

Kai Zhang

Dept. of Statistics and Operations Research
University of North Carolina
Chapel Hill, NC, 27599

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EDUCATION

2007-2012 **Ph.D.**, Statistics, The Wharton School, University of Pennsylvania
2003-2007 **Ph.D.**, Mathematics, Temple University
1999-2003 **B.S.**, Mathematics, Peking University, China

PROFESSIONAL EXPERIENCE

2018-PRESENT Associate Professor with tenure, Department of Statistics and Operations Research, University of North Carolina, Chapel Hill
2012-2018 Assistant Professor, Department of Statistics and Operations Research, University of North Carolina, Chapel Hill
2022 Visiting Scholar, Department of Statistics, Harvard University
2016 Visiting Fellow, Department of Operations Research and Financial Engineering, Princeton University
2015-2016 Faculty Fellow, The Statistical and Applied Mathematical Sciences Institute

HONORS

- **Fellow**, Institute of Mathematical Statistics, 2023.
- **R. J. Reynolds Industries Junior Faculty Development Award**, UNC-CH, 2014.
- **Laha Travel Award**, Institute of Mathematical Statistics, 2011.
- **Deming Student Scholar Award**, 67th Deming Conference on Applied Statistics, 2011.
- **J. Parker Bursk Memorial Prize** (for excellence in research), Statistics Department, The Wharton School, University of Pennsylvania, 2010.

PUBLICATIONS (* denotes a PhD student co-author; † denotes alphabetical ordering)

Book Chapters

1. **Zhang, K.** and Chen, D. (2016). Overcoming the Computing Barriers in Statistical Causal Inference. *Statistical Causal Inferences and Their Applications in Public Health Research*, 125-137. H. He et al. ed., ICSA Book Series in Statistics, Springer.
2. Berk, R., Brown, L., George, E., Pitkin, E., Traskin, M., **Zhang, K.**, and Zhao, L. (2013). What You Can Learn from Wrong Causal Models. *Handbook of Causal Analysis for Social Research*, 400-424. S. Morgan, ed., New York: Springer.

Refereed Papers

1. Xiang, S. *, Zhang, W. *, **Zhang, Kai.**, and Marron, J. S. (2023). Extreme Value Theory for Binary Expansion Testing. *Sankhya*, accepted.
2. Brown, B. * and **Zhang, K.** (2023). AUGUST: An Interpretable, Resolution-based Two-Sample Test. *The New England Journal of Statistics in Data Science*, accepted.
3. Xiang, S. *, Zhang, W. *, Liu, S. *, Hoadley, K., Perou, C. M., **Zhang, K.**, and Marron, J. S. (2023). Pairwise Nonlinear Dependence Analysis of Genomic Data. *Annals of Applied Statistics*, 17(4): 2924-2943.
4. Li, J. *, Zhang, W. *, Wang, P. *, Li, Q., **Zhang, K.**, and Liu, Y. (2023). Nonparametric prediction distribution from resolution-wise regression with heterogeneous data. *Journal of Business and Economic Statistics*, 41:4,1157-1172.
5. An, H. *, **Zhang, K.**, Oja, H. and Marron, J. S. (2023). Variable Screening based on Gaussian Centered L-moments. *Computational Statistics and Data Analysis*, 179, 107632.
6. Hoffman, K. *, Lees, J., and **Zhang, K.** (2023). Local Change Point Detection and Cleaning of EEMD Signals. *Circuits, Systems and Signal Processing*, 42, 4669–4690.
7. Lee, D. *, **Zhang, K.**, and Kosorok, M. R. (2023). The binary expansion randomized ensemble test. *Statistica Sinica*, 33, 2381-2403.
8. Gong, S. *, **Zhang, K.**, and Liu, Y. (2021). Penalized Linear Regression with High-dimensional Pairwise Screening. *Statistica Sinica*, 31, 391-420.
9. Buja, A., Brown, L., Berk, R., George, E., Pitkin, E., Traskin, M., **Zhang, K.**, and Zhao, L. (2019). Models as approximations I: consequences illustrated with linear regression (with discussions). *Statistical Science*, 34, no. 4, 523-544.
10. **Zhang, K.** (2019). BET on Independence. *Journal of the American Statistical Association*, 114, 1620-1637.
11. McCarthy, D. *, **Zhang, K.**, Brown, L. D., Berk, R., Buja, A., George, E. and Zhao, L. (2018). Calibrated Percentile Double Bootstrap for Robust Linear Regression Inference. *Statistica Sinica*, 28, 2565-2589.
12. Bodwin, K. *, **Zhang, K.**, and Nobel, A. (2018). A Testing-based Approach to the Discovery of Differentially Correlated Variable Sets, *Annals of Applied Statistics*, 12(2), 1180-1203.
13. Gong, S. *, **Zhang, K.**, and Liu, Y. (2018). Efficient Testing-based Variable Selection for High-dimensional Linear Models, *Journal of Multivariate Analysis*, 166, 17-31.
14. **Zhang, K.** (2017). Spherical Cap Packing Asymptotics and Rank-Extreme Detection. *IEEE Transactions on Information Theory*, 63(7), 4572-4584.
15. Yu, Q. *, Risk, B., **Zhang, K.**, and Marron, J. S. (2017). JIVE Integration of Imaging and Behavioral Data. *NeuroImage*, 152, 38-49.
16. Lu, S., Liu, Y., Yin, L. * and **Zhang, K.** (2017). Confidence Intervals and Regions for the LASSO Using Stochastic Variational Inequality Techniques in Optimization. *Journal of the Royal Statistical Society, Series B*, 79(2), 589-611.
17. Brown, M., Koroluk, L. D., Ko, C., **Zhang, K.**, Chen, M. and Nguyen, T. (2015). Effectiveness and Efficiency of a CAD/CAM-designed Orthodontic Bracket System. *American Journal of Orthodontics & Dentofacial Orthopedics*, 148(6), 1067–1074.

18. **Zhang, K.**, Brown, L. D., George, E. and Zhao, L. (2014). Uniform Correlation Mixture of Bivariate Normal Distributions and Hypercubically-contoured Densities That Are Marginally Normal. *The American Statistician*, 68(3), 183-187.
19. † Berk, R., Brown, L. D., Buja, A., George, E., Pitkin, E., **Zhang, K.** and Zhao, L. (2014). Misspecified Mean Function Regression: Making Good Use of Regression Models That Are Wrong. *Sociological Methods and Research*, 43, 422-451.
20. † Berk, R., Brown, L., Buja, A., **Zhang, K.** and Zhao, L. (2013). Valid Post-Selection Inference. *The Annals of Statistics*, 41(2), 802-837.
21. **Zhang, K.**, Traskin, M. and Small, D. (2012). A Powerful and Robust Test Statistic for Randomization Inference in Group-Randomized Trials with Matched Pairs of Groups. *Biometrics*. 68, 75-84.
22. **Zhang, K.**, Small, D., Lorch, S., Srinivas, S. and Rosenbaum, P. (2011). Using Split Samples and Evidence Factors in an Observational Study of Neonatal Outcomes. *Journal of the American Statistical Association*, 106, 511-524.
23. Piette, J.*, Anand, S.* and **Zhang, K.** (2010). Scoring and Shooting Abilities of NBA Players. *Journal of Quantitative Analysis in Sports*, 6(1), Article 1.
24. **Zhang, K.** (2008). Limiting Distribution of Decoherent Quantum Random Walks. *Physical Review A*, 77, 062302.
25. Yang, W., Liu, C.* and **Zhang, K.** (2007). A Path Integral Formula with Applications to Quantum Random Walks in Z^d . *Journal of Physics, Volume A*, 40, 8487-8516.

Refereed Conference Proceedings

1. † Chen, D., Chen, X., and **Zhang, K.** (2016). An Exploratory Statistical Cusp Catastrophe Model. *2016 IEEE International Conference on Data Science and Advanced Analytics*, Montreal, Canada, October.

Invited Discussions

1. Lee, D., El-Zaatari*, H., Kosorok, M., Li, X., and **Zhang, K.** (2022). Discussion of “Multiscale Fisher's Independence Test for Multivariate Dependence”. *Biometrika*, 109, 593–596.
2. Hoffman, K.*, Hannig, J., **Zhang, K.** (2021). Comments on: A Gibbs sampler for a class of random convex polytopes. *Journal of the American Statistical Association*, 116, 1206-1210.
3. **Zhang, K.** and Small, D. (2009). Comment: The Essential Role of Pair Matching in Cluster Randomized Experiments with Application to the Mexican Universal Health Insurance Evaluation. *Statistical Science*, 24(1), 59-64.

Papers Submitted or in Revision

1. Mosso, C.*, Bodwin, K.*, Chakraborty, S.*, **Zhang, K.**, and Nobel, A.. Latent Association Mining in Binary Data. Revision submitted to *Journal of Machine Learning Research*. arXiv: 1711.10427.
2. **Zhang, K.**, Zhao, Z., and Zhou, W.. BEAUTY Powered BEAST. Submitted.
3. Zhang, W.*, Zhao, Z., Baiocchi, M., Li, Y., and **Zhang, K.**. SorBET: A Fast and Powerful Algorithm to Test Dependence of Variables.

4. Brown, B.*, **Zhang, K.**, and Meng, X.-L.. BELIEF in Dependence: Leveraging Atomic Linearity in Data Bits for Rethinking Generalized Linear Models. Under major revision at *The Annals of Statistics*. arXiv:2210.10852.

PRESENTATIONS

Invited Conference Presentations

1. The 7th International Conference on Econometrics and Statistics, Beijing, China, July 2024.
2. The 2nd Joint Conference on Statistics and Data Science, Kunming, China, July 2024.
3. 2024 IMS-China International Conference on Statistics and Probability, Yinchuan, China, July 2024.
4. 2024 ICSA China Conference, Wuhan, China, June 2024.
5. The 6th International Conference on Econometrics and Statistics, Waseda University, August 2023.
6. 15th International Conference of the ERCIM WG on Computational and Methodological Statistics, online, December 2022.
7. 14th International Conference of the ERCIM WG on Computational and Methodological Statistics, online, December 2021.
8. 2021 ICSA Applied Statistics Symposium, online, September 2021.
9. 63rd ISI World Statistics Congress, online, July 2021.
10. The 2019 IMS China Meeting, Dalian, China, July 2019.
11. The 2019 ICSA China Conference, Tianjin, China, July 2019.
12. 2019 ICSA Applied Statistics Symposium, Raleigh, NC, June 2019.
13. Statistical Society of Canada 2019 Annual Meeting, Calgary, Canada, May 2019.
14. The 33rd New England Statistics Symposium (NESS), Hartford, CT, May 2019.
15. The Third Workshop on Higher-Order Asymptotics and Post-Selection Inference, St. Louis, MO, September 2018.
16. The 8th International Forum on Statistics (ISF2018) at Renmin University of China, Beijing, China, July 2018.
17. ICSA 2018 Applied Statistics Symposium, New Brunswick, NJ, June 2018.
18. Conference on Statistical Learning and Data Science/Nonparametric Statistics, New York, NY, June 2018.
19. Hangzhou International Conference on Frontiers of Data Sciences, Hangzhou, China, May 2018.
20. ENAR 2018 Spring Meeting, Atlanta, GA, March 2018.
21. 2017 Joint PI Meeting: NSF BIGDATA and Big Data Hubs & Spokes, Washington D.C., March 2017.
22. ICSA Conference on Data Science, Dali, China, July 2016.
23. Joint Statistical Meetings, Seattle, WA, August 2015.
24. 2015 IMS-China International Conference on Statistics and Probability, Kunming, China, July 2015.

25. The New Researchers Conference on High-Dimensional Statistics in the Age of Big Data, Beijing, China, June 2015.
26. INFORMS Computing Society Conference, Richmond, VA, January 2015.
27. International Conference on Advances in Interdisciplinary Statistics and Combinatorics, Greensboro, NC, October, 2014.
28. The Third IMS Asia Pacific Rim Meetings, Taipei, Taiwan, July 2014.
29. International Workshop on Controlling Multiplicity in Statistical Analysis, Shanghai, China, June 2014.
30. 15th IMS New Researchers Conference, Montreal, Canada, August 2013.
31. ICSA/ISBS 2013 Joint Statistics Conference, Bethesda, MD, June 2013.

Invited Colloquia and Seminars

1. Pennsylvania State University, Department of Statistics, December 2024.
2. Singapore Management University, School of Economics, November 2024.
3. National University of Singapore, Department of Statistics and Data Science, November 2024.
4. Nanyang Technological University, Department of Economics, November 2024.
5. International Seminar on Selective Inference, October 2024.
6. University of Southern California, Department of Data Sciences and Operations, October 2024.
7. University of Pittsburgh, Department of Statistics, October 2024.
8. North Carolina State University, Department of Statistics, September 2024.
9. Harvard University, Department of Statistics, September 2024.
10. New York University, Department of Technology, Operations, and Statistics, September 2024.
11. University of Washington, Department of Statistics, May 2024.
12. University of California at Davis, Department of Statistics, May 2024.
13. Stanford University, Department of Statistics, May 2024.
14. Northwestern University, Department of Statistics and Data Science, February 2024.
15. Duke University, Department of Statistical Science, December 2023.
16. Illinois Institute of Technology, Department of Mathematics, April 2023.
17. University of Illinois at Chicago, Department of Mathematics, Statistics and Computer Science, April 2023.
18. University of Minnesota, School of Statistics, April 2023.
19. Georgia Institute of Technology, School of Mathematics, September 2022.
20. International Seminar on Selective Inference, November 2021.
21. Temple University, Department of Statistics, November 2021.
22. Colorado State University, Department of Statistics, October 2021.
23. Georgia Institute of Technology, School of Industrial and Systems Engineering, November 2019.
24. University of Georgia, Department of Statistics, October 2019.
25. Emory University, Department of Biostatistics and Bioinformatics, October 2019.
26. University of Chinese Academy of Sciences, June 2019.

27. Tsinghua University, The Center for Statistical Science, June 2019.
28. Renmin University, School of Statistics, June 2019.
29. Peking University, Center for Statistical Science, June 2019.
30. The University of North Carolina, Chapel Hill, Department of Biostatistics, February 2019.
31. Educational Testing Service, November 2018.
32. University of Virginia, Department of Statistics, August 2018.
33. University of Pennsylvania, Department of Statistics, March 2018.
34. The University of North Carolina, Chapel Hill, Department of Statistics and Operations Research, February 2018.
35. George Washington University, Department of Statistics, October 2017.
36. McGill University, Department of Mathematics and Statistics, September 2017.
37. University of Toronto, Department of Statistical Sciences, September 2017.
38. The University of Wisconsin–Madison, Department of Statistics, March 2017.
39. Rutgers University, Department of Statistics and Biostatistics, February 2017.
40. Harvard University, Department of Statistics, November 2016.
41. Cornell University, Department of Statistical Sciences, October 2016.
42. Princeton University, Department of Operations Research and Financial Engineering, September 2016.
43. The University of North Carolina, Greensboro, Department of Mathematics and Statistics, February 2016.
44. Renmin University, School of Statistics, December 2015.
45. Peking University, Center for Statistical Science, June 2015.
46. Renmin University, School of Statistics, May 2015.
47. Tsinghua University, The Center for Statistical Science, May 2015.
48. Renmin University, School of Statistics, June 2014.
49. Shanghai Jiaotong University, Department of Mathematics, June 2014.
50. New York University, Department of Information, Operations, and Management Sciences, February 2013.
51. The University of North Carolina, Chapel Hill, Department of Computer Science, November 2012.
52. The University of North Carolina, Chapel Hill, Department of Biostatistics, October 2012.
53. The University of North Carolina, Chapel Hill, Department of Statistics and Operations Research, March 2012.
54. New Jersey Institute of Technology, Department of Mathematical Sciences, March 2012.
55. Stanford University, Department of Statistics, February 2012.
56. The University of Florida, Department of Statistics, January 2012.
57. New Jersey Institute of Technology, Department of Mathematical Sciences, Nov. 2011.

TEACHING ACTIVITIES

Courses

- FALL 2024 *Nonparametric Statistics*, 7 students.
SPRING 2024 *Applied Statistics II*, 6 students; *Time Series Data Analysis*, 67 students.

FALL 2023	<i>Methods of Data Analysis</i> , 112 students.
SPRING 2023	<i>Methods of Data Analysis</i> , 101 students and 98 students.
FALL 2022	<i>Nonparametric Statistics</i> , 18 students.
FALL 2021	<i>Introductory Statistics</i> , 108 students; <i>Statistical Machine Learning</i> , 22 students.
SPRING 2021	<i>Introductory Statistics</i> , 109 students; <i>Statistical Methods II</i> , 55 students.
FALL 2020	<i>Statistical Machine Learning</i> , 27 students.
SPRING 2020	<i>Applied Statistics II</i> , 14 students.
FALL 2019	<i>Introductory Statistics</i> , 119 students; <i>Statistical Methods II</i> , 40 students.
SPRING 2019	<i>Applied Statistics II</i> , 21 students; <i>Introductory Statistics</i> , 110 students.
FALL 2018	<i>Selected Topics in Nonparametric Statistics</i> , 15 students.
SPRING 2018	<i>Applied Statistics II</i> , 23 students; <i>Statistical Methods II</i> , 88 students.
SPRING 2017	<i>Applied Statistics II</i> , 23 students; <i>Statistical Methods II</i> , 84 students.
SPRING 2016	<i>Applied Statistics II</i> , 34 students; <i>Statistical Methods II</i> , 96 students.
SPRING 2015	<i>Applied Statistics II</i> , 19 students; <i>Statistical Methods II</i> , 94 students.
FALL 2014	<i>Introductory Statistics</i> , 107 students.
SPRING 2014	<i>Statistical Theory II</i> , 11 students; <i>Statistical Methods II</i> , 66 students.
SPRING 2013	<i>Statistical Theory II</i> , 13 students.
FALL 2012	<i>Introductory Statistics</i> , 61 students.

Graduate Students Supervision

- Ph.D. Students **Wan Zhang** (2024). Dissertation on “Statistical Learning Using Binary Expansion.” (Graduated)
- Benjamin Brown** (2023). Dissertation on “Every Bit as Good: Resolution-Based Inference, Binary Model Representations, and a Boolean Framework for Explainable Decisions.”
- Siqi Xiang** (2023; Joint with J. Steve Marron). Dissertation on “Binary Expansion Testing and Gait Force Analysis.”
- Kentaro Hoffman** (2022; Joint with Cynthia Rudin). Dissertation on “Borrowing from Your Neighbors: Three Statistical Techniques from Nontraditional Sources.”
- Hang Yu** (2021; Joint with Donglin Zeng). Dissertation on “Sparse Machine Learning Methods for Prediction and Personalized Medicine.”
- Duyeol Lee** (2020; Joint with Michael Kosorok). Dissertation on “Precision Finance and BERET.”
- Siliang Gong** (2018; Joint with Yufeng Liu). Dissertation on “Study on Correlations in High Dimensional Data.”
- Hyowon An** (2017; Joint with J. Steve Marron). Dissertation on “Gaussian Centered L-moments.”
- Kelly Bodwin** (2017; Joint with Andrew Nobel). Dissertation on “Methods of Association Mining by Variable-to-Set Affinity Testing.”
- Qunqun Yu** (2017; Joint with J. Steve Marron). Dissertation on “Curve Registration and Human Connectome Data.”

Ph.D. Students **Yuhao Zhou.**
(Current)

Ph.D. Committee Sergio Chavez, Juan Shi, Joseph Lavond, Dawn Sanderson, Andrew Ackerman, José Ángel Sánchez Gómez, Dhruv Patel, Alexander Murph, Carson Mosso, Weiwei Li, Peiyao Wang, Jianyu Liu, Yifan Cui, Tianxiao Sun, Jonathan Williams, Liuqing (Jasmine) Yang, Leo Yu-Feng Liu, Dylan Glotzer, Leicheng Yin, Ruoyu Wu, Liang Yin, Guan Yu, Chong Zhang, Gen Li, Patrick Kimes, Jenny Shi, Susan Wei, Sunyoung Shin.

M.S. Advising Ziang Li, Ji Min Choi, Wan Zhang, Bohan Li, Sunhwa Park, Hang Yu, Shuming Sun, Mengting Dai, Ke Sun, Haozhen Xu, Siyun Pan, Xu Wen, Jean Ahn, Firat Kilci, Alexander Wakim, Ying Zhao, Alan Y. Xu.

Honor Thesis Supervision Ethan Wood, Eric Yibin Qian.

GRANT SUPPORT

- 2022-2025 **PI**, Amount: \$800,000. Direct Amount: \$545,666. Percentage of effort: 22%.
NSF, DMS-2152289. Date: 07/2022-06/2025. “FRG: Collaborative Research: Mathematical and Statistical Analysis of Compressible Data on Compressive Network.”
- 2019-2022 **PI**, Amount: \$150,000. Direct Amount: \$102,113. Percentage of effort: 22%.
NSF, DMS-1916237. Date: 09/2019-08/2022. “Binary Expansion Statistics: A Nonparametric Inference Framework for Big Data.”
- 2016-2019 **PI**, Amount: \$200,000. Direct Amount: \$136,414. Percentage of effort: 22%.
NSF, IIS-1633212. Date: 09/2016-08/2019. “BIGDATA: Collaborative Research: F: Statistical Theory and Methods beyond the Dimensionality Barrier.”
- 2016-2019 **PI**, Amount: \$120,000. Direct Amount: \$78,948. Percentage of effort: 22%.
NSF, DMS-1613112. Date: 08/2016-07/2019. “Geometric Perspectives on the Correlation.”
- 2013-2015 **PI**, Amount: \$50,000. Direct Amount: \$32,895. Percentage of effort: 22%.
NSF, DMS-1309619. Date: 09/2013-08/2015. “Collaborative Research: Inference for Linear Model Parameters in Model-free Populations.”

ISSUED PATENTS

- US Patent 10296555, “Methods, systems, and computer readable media for non-parametric dependence detection using bitwise operations in a computing system”, 2019. Inventors: Kai Zhang, Michael Thomas Max Baiocchi, Zhigen Zhao.

PROFESSIONAL SERVICE*Editorial Boards*

- Associate Editor, *Journal of the American Statistical Association*, 2023-present.
- Associate Editor, *Journal of Statistical Planning and Inference*, 2021-present.

Professional Committees

- Member of Committee on Special Lectures, IMS, 2024-2027.
- Chair of Committee on Travel Awards, IMS, 2023-2025.
- Member of Committee on Nominations, IMS, 2020-2021.
- Member of Committee on Nominations, IMS, 2019-2020.

Academic Events

- Chair of Organizing Committee: STOR Fest, University of North Carolina, September 2023.
- Executive Committee and Scientific Program Committee: 2019 ICSA Applied Statistics Symposium, Raleigh, NC, June 2019.
- Local Organizing Committee: ASA Conference on Statistical Learning and Data Mining, Department of Statistics & Operations Research, University of North Carolina at Chapel Hill, 2016.
- Faculty Sponsor: American Statistical Association Student Chapter at UNC, 2014-2016.
- Local Organizing Committee: Borrowing Strength: Theory Powering Applications—A Conference in Honor of Larry Brown’s 70th Birthday, Department of Statistics, The Wharton School, University of Pennsylvania, 2010.
- Local Organizing Committee: The 2009 International Workshop on Objective Bayes Methodology, Department of Statistics, The Wharton School, University of Pennsylvania.
- Student Seminar Coordinator: Department of Statistics, The Wharton School, 2008.

Journal and Conference Proceeding Referee

100+ papers for 30+ major journals and conference proceedings in Statistics, Computer Sciences, and Physics.

Research Grant Proposal Panelist and Reviewer

- National Science Foundation, USA
- Natural Sciences and Engineering Research Council of Canada
- Israel Science Foundation
- TOP-grants, The Netherlands Organisation for Scientific Research (NWO)
- Research Grant Council, Hong Kong, China.

Departmental Committee

Director of Graduate Admissions, Faculty Search Committee, PhD Admissions Committee, Department Colloquium Committee, Summer School Administrator, Bootcamp Administrator, PhD Comprehensive Written Exam Mentoring, Executive Advisory Committee of the Major of Neuroscience, Graduate Student Teaching Mentor, Mathematical Decision Sciences Committee Member and Advisor, Transfer Course Re-evaluation.