

# Jeffrey Kuan

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## Personal

Born on December 1, 1987, in San Francisco, California.

## Research Interests

Integrable probability, representation theory, mathematical physics.

## Education

B.S. Mathematics, California Institute of Technology, 2010.

Ph.D. Mathematics, Harvard University, 2015.

## Academic Positions

NSF Postdoc, Columbia University, 2015–present.

## Honors, Awards and Scholarships

National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship, 2015–2018.

National Science Foundation Graduate Research Fellowship Program, 2010–2013.

George W. and Bernice E. Green Prize, California Institute of Technology, 2010.

Scott Russell Johnson Prize for Graduating Senior, California Institute of Technology Mathematics Department, 2010.

Eric Temple Bell Undergraduate Mathematics Research Award, California Institute of Technology Mathematics Department, 2009.

Fredrick J. Zeigler Award, California Institute of Technology, 2008.

Axline and Lingle Scholarships), California Institute of Technology, 2006–2010.

## Research

### *In Progress*

15. Generalized Casimir elements of  $U_q(\mathfrak{gl}_n)$  (with Keke Zhang).

### *Submitted*

14. Probability distributions of multi-species  $q$ -TAZRP and ASEP as double cosets of parabolic subgroups. Preprint: arXiv:1801.02313
13. Hard-edge asymptotics of the Jacobi growth process (with Mark Cerenzia), submitted to *Annales de l'Institut Henri Poincaré (B)*. Preprint: arXiv:1608.06384
12. A (2+1)-dimensional Gaussian field as fluctuations of quantum random walks on quantum groups, submitted to *Selecta Mathematica*. Preprint: arXiv:1601.04402

### *Accepted*

11. An algebraic construction of duality functions for the stochastic  $U_q(A_n^{(1)})$  vertex model and its degenerations, to appear in *Communications in Mathematical Physics*. Preprint: arXiv:1701.04468
10. A multi-species ASEP( $q, j$ ) and  $q$ -TAZRP with stochastic duality, to appear in *International Mathematics Research Notices*, preprint: arXiv:1605.00691
9. An interacting particle system with geometric jump rates near a partially reflecting boundary, *Electronic Communications in Probability*, Volume 21 (2016), paper no. 76, 15 pp.
8. Stochastic duality of ASEP with two particle types via symmetry of quantum groups of rank two, *Journal of Physics A, Mathematical and Theoretical*, Volume 49, Number 11 (2016), 29 pp.
7. Three-dimensional Gaussian fluctuations of non-commutative random surfaces along time-like paths, *Advances in Mathematics*, Volume 303, 5 November 2016, Pages 716–744.
6. Markov chains, tensor products, and quantum random walks, to appear in *Journal of Theoretical Probability*, preprint: arXiv:1212.2939
5. Strong Szegő asymptotics and zeros the zeta-function (with Paul Bourgade), *Communications on Pure and Applied Mathematics*, Volume 67, Issue 6, pages 1028–1044, June 2014.
4. Asymptotics of a discrete-time particle system near a reflecting boundary, *Journal of Statistical Physics*, Volume 150, Issue 2 (2013), Pages 398–411.
3. The Gaussian free field in interlacing particle systems, *Electronic Journal of Probability*, Volume 19 (2014), no. 72, 1–31.
2. Random surface growth with a wall and Plancherel measures for  $O(\infty)$  (with Alexei Borodin), *Communications on Pure and Applied Mathematics*, Volume 63, Issue 7, July 2010, Pages 831–894.

1. Asymptotics of Plancherel measures for the infinite-dimensional unitary group (with Alexei Borodin), *Advances in Mathematics*, Volume 219, Issue 3, 20 October 2008, Pages 894–931.

## Professional Activities

Referee for *Annals of Mathematics*, *Probability Theory and Related Fields*, *International Mathematics Research Notices*, *SIGMA*, and *Electronic Communications in Probability*.

Senior Thesis advisor for Keke Zhang, Fall 2017–present.

REU at Columbia University, Summer 2017.

REU at Columbia University, Summer 2016.

Co-organizer for Columbia Probability Seminar, 2015–present.

Teaching Assistant for Mathematical Sciences Research Institute Summer School, July 2014.

## Teaching

Instructor for Calculus III, Columbia University, Fall 2017.

Instructor for Calculus III, Columbia University, Fall 2016.

Teaching Fellow for Multivariable Calculus, Harvard University, Fall 2014.

Graduate Course Fellow for Linear Algebra, Harvard University, Spring 2014.

Graduate Course Assistant for Real Analysis, Harvard University, Fall 2013.

Graduate Course Assistant for Analytic Number Theory, Harvard University, Spring 2013.

Graduate Course Assistant for Random Matrix Theory and Number Theory, Harvard University, Fall 2012.

Graduate Course Assistant for Probability Theory and Stochastic Processes, Harvard University, Spring 2012.

## Presentations

### *Colloquia*

University of California at Irvine, Irvine, December 8, 2017.

University of Southern California, Los Angeles, November 1, 2017.

Colby College, Waterville, November 25, 2013.

## *Seminars*

Probability Seminar, Cornell University, Ithaca, March 12, 2018.

Probability Seminar, Temple / University of Pennsylvania, Philadelphia, January 16, 2018.

Probability Seminar, University of Washington, Seattle, December 4, 2017.

Combinatorics Seminar, University of Michigan, Ann Arbor, December 1, 2017.

Functional Analysis Seminar, University of California at San Diego, San Diego, November 9, 2017.

Representation Theory Seminar, University of California at Berkeley, Berkeley, November 8, 2017.

Mathematical Physics and Probability Seminar, University of California at Davis, Davis, November 6, 2017.

Stochastics Seminar, University of Utah, Salt Lake City, November 3, 2017.

Probability Seminar, University of California at Los Angeles, Los Angeles, November 2, 2017.

Integrable Probability Seminar, Columbia University, New York, January 20, 2017.

Probability Seminar, Columbia University, New York, March 4, 2016.

Mathematical Physics and Probability Seminar, University of California at Davis, Davis, January 27, 2016.

Probability Seminar, City University of New York, New York, December 8, 2015.

Integrable Probability Seminar, Massachusetts Institute of Technology, Cambridge, May 14, 2015.

Integrable Probability Seminar, Massachusetts Institute of Technology, Cambridge, October 10 and 31, 2013.

Probability Seminar, Technische Universität Berlin, Berlin, August 21, 2013.

Discrete Math and Combinatorics Seminar, Brown University, Providence, November 13, 2012.

Analysis and Probability Seminar, University of Connecticut, Storrs, September 30, 2011.

## *Conferences and Summer Schools*

Summer School in Probability, Northwestern University, Evanston, July 18, 2016.

New approaches to non-equilibrium and random systems: KPZ integrability, universality, applications and experiments, Kavli Institute for Theoretical Physics, Santa Barbara, February 10, 2016.

Random Matrices, Random Growth Processes and Statistical Physics, Simons Center for Geometry and Physics, Stony Brook, September 8, 2015.

Random Polymers and Algebraic Combinatorics, Oxford University, Oxford, May 26, 2015.

Northeast Probability Seminar, Columbia University, New York, November 20, 2014.

From Macdonald Processes to Hecke Algebras and Quantum Integrable Systems, Institut Henri Poincaré, Paris, May 27, 2014.

Randomness in Physics and Mathematics, Center for Interdisciplinary Research, Bielefeld University, Bielefeld, August 14, 2013.

Focus Program on Noncommutative Distributions in Free Probability Theory, Fields Institute, Toronto, July 8, 2013.

Young Researchers Conference at The International Congress in Mathematical Physics, Aalborg, August 3, 2012.

6th Prague Summer School in Mathematical Statistical Mechanics, Prague University, Prague, August 30, 2011.

7th Cornell Probability Summer School, Cornell University, Ithaca, July 19, 2011.

5th Cornell Probability Summer School, Cornell University, Ithaca, July 14, 2009.

Random Tilings, Random Partitions and Stochastic Growth Processes, Centre de Recherches Mathématiques, Montreal, September 5, 2008.

## **Volunteering**

Classroom Assistant in Mathematics at Cambridge Ringe and Latin School, February 2013–May 2014.

Math Tutor at Arlington High School, September 2011 - May 2012.