

Hao Shen

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ACADEMIC POSITIONS

- 2015.8 - Now * Ritt Assistant Professor and Minerva Fellow, Columbia University
* Offered in 2014 and deferred the start date to 2015
- 2014.8 - 2015.7 Research Associate, University of Warwick, Mentor: Martin Hairer
- 2013.8 - 2014.7 Research Associate, Princeton University, Mentor: Weinan E

EDUCATION

- May 2013 PhD. Princeton University. Advisor: Weinan E
- June 2008 MSc. Peking University. Advisor: Gang Tian
- June 2006 BSc. Peking University. Undergraduate thesis advisor: Huijun Fan

PUBLICATIONS AND PREPRINTS

1. I. Corwin and H. Shen, Open ASEP in the weakly asymmetric regime, *Accepted by Comm. Pure Appl. Math.*
2. H. Shen and H. Weber, Glauber dynamics of 2D Kac-Blume-Capel model and their stochastic PDE limits, *arXiv:1608.06556*
3. A. Chandra and H. Shen, Moment bounds for SPDEs with non-Gaussian fields and application to the Wong-Zakai problem, *Accepted by Electron. J. Probab.*
4. I. Corwin, H. Shen and L-C. Tsai, ASEP (q,j) converges to the KPZ equation, *Accepted by Ann. Inst. Henri Poincaré (B) Probab. Stat.*
5. H. Shen and W. Xu, Weak universality of dynamical Φ_3^4 : non-Gaussian noise, *arXiv:1601.05724*
6. M. Hairer and H. Shen, A central limit theorem for the KPZ equation, *Accepted by Ann. Probab.*
7. M. Hairer and H. Shen, The dynamical sine-Gordon model, *Comm. Math. Phys.* **341** (2016), no. 3, 933-989
8. I. Corwin, T. Seppäläinen and H. Shen, The strict-weak lattice polymer, *J. Stat. Phys.* **160** (2015), no. 4, 1027-1053
9. W. E and H. Shen, Exact renormalization group analysis of turbulent transport by the shear flow, *J. Stat. Phys.* **153** (2013), no. 4, 553-571
10. W. E and H. Shen, Mean field limit of a dynamical model of polymer systems, *Sci. China Math.* **56** (2013), no. 12, 2591-2598
11. H. Shen, A renormalization group method by harmonic extensions and the classical dipole gas, *Ann. Henri Poincaré* **17** (2016), no. 4, 861-911
12. W. E, A. Jentzen and H. Shen, Renormalized powers of Ornstein-Uhlenbeck processes and well-posedness of stochastic Ginzburg-Landau equations, *Nonlinear Anal.* **142** (2016), 152-193

THESES

- *PhD Thesis: Renormalization Theory in Statistical Physics and Stochastic Analysis*
Committee: Michael Aizenman & Weinan E (Supervisor) & Thomas Spencer
Description: This thesis consists of: (1) a rigorous renormalization group method based on harmonic extensions; (2) well-posedness of a class of stochastic Ginzburg-Landau equations; (3) rigorous renormalization group study of turbulent transport by the shear flow.
- *Master Thesis: Anti-self-dual metrics on four-manifolds*
Supervisor: Gang Tian
Description: This thesis studies the anti-self-dual metrics on four-manifolds, the linear theory, their relation with complex structures and local structure of moduli spaces. Some examples are also given.

TEACHING EXPERIENCE

Fall	2017	Calculus IV, Columbia University
Spring	2017	Topics in Stochastic PDE, Columbia University
Fall	2016	Calculus IV (Two sections), Columbia University
Summer	2016	Ordinary Differential Equations (temporary instructor), Columbia University
Spring	2016	Calculus IV, Columbia University
Fall	2015	Calculus I (Two sections), Columbia University
Fall	2010	Topics in Applied Mathematics, Princeton University (I gave about eight lectures.)
Spring	2007	Linear Algebra (teaching assistant), Peking University

LECTURES AND MINI-COURSES

- 7/25 - 8/05/2016, Peking University, Two-week summer course on stochastic PDEs and regularity structures

CONFERENCE AND WORKSHOP TALKS

1. 2018 IMS Annual Meeting / 12th International Vilnius Conference on Probability Theory and Mathematical Statistics, Lithuania, invited session “Editors’ pick from the Annals of Probability” (upcoming)
2. UBC Summer School in Probability, Vancouver, *Lattice gauge theory and stochastic PDE*; 6/13/2017
3. Warwick EPSRC Symposium “Stochastic PDEs: Analysis and Computation”, UK, Title: *Lattice gauge theory and stochastic PDE*, organized by I.Gyongy, M.Hairer, A.Stuart; 3/29/2017
4. World Congress on Probability and Statistics, Toronto, Title: *Stochastic quantization equations and the theory of regularity structures*, Invited session talk in session “SPDEs and the work of Martin Hairer” organized by I.Corwin; 7/13/2016
5. Random Structures in High Dimensions, Oaxaca, Mexico, Title: *A stochastic PDE with $U(1)$ gauge symmetry*, organized by David Brydges and Frank den Hollander; 6/28/2016
6. Workshop on Stochastic Partial Differential Equations, Simons Center for Geometry and Physics, Stony Brook, Title: *Some convergence results of discrete dynamics*, organized by Martin Hairer; 5/20/2016
7. Oberwolfach workshop: rough paths, regularity structures and related topics, Germany, Title: *SPDEs with three types of multiplicative noises*, organized by Thomas Cass, Peter Friz and Massimiliano Gubinelli; 5/5/2016
8. Columbia-Princeton Probability Day, New York, Title: *Regularity structure theory and its applications*; 4/8/2016

9. “Paths to, from and in renormalization” At the confluence of rough paths, algebra, analysis and geometry, Potsdam, Germany, Title: *Renormalization for stochastic PDEs with non-Gaussian noises*; 2/10/2016
10. Current Topics in Mathematical Physics and Probability, Sanya, Title: *Stochastic PDEs as scaling limits of some microscopic models*, organized by Paul Bourgade, Horng-Tzer Yau and Jun Yin; 12/28/2015
11. Pittsburgh workshop on Stochastic PDEs, Title: *Regularity structure theory and its applications*, organized by Dehua Wang; 12/4/2015
12. International Congress on Industrial and Applied Mathematics (ICIAM), Beijing, Title: *Renormalization and Stochastic PDEs*, Invited talk in mini-symposium organized by Arnulf Jentzen; 8/11/2015
13. 38th Conference on Stochastic Processes and their Applications (SPA), Oxford, UK, Title: *A central limit theorem for the KPZ equation*, Contributed talk; 7/14/2015
14. Peking University Youth Probability Forum, Beijing, *Singular stochastic PDEs and the theory of regularity structures* 7/7/2015
15. Random Polymers and Algebraic Combinatorics, Oxford, UK, Title: *The Strict-Weak Lattice Polymer*, Clay Mathematics Institute workshop organized by Ivan Corwin and Nikos Zygouras; 5/25/2015
16. Topics in renormalisation group and regularity structures, Title: *Dynamical sine-Gordon equation*, MASDOC summer school at U. of Warwick organized by Stefan Adams; 5/11/2015
17. 3rd Annual ERC Berlin-Oxford Young Researchers Meeting on Applied Stochastic Analysis, Weierstrass Institute, Berlin, Title: *Dynamical sine-Gordon model*; 1/27/2015
18. 13th Northeast Probability Seminar, Columbia University, Title: *Strict-Weak Polymers and KPZ Universality* 11/21/2014
19. Special Seminar on KPZ, Berkeley, Title: *Strict-weak polymers and KPZ universality*, organized by Ivan Corwin and Fraydoun Rezakhanlou 7/10/2014
20. Workshop on Harmonic Analysis and the Renormalization Group, U. of Virginia, Title: *Renormalization group by harmonic extensions*, organized by A. Abdesselam; 4/21/2014
21. Workshop on Stochastic Analysis and Related Topics, Chinese Academy of Sciences, Beijing, Title: *Renormalization and well-posedness of stochastic PDEs*, organized by Xiangdong Li; Aug 2013

COLLOQUIUM TALKS

1. McGill University, Title: *Singular Stochastic Partial Differential Equations - How do they arise and what do they mean?* 1/10/2017
2. University of Wisconsin-Madison, Title: *Singular Stochastic Partial Differential Equations - How do they arise and what do they mean?* 12/2/2016
3. University of Minnesota, Title: *Singular Stochastic PDEs - How do they arise and what do they mean?* 11/28/2016

SEMINAR TALKS

- Penn and Temple Probability Seminar, *Some new scaling limit results on ASEP and Glauber dynamics of spin models* (12/6/2016)
- Wisconsin-Madison Probability Seminar, *On scaling limits of Open ASEP and Glauber dynamics of ferromagnetic models* (12/1/2016)
- University of Toronto Probability Seminar, *Asymmetric simple exclusion processes with open boundaries and their KPZ equation limits* (10/21/2016)

- Rutgers Seminar on Mathematical Finance, Probability and PDEs, *Stochastic PDE with $U(1)$ gauge symmetry* (10/4/2016)
- Chinese Academy of Sciences, *Stochastic PDEs and regularity structures* (8/5/2016)
- U. of Chicago Probability Seminar, *Regularity structure theory and its applications* (4/15/2016)
- Brown Dynamical System Seminar, *Regularity structure theory and its applications* (3/14/2016)
- Harvard University Random Matrix and Probability Seminar, *The sine-Gordon stochastic PDE and regularity structures* (3/11/2016)
- City University of New York Probability Seminar, *Regularity structure theory and its applications* (3/1/2016)
- Institute for Advanced Study Analysis Seminar, *Stochastic quantization equations* (2/23/2016)
- Duke University Probability seminar, *Stochastic PDEs and regularity structures* (10/29/2015)
- U. of Macau Probability Seminar, *Stochastic PDEs and regularity structures* (8/20/2015)
- Oxford Stochastic Analysis Seminar, *A central limit theorem for the KPZ equation* (6/15/2015)
- Max Planck Institute at Leipzig, Analysis Seminar, *Theory of regularity structures and dynamical sine-Gordon model* (1/12/2015)
- Cambridge Probability Seminar, *Solving the dynamical sine-Gordon equation* (10/21/2014)
- Loughborough Probability Seminar, *The dynamical sine-Gordon equation* (10/16/2014)
- Warwick Statistical Mechanics Seminar, *The dynamical sine-Gordon equation* (10/9/2014)
- University of Virginia Mathematical Physics Seminar, *Renormalization group by conditional expectations and dipole gas revisited* (12/4/2013)
- Princeton University Ergodic Theory and Statistical Mechanics Seminar, *Renormalization group and stochastic PDEs* (11/21/2013)
- Chinese Academy of Sciences, *Rigorous Renormalization Group and Applications* (9/2011)

GRANTS

NSF DMS-1712684; AMS Simons Travel Grant (2016 - 2018); Oberwolfach Travel Grant (May 2016); Columbia University Faculty Research Allowance Program (2015 - 2019); Minerva Foundation Fellowship (2015 - 2019); Centennial Fellowship at Princeton University (2008 - 2012).

ORGANIZER

- 5/1 - 5/3, 2018, (upcoming) Meeting on “Transport and localization in random media: theory and applications” at Columbia University, (co-organizer)
- 2/5/2016, Semi-annual Columbia-Courant joint probability seminar, with theme on Stochastic PDEs, at Columbia University
- 2015-present, Columbia University Probability Seminar, (co-organizer)

JOURNAL REFEREE

• Annals of Probability; • Brazilian Journal of Probability and Statistics; • Communications in Mathematical Physics; • Communications in Mathematical Sciences; • Electronic Journal of Probability; • Forum of Mathematics, Pi • Journal of Functional Analysis; • Journal of Mathematical Analysis and Applications; • Probability Theory and Related Fields; • Stochastics and Partial Differential Equations: Analysis and Computations.