

JIAOYANG HUANG
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Employment

Courant Institute, New York University Simons Junior Fellow (Postdoc associate)	<i>New York, NY</i> 2020–now
Institute for Advanced Study Member	<i>Princeton, NJ</i> 2019– 2020

Education

Harvard University Ph.D., Mathematics Advisor: Horng-Tzer Yau	<i>Cambridge, MA</i> 2019
Massachusetts Institute of Technology (MIT) B.S., Mathematics	<i>Cambridge, MA</i> 2014
Tsinghua University B.S., Computer Science and Technology	<i>Beijing, China</i> 2010-2011

Awards

NSF Award: DMS-2054835	<i>2021-2024</i>
Simons Junior Fellow	<i>2020–2023</i>
Harvard Graduate Society Term-time Research Fellowship	<i>2018-2019</i>
Top 25 of Putnam competition	<i>2013</i>
Gold medal in the 50th International Mathematical Olympiad	<i>2009</i>

Research Interests

Probability Theory and its applications to mathematical physics, combinatorics, computer science and statistics.

Publications

1. *Invertibility of adjacency matrices for random d -regular graphs*
Accepted by Duke Mathematical Journal, 2021.
2. *Law of Large Numbers and Central Limit Theorems by Jack Generating Functions*
Advances in Mathematics 380, 107545, 2021
3. *β -Nonintersecting Poisson Random Walks: Law of Large Numbers and Central Limit Theorems*
International Mathematics Research Notices (8), 5898-5942, 2021.
4. *Edge rigidity and universality of random regular graphs of intermediate degree*
with Roland Bauerschmidt, Knowles Antti and Horng-Tzer Yau, Geometric and Functional Analysis, 30(3):693–769, 2020.
5. *Dyson Brownian Motion for General β and Potential at the Edge*
with Arka Adhikari, Probability Theory and Related Fields, 178(3), 893–950, 2020

6. *Transition from Tracy-Widom to Gaussian fluctuations of extremal eigenvalues of sparse Erdős-Rényi graphs*
with Benjamin Landon and Horng-Tzer Yau, *Annals of Probability*, 48(2), 916–962, 2020.
7. *Spectral statistics of sparse Erdős-Rényi graph Laplacians*
with Benjamin Landon, *Annales de l’Institut Henri Poincaré, Probabilités et Statistiques*, 56(1), 120–154, 2020.
8. *Towards Understanding the Dynamics of the First-Order Adversaries*
with Zhun Deng, Hangfeng He and Weijie Su, In *Proceedings of the 37th International Conference on Machine Learning*, 2020.
9. *Dynamics of deep neural networks and neural tangent hierarchy*
with Horng-Tzer Yau, In *Proceedings of the 37th International Conference on Machine Learning*, 2020.
10. *Gradient descent finds global minima for generalizable deep neural networks of practical sizes*
with Kenji Kawaguchi, In *Proceedings of the 57th Allerton Conference on Communication, Control, and Computing (Allerton)*, IEEE, 2019.
11. *Every Local Minimum Value is the Global Minimum Value of Induced Model in Non-convex Machine Learning*
with Kenji Kawaguchi and Leslie Pack Kaelbling, *Neural Computation*, 31(12), 2293–2323, MIT press, 2019.
12. *Effect of Depth and Width on Local Minima in Deep Learning*
with Kenji Kawaguchi and Leslie Pack Kaelbling, *Neural Computation*, 31(7), 1462–1498, MIT press, 2019.
13. *Rigidity and Edge Universality of Discrete β -Ensembles*
with Alice Guionnet, *Communications on Pure and Applied Mathematics*, 72(9), 1875–1982, 2019.
14. *Local Law and Mesoscopic Fluctuations of Dyson Brownian Motion for General β and Potentials*
with Benjamin Landon, *Probability Theory and Related Fields*, 175(1-2), 209–253, 2019.
15. *Local Kesten–McKay Law for Random Regular Graphs*
with Roland Bauerschmidt and Horng-Tzer Yau, *Communications in Mathematical Physics*, 369(2), 523–636, 2019.
16. *Asymptotic Expansion of Spherical Integral*
Journal of Theoretical Probability, 32(2), 1051–1075, 2019.
17. *Mesoscopic Perturbations of Large Random Matrices*
Random Matrices: Theory and Applications, 7(02), 1850004, 2018.
18. *Eigenvector Statistics of Sparse Random Matrices*
with Paul Bourgade and Horng-Tzer Yau, *Electronic Journal of Probability*, 22, 2017.
19. *Bulk eigenvalue statistics for random regular graphs*
with Roland Bauerschmidt, Antti Knowles and Horng-Tzer Yau, *The Annals of Probability*, 45(6A), 3626–3663, 2017.
20. *Laurent Phenomenon Sequences*
with Joshua Alman and Cesar Cuenca, *Journal of Algebraic Combinatorics*, 43(3), 589–633, 2016.

21. *Bulk universality of sparse random matrices*
with Benjamin Landon and Horng-Tzer Yau, *Journal of Mathematical Physics*, 56(12), 123301, 2015.

Preprints

1. *Edge Statistics for Lozenge Tilings of Polygons, II: Airy Line Ensemble*
with Amol Aggarwal, preprint, 2021.
2. *Edge Statistics for Lozenge Tilings of Polygons, I: Concentration of Height Function on Strip Domains*
preprint, 2021.
3. *Large Deviations Asymptotics of Rectangular Spherical Integral*
with Alice Guionnet, preprint, 2021.
4. *Spectrum of Random d -regular Graphs Up to the Edge*
with Horng-Tzer Yau, preprint, 2021.
5. *Improve Unscented Kalman Inversion With Low-Rank Approximation and Reduced-Order Model*
with Daniel Z Huang, preprint, 2021.
6. *Unscented Kalman Inversion: Efficient Gaussian Approximation to the Posterior Distribution*
with Daniel Z Huang, preprint, 2021.
7. *Power Iteration for Tensor PCA*
with Guang Cheng, Daniel Z. Huang and Qing Yang, preprint, 2020.
8. *Edge Universality for Nonintersecting Brownian Bridges*
preprint, 2020.
9. *Height Fluctuations of Random Lozenge Tilings Through Nonintersecting Random Walks*
preprint, 2020.
10. *Large Deviation Principles via Spherical Integrals*
with Serban Belinschi and Alice Guionnet, preprint, 2020.
11. *Eigenvalues for the Minors of Wigner Matrices*
preprint, 2019.

Teaching

Instructor, Calculus 2, New York University	<i>Fall 2021</i>
Lecturer, Summer School: RMT 2019 at LA, UCLA	<i>Summer 2019</i>
Instructor, Calculus, Math 1b, Harvard University	<i>Fall 2017</i>
Instructor, Calculus, Math 1b, Harvard University	<i>Fall 2016</i>
Teaching Assistant, MATH 254: Topics in Random Matrices, Harvard University	<i>Fall 2015</i>
Calculus Coach, Math 1b, Harvard University	<i>Fall 2015</i>
Teaching Assistant, Introduction to Topology, Math 18.901, MIT	<i>Fall 2013</i>
Teaching Assistant, Complex Variables with Applications, Math 18.04, MIT	<i>Spring 2012</i>

Invited Talks

2021: University of Chicago: Probability Seminar, Cornell University: Probability Seminar, New Jersey Institute of Technology: Applied Math Colloquium, MSRI: Connections and Introductory Workshop, New York University: Student Probability Seminar, University of Victoria: Applied Math Seminar.

2020: Columbia University: Integrable Probability Seminar, THU-PKU-BNU Joint Probability Webinar, University of Kansas: KU Probability and Statistics Seminar, One World Probability Seminar, Stanford University: Probability Seminar, University of Minnesota: Probability Seminar, University of Wisconsin-Madison: Probability Seminar, University of Pennsylvania: Penn/ Temple Probability Seminar, Columbia University: Probability Seminar.

2019: University of Michigan: Integrable Systems and Random Matrix Theory Seminar, University of Strasbourg: Probability Seminar, 8th Strasbourg/Zurich Meeting: Frontiers in Analysis and Probability, Yale University: Combinatorics Seminar, IAS Analysis-Mathematical Physics Seminar, Google, CIRM: Random Matrices and Random Graphs, Brandeis University: Brandeis-Harvard-MIT-Northeastern Joint Mathematics Colloquium, Brown University: 6th Annual AMS Grad Student Conferences at Brown. University of Chicago: Probability Seminar.

2018: Oberwolfach Workshop: Free Probability Theory, Ohio State University: Probability Seminar, MIT: FRG Integrable probability meeting, Cornell University: Probability Seminar, Princeton University: Topics in Probability Seminar, MIT: Combinatorics Seminar, Columbia University: Probability Seminar, University of Virginia: Probability Seminar, Gothenburg: Conference on Stochastic Processes and their Applications, IPAM: Workshop “Random Matrices and Free Probability Theory”, Northeastern University: AMS Special Session on The Gaussian Free Field and Random Geometry.

2017: ENS Lyon: Conference “ProbabLY ON Random Matrices”, University of Wisconsin-Madison: Combinatorics Seminar.

Professional Service

Reviewer for: Ann. Appl. Probab., Ann. of Math., Ann. Probab., Comm. Math. Phys., C. R. Math. Acad. Sci. Paris, Duke Math. J., Electron. Commun. Probab., Electron. J. Probab., Probab., IEEE TPAMI, IEEE Trans. Inform. Theory, Int. Math. Res. Not., J. Eur. Math. Soc., J. Funct. Anal., J. Theoret. Probab., Probab. Theory Related Fields, Proc. Lond. Math. Soc.

Summer Schools attended

Summer School: RMT 2019 at LA, UCLA	<i>July 2019</i>
PCMI Summer Session 2017, Utah	<i>June 2017</i>
Michigan Summer School on Random Matrices, Michigan	<i>June 2016</i>
Summer School on Stochastic Processes and Random Matrices, Les Houches	<i>July 2015</i>