David Keating

Contact Information

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Employment/ Education

University of Illinois, Urbana-Champaign, Urbana, IL

RTG Postdoctoral Research Associate, August 2024 - present

University of Wisconsin-Madison, Madison, WI

Van Vleck Visiting Assistant Professor, August 2021- May 2024

University of California, Berkeley, Berkeley, CA

Ph.D., Mathematics, August 2015 - May 2021

- Advisor: Prof. Nicolai Reshetikhin
- Thesis: "Limit shapes in two-dimensional lattice models arising from physics and combinatorics."

B.A., Mathematics, May 2015

B.A., Physics, May 2015

Research Interest

I am interested in statistical mechanics of two-dimensional lattice models, integrable probability, and combinatorics.

Publications and Preprints

1. **Keating, D.**, Kim, M., Loeser, E., and Lyu, H. "The stochastic box-ball system," *in preparation* (2025).
2. **Keating, D.** and Francesco, P.d. "Limit shapes for domain-wall (colored) vertex models," *in preparation* (2025).
3. **Keating, D.** and Vu, H.T. "Perfect t-embeddings of uniformly weighted generalized tower graphs," *preprint* (2025), arXiv:2509.18791 [math-ph].
4. Guse, J., **Keating, D.**, and Jiang, D. "Colored vertex models and interacting reverse plane partitions," *preprint* (2025), arXiv:2505.13806 [math.CO].
5. **Keating, D.** and Xu, J. "Edge universality of β-additions through Dunkl operators," submitted for publication (2024), arXiv:2411.12149 [math.PR].
6. Li, Z., **Keating, D.**, and Prause, I. "Asymptotics of Bounded Lecture-Hall Tableaux," submitted for publication (2024), arXiv:2309.15235 [math.PR].
7. **Keating, D.** and Nicoletti, M. "Shuffling algorithm for coupled tilings of the Aztec diamond," *Annales Henri Poincaré,* vol. 25, no. 12, pp. 5187-5229 (2024), arXiv:2303.09089 [math.CO].
8. Corteel, S., Gitlin, A., and **Keating, D.** "Colored vertex models and k-tilings of the Aztec diamond," *Transactions of the AMS,* accepted (2024), arXiv:2202.06020 [math.CO] (2022).

9. Gitlin, A. and **Keating, D.** "A Vertex Model for Supersymmetric LLT Polynomials," *Annales de l'Institut Henri Poincar D* 11, no. 3 (2023):571-640, arXiv:2110.10273 [math.CO].

10. **Keating, D.** "Equivalences of LLT polynomials via lattice paths." *Electronic Journal of Combinatorics,* accepted (2025), arXiv:2104.05862 [math.CO].

11. Corteel, S., Gitlin, A., **Keating, D.**, and Meza, J. "A Vertex Model for LLT Polynomials." *International Mathematics Research Notices,* Volume 2022, Issue 20, October 2022, Pages 15869-15931, arXiv:2012.02376 [math.CO].

12. **Keating, D.** "Area Statistics for Large Oscillating Tableaux." *Preprint* (2020), arXiv:2010.10093 [math.CO].

13. **Keating, D.**, Reshetikhin, N., and Sridhar, A. "Integrability of Limit Shapes of the Inhomogeneous Six Vertex Model." *Communications in Mathematical Physics* 391, 1181-1207 (2022), arXiv:2004.08971 [math-ph].

14. Corteel, S., **Keating, D.**, and Nicoletti, M. "Arctic curves phenomena for bounded lecture hall tableaux." *Communications in Mathematical Physics* 382, 1449-1493 (2021), arXiv:1905.02881 [math.CO].

15. **Keating, D.**, Reshetikhin, N., and Sridhar, A. "Conformal Limit for Dimer Models on the Hexagonal Lattice." *Journal of Mathematical Sciences* 242, 701-714 (2019).

16. **Keating, D.** and Sridhar, A. "Random Tilings with the GPU." *Journal of Mathematical Physics* 59, 091420 (2018), arXiv:1804.07250 [cs.OH].

17. Carlsson, J., Khrabrov, A., Kaganovich, I., Sommerer, T., and **Keating, D.** "Validation and benchmarking of two particle-in-cell codes for a glow discharge." *Plasma Sources Science and Technology*, 26(1) (2016), arXiv:1711.10830 [physics.plasm-ph].

18. Bhowmik, D., Nowakowski, M., You, L., Lee, O., **Keating, D.**, Wong, M., Boker, J., and Salahuddin, S. "Deterministic Domain Wall Motion Orthogonal To Current Flow Due To Spin Orbit Torque" *Scientific Reports* 5 (2015), arXiv:1407.6137 [cond-mat.mtrl-sci].

Awards

AIM, SQuaRE with Amol Aggarwal, Arvind Ayyer, Sylvie Corteel, Matthew Nicoletti, and Leonid Petrov — 2024 - present

Nominated: Postdoctoral Excellence in Mentoring and Outreach Award — 2023

Université de Paris, Guest Researcher — 2022

Herb Alexander Thesis Prize — 2021

Outstanding GSI Award — 2018

Invited Talks

1. *A vertex model for LLT polynomials*, UIUC Integrability and Representation Theory Seminar, UIUC, September 2024.
2. *Vertex models, symmetric polynomials, and tilings*, UIUC Algebra-Geometry-Combinatorics seminar, UIUC, September 2024.
3. *The stochastic box-ball system*, Geometry, Statistical Mechanics, and Integrability Workshop IV: Vertex Models: Algebraic and Probabilistic Aspects of Universality, Institute for Pure and Applied Mathematics, May 2024.
4. *Coupled Tilings of the Aztec Diamond*, JMM Special Session on Solvable Lattice Models and their Applications, January 2024.
5. *Coupled Tilings of the Aztec Diamond*, Mathematical Physics Seminar, Purdue University, November 2023.
6. *Double dimers, coupled tilings, and LLT polynomials*, Integrable Probability Seminar, MIT, October 2023.
7. *Double dimers, coupled tilings, and LLT polynomials*, DIMERS Closing Conference, Sorbonne Université, July 2023.
8. *k-tilings of the Aztec Diamond*, Berkeley Probability Seminar, UC Berkeley, April 2023.
9. *k-tilings of the Aztec Diamond*, Journées Cartes, Institute of Theoretical Physics, June 2022.
10. *k-tilings of the Aztec Diamond*, Enumerative and Analytic Combinatorics Seminar, Université Paris Cité, June 2022.
11. *Lattice models and LLT polynomials*, Madison Combinatorics Seminar, UW Madison, May 2022.
12. *k-tilings of the Aztec Diamond*, Madison Probability Seminar, UW Madison, April 2022.
13. *k-tilings of the Aztec Diamond*, Solvable lattice model seminar, Stanford University, February 2022.
14. *A Vertex Model for LLT Polynomials*, Berkeley Combinatorics Seminar, UC Berkeley, December 2020.
15. *A Vertex Model for LLT Polynomials*, CMS Winter Meeting, December 2020.
16. *Arctic Curves, Lecture Hall Tableaux, and the Tangent Method*, LPSM Friday Seminar, Sorbonne University, November 2019.
17. *Arctic Curves, Lecture Hall Tableaux, and the Tangent Method*, Berkeley Combinatorics Seminar, UC Berkeley, September 2019.
18. *Arctic Curves in Lecture Hall Tableaux*, Asymptotic Algebraic Combinatorics Workshop, Banff International Research Station, March 2019.
19. *Random Tilings with the GPU*, Representation Theory, Mathematical Physics and Integrable Systems, Centre International de Rencontres Mathmatiques, June 2018.

Organization

2025
Co-organized the SLMath summer school "Graphical Models in Algebraic Combinatorics." Notes and exercises available on my website.

2024 - present
Co-organized the University of Illinois Algebra-Geometry-Combinatorics Seminar.

2024 - present
Co-organized the University of Illinois Integrability and Representation Theory Seminar

2022 - 2023
Co-organized the University of Wisconsin Probability Seminar.

Teaching Experience

At UIUC:

Instructor — Fall 2025
Math 413 - Introduction to Combinatorics

Instructor — Fall 2024
Math 441 - Differential Equations

At UW Madison:

Instructor — Spring 2023
Math 699 - Independent study
A reading course on "Integer Partitions" by George Andrews.

Instructor — Fall 2022, Spring 2023
Math 390 - Undergraduate research
Numerical study of coupled tilings.

Instructor — Fall 2022, Spring and Fall 2023, Spring 2024
Math 632 - Introduction to Stochastic Processes

Instructor — Spring 2022
Math 475 - Introduction to Combinatorics

Instructor — Fall 2021, Spring 2024
Math 431 - Introduction to Probability

At UC Berkeley:

Teaching Assistant — Spring 2021
Math 54 - Linear Algebra
Instructor: Prof. Katrin Wehrheim

Teaching Assistant — Spring 2020
Math 128A - Numerical Analysis
Instructor: Prof. Per-Olof Persson

Teaching Assistant — Spring 2019
Math 54 - Linear Algebra and Differential Equations
Instructor: Prof. Ming Gu

Teaching Assistant — Fall 2018
Math 54 - Linear Algebra and Differential Equations
Instructor: Prof. Constantin Teleman

Teaching Assistant — Spring and Fall 2017
Math 53 - Multivariable Calculus
Instructor: Prof. Edward Frenkel

Teaching Assistant — Fall 2016
Math 54 - Linear Algebra and Differential Equations
Instructor: Prof. Ming Gu

Teaching Assistant — Spring 2016
Math 1B - Calculus
Instructor: Dr. Alexander Paulin

Teaching Assistant — Fall 2015
Math 1A - Calculus
Instructor: Dr. Alexander Coward

Undergraduate Mentoring

Tosh Omprakash — 2025
Project: Simulation of colored interacting particle systems.

Brian Wang — 2025
Project: Random reverse plane partitions using bijectivization of the Yang-Baxter equation.
Ran through the Illinois Combinatorics Lab for Undergraduate Experiences.

David Jiang, Jonah Guse — 2023
Project: Generating functions for coupled plane partitions.
Jonah is now a graduate student at UC Davis.

Noah Bertz, Harsha Kenchareddy, Wei Zhiyuan, Ying Zheng, Lucas Allen — Fall 2022, Spring 2023
Project: Numerical study of coupled tilings.
Ran through the Madison Experimental Mathematics lab.

Matthew Nicoletti — 2019
Project: Simulations of large lecture hall tableaux.
Matthew is now a postdoc at Stanford.

Murat Magomedov — 2019
Project: Kawasaki Dynamics and the Ising Model.

Danny Wu — 2018
Project: Numerical computing fluctuations in the DWBC six vertex model.

Pavel Dmitriev — 2017
Project: Numerically computing correlation functions in the DWBC six vertex model.

Melissa Joseph 2016
Project: Glueing formulas for discrete Laplacians.
Melissa is now a postdoc at University of Utah.

CODE https://github.com/GPUTilings
A library for generating random tilings with Markov chain Monte Carlo on the GPU.