall 2009, fall 2008
- Math 10560 (Calculus II)
spring 2008

University of Pennsylvania.

- Math 581 (Probabilistic Methods in Combinatorics, graduate class)
spring 2007
- Math 114 (Calculus II)
spring 2007, fall 2006, fall 2005
- Math 313/CSE 313 (Computational Linear Algebra)
spring 2006
- Math 430 (Introduction to Probability)
fall 2005

University of Washington.

- Math 324 (Calculus III)
fall 2003

Rutgers, The State University of New Jersey.

- Math 356 (Number Theory)
summer 2001
- Math 134 (Calculus I), Head Teaching Assistant
fall 2000 – spring 2001
- Math 152 (Calculus II)
summer 2000
- Recitation instructor (various courses)
fall 1997 – spring 2000
- Math 250 (Linear Algebra)
summer 1998
- Grader (300- and 400-level courses)
fall 1996 – spring 1997

DEPARTMENTAL SERVICE

Committee work.

- Ad hoc committee on library space
May 2020 – present
- Graduate committee
May 2019 – present
- Post-doctoral search committee

- spring 2020 and fall 2011
- Mentor for post-doctoral researcher Abdul Basit (with S. Starchenko)
August 2017 – June 2020
- Hiring committee
May 2016 – June 2020 and May 2014 – April 2015
- Faculty-library liaison
August 2015 – present
- Reading graduate applicant files
spring 2020 and spring 2019
- Faculty classroom observation
fall 2019 (Chris Schommer-Pries) and spring 2018 (Steve Heilman)
- Undergraduate committee
May 2016 – April 2019, May 2012 – April 2015 and May 2009 – April 2010
- Aumann Prize coordinator
spring 2020, spring 2019 and spring 2018
- Special Opportunities search committee
fall 2018
- Taliaferro Prize committee
fall 2017
- Faculty teaching mentor for Claudiu Raicu
August 2014 – May 2017
- Committee on Appointments and Promotions
May 2015 – April 2017
- Departmental faculty senate representative
May 2014 – April 2017
- Probability search committee
fall 2016 and fall 2015

Work with and for students.

- Summer reading group on Ramsey Theory organizer
June – July 2020
- First year graduate student advisor for
Yufei Zhang, fall 2020 – present
Adele Zhou, fall 2016 – spring 2017
José Pastrana, fall 2015 – spring 2016
Juan Lebrón-Vázquez, fall 2014 – spring 2015
Phillip Jedlovec, fall 2013 – spring 2014
Hank Ditton, fall 2011 – spring 2012
Justin Hilyard, fall 2009 – spring 2010
- Admitted graduate students open day
March 21 2020, March 24 2012, April 4 2009
- Department representative, Junior Parents Weekend
February 15 2020
- Department representative, AMS–MAA Joint Math Meetings Graduate student fair
January 17 2020 and January 12 2018

- Putnam Competition coordinator
fall 2019, fall 2015, fall 2014 and fall 2013
- Panel discussion for visiting REU students
July 8 2019, July 11 2017, July 7 2015 and June 22 2012
- Math bunker coordinator
May 2019 – present
- Undergraduate advising
April 2017 – present, April 2013 – May 2016 and April 2009 – May 2012
- Ph.D. defense examiner for
Danny Orton, June 26 2019
Nyima Kao, May 3 2017
Stephen Flood, May 11 2012
- Graduate student classroom observation for
Justin Miller, spring 2019
Cunlu Zhu, spring 2017
Timothy Ferdinands, fall 2013
- Ph.D. oral candidacy examiner for
Daniel Soskin, February 28 2019
Li Ling Ko, February 16 2018
Justin Miller, January 26 2018
Derric Chien, November 1 2016
Nyima Kao, April 4 2013
- Research Experience for Undergraduates organizer & mentor (with Abdul Basit)
May – July 2018
- Senior thesis reader for
Patrick Leblanc, May 2018
Mike McCaffrey, May 2017
Eun Seuk Choi, May 2016
Katherine Ritchey, May 2013
Logan Zoellner, May 2009
- Video for online Calculus III course
March 10 2017
- Majors night department representative
spring 2016, spring 2015 and spring 2014
- Panel member, Professional Development Seminar on postdoctoral experience
February 21 2012
- Panel member, Mathematics Teaching Seminar on job search experience
May 3 2011 and April 29 2010
- Undergraduate Admissions Admitted Student Open House
April 7 2011 and April 16 2009
- Numerous recommendation letters

Other departmental service.

- Discrete Mathematics seminar organizer
fall 2017 – spring 2018 and fall 2012 – spring 2013

- Combinatorics and Logic seminar co-organizer (with P. Cholak)
fall 2009 – spring 2012

COLLEGE AND UNIVERSITY SERVICE

Committee work.

- University Committee on Libraries
May 2020 – present
- Shilts-Leonard award selection committee
spring 2018 and spring 2017
- Faculty Senate Bookstore Advisory Committee representative
May 2016 – April 2018
- University Committee on Admissions, Scholarships, and Financial Aid
May 2015 – April 2018
- Faculty Senate election committee
April 2017 and April 2015
- College of Science Dean search committee
fall 2014 – spring 2015
- Faculty Senate
May 2014 – April 2017
- Network physics position search committee
fall 2013
- Committee on an ethics requirement for Science majors
spring 2011

Work with and for students.

- Mentor for the Building Bridges Mentoring Program
fall 2018 – spring 2020 and fall 2014 – spring 2016
- Campus Life Council
fall 2015 – spring 2016 and fall 2014
- Graduate School recruitment day for Morehouse & Spelman undergraduates
March 13 2013
- Ph.D. defense examiner for
Hyunju Kim, Department of Physics, May 19 2011
Radha Krishna Ganti, Department of Electrical Engineering, October 8 2009
- Ph.D. defense Outside Chair for
Ge Liu, Department of Sociology, April 5 2011
Thomas Apker, Department of Aerospace and Mechanical Engineering, December 11 2009
ShaoPing Shen, Department of Physics, April 2 2009
- Ph.D. oral candidacy Outside Chair for
Kan Wang, Department of Aerospace and Mechanical Engineering, August 17 2010
- Ph.D. oral candidacy examiner for
Hyunju Kim, Department of Physics, March 17 2009
- Ph.D. written candidacy examiner for
Hyunju Kim, Department of Physics, October 8 2008

SERVICE AT OTHER INSTITUTIONS

University of Pennsylvania, fall 2005 – spring 2007.

- Probability and Combinatorics Seminar Coordinator
- Preliminary Exam Committee
- Class of 1880 Prize Exam Committee
- Masters thesis examiner
- Oral qualifying examiner

Rutgers, The State University of New Jersey, fall 1999 – spring 2000.

- Graduate Student Seminar Coordinator, Department of Mathematics

SERVICE TO THE PROFESSION

Editorial service.

- Editor, Indian Journal of Discrete Mathematics
August 2018 – present
- Guest editor, special issue of *Theory of Computing* (Volume 12, 2016)

Outreach activities.

- Judge, The Siemens Competition in Math, Science & Technology, Notre Dame regional final
November 14 2017, November 15 2015, November 17 2013,
November 19 2011, November 20 2010 and November 14 2009
- Judge, Northern Indiana Regional Science Fair
March 22 2014 and March 21 2009

Other service to the profession.

- Thesis defense committee (external examiner)
Jinyoung Park, Rutgers, The State University of New Jersey, March 9 2020
- Thesis defense committee
Laars Helenius, Western Michigan University, March 1 2018
- Thesis proposal committee
Laars Helenius, Western Michigan University, February 11 2016
- Panel member for evaluation of federal grant proposals
fall 2015 – spring 2016 and fall 2012 – spring 2013
- External reviewer of domestic & foreign grant proposals
2010 – present
- Program committee member
18th International Workshop on Randomization and Computation (RANDOM'2014)
- Reviewer, Mathematical Reviews
2006 – present
- Refereeing, numerous journals
1999 – present

Professional memberships.

- American Mathematical Society
- Mathematical Association of America