Ke Wang

Department of Mathematics
The Hong Kong University of Science and Technology
Clear Water Bay, Kowloon
Hong Kong

Office: Room 3434, Lift 25-26
Email: kewang@ust.hk
Homepage: http://www.math.ust.hk/∼kewang

Research interests

Probabilistic combinatorics, random structures, random matrix theory and its applications.

Work experience

- Associate Professor (2025–present), *Department of Mathematics*, HKUST.
- Assistant Professor (2019–2025), *Department of Mathematics*, HKUST.
- Research Assistant Professor (2016–2019), *Department of Mathematics*, HKUST.
- Visiting Scholar (2015–2016), *Department of Computing & Mathematical Sciences*, California Institute of Technology.
- Postdoctoral Fellow (2015–2016), *HKUST Jockey Club Institute for Advanced Study (IAS)*, HKUST (on leave).
- Postdoctoral Fellow (2013–2015), *Institute for Mathematics and its Applications*, University of Minnesota.
- Summer Internship (June–August 2011), *Industrial Mathematics and Operation Research*, Bell Laboratories, Murray Hill, New Jersey, US.

Education

- Rutgers University, New Brunswick, New Jersey, USA, Ph.D. in Mathematics, 2006–2013.
  - Advisor: Van H. Vu.
- University of Science and Technology of China, Hefei, China, B.S. in Mathematics, 2002–2006.

Awards

- 2023-2025 Hong Kong RGC grant GRF 16304222.
- 2020-2023 Hong Kong RGC grant ECS 26304920 (with the RGC Early Career Award).
- 2019-2022 Hong Kong RGC grant GRF 16308219.

- 2018-2021 Hong Kong RGC grant GRF 16301618.
- 2017-2020 HKUST Initiation Grant IGN16SC05.

Journal Articles

19. (With G. Dai, Y. He, Y. Zhu) *A note on the improved sparse Hanson-Wright inequalities*. arXiv:2505.20799.
18. (With Y. He, Y. Zhu) *Sparse Hanson-Wright inequalities with applications*. arXiv:2410.15652.
17. *Analysis of singular subspaces under random perturbations*, arXiv:2403.09170.
16. (With S. O'Rourke, V. Vu) *Matrices with Gaussian noise: optimal estimates for singular subspace perturbation*, IEEE Transactions on Information Theory, 70(3): 1978–2002 (2024).
15. (With P. M. Wood) *Limiting empirical spectral distribution for the non-backtracking matrix of an Erdős-Rényi random graph*, Combinatorics, Probability and Computing, 1-18 (2023).
14. (With T. Jiang) *Asymptotic properties of random restricted partitions*, Mathematics 11(2):417 (2023).
13. (With Z. Bao, X. Ding, J. Wang) *Statistical inference for principal components of spiked covariance matrices*, Ann. Statist. 50 (2) 1144-1169 (2022).
12. (with J.-F. Cai, D. Li and J. Sun) *Enhanced expressive power and fast training of neural networks by random projections*, CSIAM Trans. Appl. Math., 2, pp. 532-550 (2021).
11. (With T. Jiang) *Statistical properties of eigenvalues of Laplace-Beltrami operators*, Journal of Theoretical Probability (2021).
10. (With Z. Bao, X. Ding) *Singular vector and singular subspace distribution for the matrix denoising model*, Ann. Statist. 49 (1) 370 - 392 (2021).
9. (With T. Jiang) *A generalized Hardy-Ramanujan formula for the number of restricted integer partitions*, Journal of Number Theory, Volume 201, Pages 322-353 (2019).
8. (With L. Guan, D. Li, K. Zhao) *On a Class of Nonlocal SIR Models*, Journal of Mathematical Biology, 78(6): 1581–1604 (2019).
7. (With D. Li) *Symmetric radial decreasing rearrangement can increase the fractional Gagliardo norm in domains*, Communications in Contemporary Mathematics, Vol. 21, No. 07, 1850059 (2019).
6. (With G. Tucci) *New methods for handling singular covariance matrices*, IEEE Transactions on Information Theory, 65(2): 770–786 (2019).
5. (With S. O'Rourke, V. Vu) *Random perturbation of low rank matrices: Improving classical bounds*, Linear Algebra and its Applications, 540:26-59 (2018).
4. (With S. O'Rourke, V. Vu) *Eigenvectors of random matrices: a survey*, Journal of Combinatorial Theory, Series A, 144:361-442 (2016).
3. (With V. Vu) *Random weighted projections, random quadratic forms and random eigenvectors*, Random Structures & Algorithms, 47(4): 792-821 (2015).
2. (With L. Tran, V. Vu) *Sparse random graphs: Eigenvalues and eigenvectors*, Random Structures & Algorithms, 42(1): 110-134 (2013).
1. *Random covariance matrices: Universality of local statistics of eigenvalues up to the edge*, Random matrices: Theory and Applications 1.01 (2012).

Peer-Reviewed Conference Articles

1. (With S. O'Rourke, V. Vu) *Optimal Subspace Perturbation Bounds under Gaussian Noise*, IEEE International Symposium on Information Theory - Proceedings, 2023, article number 10206931, p. 2601-2606.
2. (With G. Tucci) *An Innovative Approach for Analysing Rank Deficient Covariance Matrices*, IEEE International Symposium on Information Theory - Proceedings, 2012, article number 6283987, p. 2596-2600.

Student supervision

- Fengkai Liu (2024-), PhD student.
- WU Yue (2019-2023), PhD student, co-advised with Prof. XIANG Yang.
- UROP students: Yitao Xu (summer 2022, fall 2022), Yixin Xiong (fall 2022, spring 2023, summer 2023), Shuyang Gao (spring 2025, summer 2025).
- SCIE 2500 students: Kin Ming Kwok (fall 2022), Wing Yan Yau (fall 2022), Xiaochen Wang (spring 2023).

Teaching experience

- **Instructor**, Department of Mathematics, HKUST
  - Probability, Math 2421, Spring 2022, Spring 2023, Spring 2024, Fall 2024, Spring 2025 (2 Sections).
  - Calculus I, Math 1013, Fall 2021, Fall 2022, Fall 2023. (2 Sections)
  - High-dimensional probability: theory and applications, Math6450G, Fall 2020.
  - Calculus I, Math 1013, Fall 2019. (2 Sections)
  - Calculus II, Math 1014, Spring 2019. (2 Sections)
  - Calculus and linear algebra, Math 1003, Fall 2016. (2 Sections)
  - Calculus and linear algebra, Math 1003, Fall 2017. (2 Sections)
- **Instructor**, Department of Computing & Mathematical Sciences, California Institute of Technology
  - Topics in random matrix theory, ACM 217, Winter Term 2015–16.
- **Instructor**, School of Statistics, University of Minnesota
  - Theory of Statistics II, STAT 5102, Spring 2014.
- **Instructor**, Department of Mathematics, Rutgers University
  - Calculus I, MATH 135, Summer 2008.
  - Calculus II, MATH 152, Spring 2009.
  - Mathematical Theory of Probability, MATH 477, Summer 2009.
- **Teaching assistant**, Department of Mathematics, Rutgers University
  - Precalculus, MATH 115, Spring 2008.
  - Calculus I, MATH 135, Fall 2007, Fall 2009, Spring 2010, Fall 2010.
  - Calculus II, MATH 152, Fall 2008, Spring 2012, Spring 2013.
  - Multivariable Calculus, MATH 251, Fall 2012.