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Will Perkins

Positions

University of Illinois Chicago, MSCS Department   **Chicago, Illinois**
    Assistant Professor   August 2018 – present

University of Birmingham, School of Mathematics   **Birmingham, England**
    Birmingham Fellow (Assistant Professor equiv.)   January 2015 – August 2018

Institute for Mathematics and its Applications   **Minneapolis, Minnesota**
    Postdoc, Special Year on Discrete Structures   September 2014 – December 2014

Georgia Institute of Technology, School of Mathematics   **Atlanta, Georgia**
    NSF Postdoc   September 2011 – August 2014

Education

New York University   **New York, NY**
    Ph.D. in Mathematics   September 2007 – May 2011
    Supervisor: Joel Spencer

Yale University   **New Haven, CT**
    B.A. in History   September 1999 – May 2003

Research Interests

Probability, algorithms and complexity, statistical physics, and combinatorics.

Grants and Awards

EPSRC First Grant, 2017–2018.

NSF Mathematical Sciences Postdoctoral Fellowship, 2011–2014.

Kurt O. Friedrichs Prize for Outstanding Dissertation in Mathematics at New York University, 2011.

Papers

Preprints:

[28]   A. Coja-Oghlan and W. Perkins. Spin systems on Bethe lattices. *arXiv preprint arXiv:1808.03440* (2018)

[27]   T. Helmuth, W. Perkins, and G. Regts. Algorithmic Pirogov-Sinai theory. *arXiv preprint arXiv:1806.11548* (2018)

[26]   A. Coja-Oghlan and W. Perkins. Bethe states of random factor graphs. *arXiv preprint arXiv:1709.03827* (2017)

[25]   M. Jenssen, F. Joos, and W. Perkins. On the hard sphere model and sphere packings in high dimensions. *arXiv preprint arXiv:1707.00476* (2017)

Published and accepted:

[24]   M. Jenssen, P. Keevash, and W. Perkins. Algorithms for #BIS-hard problems on expander graphs. *SODA 2019* (to appear)

[23]   M. Jenssen, F. Joos, and W. Perkins. On kissing numbers and spherical codes in high dimensions. *Advances in Mathematics* 335 (2018), 307–321

[22] G. Perarnau and W. Perkins. Counting independent sets in cubic graphs of given girth. *Journal of Combinatorial Theory, Series B* 133 (2018), 211–242

[21] V. Feldman, W. Perkins, and S. Vempala. On the complexity of random satisfiability problems with planted solutions. *SIAM Journal on Computing* 47.4 (2018), 1294–1338. Extended abstract at *STOC 2015*

[20] A. Coja-Oghlan, F. Krzakala, W. Perkins, and L. Zdeborová. Information-theoretic thresholds from the cavity method. *Advances in Mathematics* 333 (2018), 694–795. Extended abstract at *STOC 2017*

[19] E. Davies, M. Jenssen, W. Perkins, and B. Roberts. Tight bounds on the coefficients of partition functions via stability. *Journal of Combinatorial Theory, Series A* 160 (2018), 1–30

[18] E. Davies, M. Jenssen, W. Perkins, and B. Roberts. Extremes of the internal energy of the Potts models on cubic graphs. *Random Structures & Algorithms* 53.1 (2018), 59–75

[17] A. Coja-Oghlan and W. Perkins. Belief Propagation on replica symmetric random factor graph models. *Annales de l'Institut Henri Poincaré D* 5 (2018), 211–249. Extended abstract at *RANDOM 2016*

[16] E. Davies, M. Jenssen, W. Perkins, and B. Roberts. On the average size of independent sets in triangle-free graphs. *Proceedings of the American Mathematical Society* 146 (2018), 111–124

[15] E. Davies, M. Jenssen, W. Perkins, and B. Roberts. Independent sets, matchings, and occupancy fractions. *Journal of the London Mathematical Society* 96.1 (2017), 47–66

[14] A. Coja-Oghlan, W. Perkins, and K. Skubch. Limits of discrete distributions and Gibbs measures on random graphs. *European Journal of Combinatorics* 66 (2017), 37–59

[13] E. Cohen, P. Csikvári, W. Perkins, and P. Tetali. The Widom–Rowlinson model, the hard-core model and the extremality of the complete graph. *European Journal of Combinatorics* 62 (2017), 70–76

[12] E. Cohen, W. Perkins, and P. Tetali. On the Widom–Rowlinson Occupancy Fraction in Regular Graphs. *Combinatorics, Probability and Computing* 26.2 (2017), 183–194

[11] W. Perkins. Birthday inequalities, repulsion, and hard spheres. *Proceedings of the American Mathematical Society* 144.6 (2016), 2635–2649

[10] L. Florescu and W. Perkins. Spectral thresholds in the bipartite stochastic block model. *29th Annual Conference on Learning Theory (COLT)*. 2016, pp. 943–959

[9] V. Feldman, W. Perkins, and S. Vempala. Subsampled Power Iteration: a Unified Algorithm for Block Models and Planted CSP's. *Advances in Neural Information Processing Systems (NIPS)*. 2015, pp. 2836–2844

[8] O. Louidor and W. Perkins. Large deviations for the empirical distribution in the branching random walk. *Electron. J. Probab.* 20 (2015), no. 18, 19

[7] W. Perkins. Random k-SAT and the power of two choices. *Random Structures & Algorithms* 47.1 (2015), 163–173

[6] M. Bradonjic and W. Perkins. On Sharp Thresholds in Random Geometric Graphs. *APPROX/RANDOM 2014, September 4-6, 2014, Barcelona, Spain*. 2014, pp. 500–514

[5] W. Perkins, M. Tygert, and R. Ward. Some deficiencies of $\chi 2$ and classical exact tests of significance. *Applied and Computational Harmonic Analysis* 36.3 (2014), 361–386

[4] M. Kang, W. Perkins, and J. Spencer. The Bohman-Frieze process near criticality. *Random Structures & Algorithms* 43.2 (2013), 221–250

[3] W. Perkins. The forgetfulness of balls and bins. *Random Structures & Algorithms* 42.2 (2013), 250–267

[2] W. Perkins, M. Tygert, and R. Ward. Computing the confidence levels for a root-mean-square test of goodness-of-fit. *Applied Mathematics and Computation* 217.22 (2011), 9072–9084

[1] I. Dinur, S. Khot, W. Perkins, and M. Safra. Hardness of finding independent sets in almost 3-colorable graphs. *2010 IEEE 51st Annual Symposium on Foundations of Computer Science (FOCS)*. IEEE. 2010, pp. 212–221

Talks

Invited conference and workshop talks:

2018	Aug	Statistical physics and machine learning back together	Cargese, France
	Jul	Large networks and random graphs	Frankfurt, Germany
	Jun	LSE postgraduate combinatorics conference, plenary speaker	London, England
	May	Georgia Tech workshop on algorithms and randomness	Atlanta, GA
	Apr	Scottish Combinatorics Meeting	Edinburgh, Scotland
	Apr	SFI workshop on limits to inference in networks	Santa Fe, NM
2017	Sept	Eurandom workshop on randomness and graphs	Eindhoven, Netherlands
	Aug	Dagstuhl workshop on computational counting	Saarbrucken, Germany
	Jul	Hausdorff school on random constraint satisfaction	Bonn, Germany
	Jun	AIM workshop on randomized computational problems	San Jose, CA
	Feb	Les Houches workshop on statistical inference and physics	Les Houches, France
2016	Oct	Birmingham EPS Research Conference, keynote speaker	Birmingham, England
	Jul	Workshop on Phase Transitions in Discrete Structures	Frankfurt, Germany
	Jun	Minisymposium, SIAM Conference on Discrete Mathematics	Atlanta, GA
	Apr	Random Roads: A Celebration of Joel Spencer's 70th Birthday	New York, NY
	Feb	Simons Institute workshop on Markov Chains and Phase Transitions	Berkeley, CA
	Feb	University of Bristol Algorithms Days	Bristol, England
2015	May	London Colloquia in Combinatorics	London, England
2014	Jun	Minisymposium, SIAM Conference on Discrete Mathematics	Minneapolis, MN
	Apr	Atlanta Lecture Series in Combinatorics and Graph Theory	Atlanta, GA
	Apr	New Frontiers in Random Geometric Graphs, Lorentz Center	Leiden, Netherlands
2012	Jun	Minisymposium, SIAM Conference on Discrete Mathematics	Halifax, Canada

Invited lecture series:

2018	Mar	Mini-course on Gibbs measures, Graph Limits Workshop	Bohemian Switzerland
2017	May	Mini-course on Gibbs measures, phase transitions, and combinatorics	Athens, Greece

Invited seminar talks:

2018	Jun	Theory and Algorithms in Data Science, Turing Institute	London, England
	Jun	Oxford combinatorics seminar	Oxford, England
	Mar	University of Bristol probability seminar	Bristol, England
	Feb	University of Birmingham optimization seminar	Birmingham, England
2017	Dec	London School of Economics discrete math seminar	London, England
	Sept	Ecole Normale Superiure Golosino statistical physics seminar	Paris, France
	May	University of Birmingham CS Theory Seminar	Birmingham, England
	Apr	Santa Fe Institute seminar	Santa Fe, NM
	Jan	Queen Mary University combinatorics seminar	London, England
2016	Dec	University of Warwick combinatorics seminar	Warwick, England
	Oct	Oxford probability workshop	Oxford, England
	Oct	University of Birmingham Popular Maths Lecture	Birmingham, England

	Feb	University of Birmingham Theoretical Physics Seminar	Birmingham, England
	Feb	Cambridge Statistics Seminar	Cambridge, England
	Jan	Universite Paris Ouest Probability Seminar	Paris, France
2015	Dec	University of Frankfurt Discrete Math Seminar	Frankfurt, Germany
	Nov	Oxford University Algorithms Seminar	Oxford, England
	Oct	University of Bath Probability Seminar	Bath, England
	Apr	Cambridge Combinatorics Seminar	Cambridge, England
	Apr	University of Warwick DIMAP Seminar	Warwick, England
	Mar	London School of Economics Combinatorics Seminar	London, England
	Jan	University of Birmingham Combinatorics Seminar	Birmingham, England
2014	Dec	Indiana University Probability and Related Fields Seminar	Bloomington, IN
	Dec	Penn/Temple Probability Seminar	Philadelphia, PA
	Oct	University of Minnesota Probability Seminar	Minneapolis, MN
	Oct	Georgia Tech CETL: Innovations in Teaching	Atlanta, GA
	Apr	ESPCI Golosino Seminar	Paris, France
2013	Nov	Emory University Combinatorics Seminar	Atlanta, GA
	Oct	Georgia Tech Stochastics Seminar	Atlanta, GA
	May	University of Illinois Chicago Combinatorics Seminar	Chicago, IL
	Feb	Courant Institute CS Theory Seminar	New York, NY
	Feb	Purdue University CS Theory Seminar	West Lafayette, IN
	Jan	UCLA Probability Seminar	Los Angeles, CA
2012	Oct	Georgia Tech ACO Student Seminar	Birmingham, England
	Oct	Clemson University Discrete Math seminar	Clemson, SC
	Sept	Georgia Tech Combinatorics Seminar	Atlanta, GA
	May	Yandex Corporation	Moscow, Russia
2011	May	Hebrew University CS Theory Seminar	Jerusalem, Israel
	May	Weizmann Institute Computer Science Seminar	Rehovot, Israel
	May	Tel Aviv University CS Theory Seminar	Tel Aviv, Israel
	Apr	Georgia Tech Combinatorics Seminar	Atlanta, GA
	Mar	Carnegie Mellon ACO Seminar	Pittsburgh, PA
	Feb	Courant Institute Probability Seminar	New York, NY
	Feb	Rutgers Discrete Math Seminar	Piscataway, NJ
	Feb	Princeton Discrete Math Seminar	Princeton, NJ
2010	Sept	ETH Mittagsseminar	Zurich, Switzerland
	Mar	Courant Institute CS Theory Seminar	New York, NY

Teaching

2017	2STAT: Statistics	University of Birmingham
2016	2STAT: Statistics	University of Birmingham
	3COM: Combinatorics	University of Birmingham
2013	Math 4221: Stochastic Processes I	Georgia Tech
	Math 6221: Advanced Classical Probability	Georgia Tech

2012	Math 4221: Stochastic Processes I	Georgia Tech
	Math 3215: Probability and Statistics	Georgia Tech
	CS 8803: Discrete Fourier Analysis and Applications	Georgia Tech
2010	Linear Algebra	New York University
2009	Math Patterns in Nature	New York University

Students supervised

Wei En Tan, University of Birmingham, PhD 2017.

Joe Duffield-Harding, University of Birmingham, MSci 2018.

Liam Barstable, University of Birmingham, MSci 2017.

Charlie Dickens, University of Birmingham, MSci 2016.

Academic Service

Workshop and seminar organizer:
Birmingham Combinatorics seminar, 2015-2016

Birmingham Student Combinatorics Day 2016

Birmingham Workshop on Probabilistic and Extremal Combinatorics 2016

Georgia Tech Combinatorics Seminar, 2013-2014

Reviewer for:
Advances in Mathematics, Probability Theory and Related Fields, Random Structures & Algorithms, Combinatorics, Probability and Computing, Annals of Applied Probability, Journal of Statistical Physics, SIAM Journal on Discrete Mathematics, Journal of the ACM, SIAM Journal on Computing, Algorithmica, Journal of Machine Learning Research, STOC, FOCS, COLT, SODA, RANDOM, ICALP

Program committee:
RANDOM 2017

Previous employment

University of Michigan Rowing Team	**Ann Arbor, MI**
Assistant Men's Rowing Coach	September 2005 – June 2007
St. Ignatius High School	**Chicago, IL**
Head Boys' and Girls' Rowing Coach	September 2003 – June 2005