Shuyang (Ray) Bai

CONTACT INFORMATION

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Athens, GA 30602
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RESEARCH INTERESTS

Statistics, probability, long-range dependence, heavy tails, limit theorems for sums and extremes, time series, extreme value analysis, causal inference, resampling, online sampling.

WORK EXPERIENCE

Associate Professor
Department of Statistics, University of Georgia, Athens, GA. 08/2022- now

Assistant Professor
Department of Statistics, University of Georgia, Athens, GA. 08/2016- 07/2022

EDUCATION

Boston University, Boston, MA, 09/2011-05/2016

Ph.D. in Mathematics

- Advisor: Murad S. Taqqu

Bejing Normal University, Beijing, China, 09/2007-07/2011

B.S. in Mathematics and Applied Mathematics

PREPRINTS AND SUBMITTED MANUSCRIPTS

1. Shuyang Bai and Marie-Christine Düker. "On extremes for Gaussian subordination." arXiv preprint arXiv:2510.10578 (2025).
2. Shuyang Bai, Hanyue Cao, Tang He, Weiliang Wang, Fei Wen, and Ting Zhang. "Estimating Extremely High Quantiles of Tail Dependent Time Series under Tail Adversarial Stability." (2025).
3. Fei Fang, Shuyang Bai, and Tiandong Wang. "Structural Causal Models for Extremes: an Approach Based on Exponent Measures." arXiv preprint arXiv:2508.00223 (2025).
4. Shuyang Bai and Jiemiao Chen. "Multiple Extremal Integrals." arXiv preprint arXiv:2503.23142 (2025).
5. Hongju Park, Shuyang Bai, Zhenyao Ye, Hwiyoung Lee, Tianzhou Ma, and Shuo Chen. "Graph Canonical Correlation Analysis." arXiv preprint arXiv:2502.01780 (2025).

PUBLICATIONS

1. Shuyang Bai, Rafal Kulik, and Yizao Wang. "A remarkable example on clustering of extremes for regularly-varying stochastic processes." *Annals of Applied Probability*, to appear. arXiv:2409.17966 (2026).
2. Shuyang Bai, Herold Dehling, Piotr Kokoszka, Vladas Pipiras, Stilian Stoev, and Walter Willinger "A conversation with Murad S. Taqqu" *Statistical Science*, to appear. (2025).

3. Shiyuan Deng, He Tang, and Shuyang Bai. "On estimation and order selection for multivariate extremes via clustering." *Journal of Multivariate Analysis* 208 (2025), 105426.

4. Shuyang Bai, and Jiemiao Chen. "Empirical limit theorems for Wiener chaos." *Statistics & Probability Letters* 215 (2024): 110222.

5. Shuyang Bai, Tang He. "Joint sum-max limit for a class of long-range dependent processes with heavy tails." *Journal of Theoretical Probability* 37 (2024): 1958–1987.

6. Shuyang Bai, Ting Zhang. "Tail adversarial stability for regularly varying linear processes and their extensions." *Extremes* 27 (2024): 33–65.

7. Shuyang Bai, Yizao Wang. "Phase transition for extremes of a family of stationary multiple-stable processes." *Annales de L'Institut Henri Poincare Section (B) Probability and Statistics.* 60.3 (2024): 2157-2193.

8. Rui Xie, Shuyang Bai, Ping Ma. "Optimal Sampling Designs for Multi-dimensional Streaming Time Series with Application to Power Grid Sensor Data" *Annals of Applied Statistics* 17.4 (2023): 3195-3215.

9. Shuyang Bai, and Yizao Wang. "Tail processes for stable-regenerative multiple-stable model." *Bernoulli* 29.4 (2023): 3255-3279.

10. Shuyang Bai. "Limit theorems for conservative flows on multiple stochastic integrals." *Journal of Theoretical Probability* 35.2 (2022): 917-948.

11. Shuyang Bai. "Representations of Hermite processes using local time of intersecting stationary stable regenerative sets." *Journal of Applied Probability* 57.4 (2020): 1234-1251.

12. Shuyang Bai, Takashi Owada, Yizao Wang. "A functional non-central limit theorem for multi-stable processes with long-range dependence." *Stochastic Processes and their Applications* 30.9 (2020): 5768-5801.

13. Shuyang Bai, Murad S. Taqqu. "Limit theorems for long-memory flows on Wiener chaos." *Bernoulli* 26.2 (2020): 1473-1503.

14. Rui Xie, Zengyan Wang, Shuyang Bai, Ping Ma, Wenxuan Zhong. "Decentralized Leverage Score Sampling for Streaming Multidimensional Time Series." *The 22nd International Conference on Artificial Intelligence and Statistics (AISTATS 2019)* (2019): 2301-2311.

15. Shuyang Bai, Murad S. Taqqu. "Sensitivity of the Hermite rank." *Stochastic Processes and their Applications* 129.3 (2019): 822-840.

16. Fumiya Akashi, Shuyang Bai, Murad S. Taqqu. "Robust regression on stationary time series: a self-normalized resampling approach." *Journal of Time Series Analysis* 39.3 (2018): 417-432.

17. Shuyang Bai, Murad S. Taqqu. "How the instability of ranks in non-central limit theorems affects large-sample inference under long memory." *Statistical Science* 33.1 (2018): 96-116.

18. Shuyang Bai, Murad S. Taqqu. "On the validity of resampling methods under long memory." *The Annals of Statistics* 45.6 (2017): 2365-2399.

19. Shuyang Bai, Murad S. Taqqu. "The behavior of the generalized Rosenblatt process at extreme parameter values." *The Annals of Probability* 45.2 (2017): 1278-1324.

20. Shuyang Bai, and Murad S. Taqqu."The impact of diagonals of polynomial forms on limit theorems with long memory". *Bernoulli* 23.1 (2017):710-742.

21. Shuyang Bai, Murad S. Taqqu. "The universality of homogeneous polynomial forms and critical limits". *Journal of Theoretical Probability* 29.4 (2016): 1710-1727.

22. Shuyang Bai, Murad S. Taqqu, Ting Zhang. "A unified approach to self-normalized block sampling". *Stochastic Processes and their Applications* 126.8 (2016): 2465-2493.

23. Shuyang Bai, Murad S. Taqqu " Short-range dependent processes subordinated to the Gaussian may not be strong mixing." *Statistics & Probability Letters* 110 (2016): 198-200.

24. Shuyang Bai, Mamikon S. Ginovyan, Murad S. Taqqu "Limit theorems for quadratic forms of Lévy-driven continuous-time linear processes." *Stochastic Processes and their Applications* 126.4 (2016): 1036-1065.

25. Shuyang Bai, Mamikon S. Ginovyan, Murad S. Taqqu. "Functional limit theorems for Toeplitz quadratic functionals of continuous-time Gaussian stationary processes." *Statistics & Probability Letters* 104 (2015): 58-67.

26. Shuyang Bai and Murad S. Taqqu. "Convergence of long-memory discrete k-th order Volterra processe." *Stochastic Processes and their Applications* 125.5 (2015): 2026-2053.

27. Shuyang Bai and Murad S. Taqqu. "Structure of the third moment of the generalized Rosenblatt distribution." *Statistics & Probability Letters* 94 (2014): 2473-2485.

28. Shuyang Bai and Murad S. Taqqu. "Generalized Hermite processes, discrete chaos and limit theorems." *Stochastic Processes and their Applications* 124.4 (2014): 144-152.

29. Shuyang Bai and Murad S. Taqqu. "Multivariate limits of multilinear polynomial-form processes with long memory." *Statistics & Probability Letters* 83.11 (2013): 2473-2485.

30. Shuyang Bai and Murad S. Taqqu. "Multivariate limit theorems in the context of long-range dependence." *Journal of Time Series Analysis* 34.6 (2013): 717-743.

Presentations

1. Talk: "Structural Causal Models for Extremes", Applied Mathematics Seminar, Shanghai Center for Mathematical Sciences, 12/2025.

2. Talk: "A remarkable example on clustering of extremes for regularly-varying stochastic processes", INFORMS Applied Probability Society Conference, Atlanta, 06/2025.

3. Talk: "Structural Causal Models for Extremes: A Perspective Via Exponent Measure", The 14th International Conference on Extreme Value Analysis, University of North Carolina at Chapel Hill, 06/2025.

4. Talk: "An Unusual Example of Extremal Clustering", Probability and Statistics Seminar, Department of Mathematics, Drexel University, Knoxville, 05/2025.

5. Talk: "An Unusual Example of Extremal Clustering", Probability Seminar, Department of Mathematics, The University of Tennessee, Knoxville, 04/2025.

6. Talk: "Order Selection for Clustering Multivariate Extremes", Georgia Statistics Day, Emory University, 10/2024.

7. Talk: "Order Selection for Clustering Multivariate Extremes", Georgia Statistics Day, Emory University, 10/2024.

8. Talk: "Order Selection for Clustering Multivariate Extremes", Oberwolfach Workshop in Mathematics, Statistics, and Geometry of Extreme Events in High Dimensions, , Oberwolfach, Germany, 08/2024.

9. Talk: "Optimal Sampling Designs for Multi-dimensional Streaming Time Series", Bernoulli-IMS 11th World Congress in Probability and Statistics, Bochum, Germany, 08/2024.

10. Talk: "Order Selection for Clustering Multivariate Extremes", International Conference on Econometrics and Statistics (EcoSta) 2024, Beijing, 07/2024.

11. Talk: "A journey crossing the boundary between long and short memory", 13th conference on Extreme Value Analysis, Probabilistic and Statistical Models and their Applications, Milan, Italy, 06/2023.

12. Talk: "Does a local cluster always reveal the global extremal index?" AMS 2023 Spring Southeastern Sectional Meeting, Atlanta, 03/2023.

13. Talk: "Does a local cluster always reveal the global extremal index?", online talk, Workshop on Extreme Value Theory and Quantitative Risk Management, Fudan University, China, 08/2022.

14. Talk: "Tail Adversarial Stability", online talk, Joint Statistical Meeting, Washington DC, 08/2022.

15. Talk: "Can a Local Cluster Always Reveal the Global Extremal Index?", Workshop on Heavy Tails, Long-Range Dependence, and Beyond, CIRM, France, 07/2022.

16. Talk: "Tail Adversarial Stability", Long Memory and Extremes Online Seminar, 04/2022.

17. Talk: "Phase transition of extremes for a family of stationary multiple-stable processes: the microscopic level", AMS Spring Central Sectional Meeting. 03/2022.

18. Talk: "Extremes for a Family of Multiple-Stable Processes", Long Memory and Extremes Online Seminar, 01/2022.

19. Talk: "Phase transition of extremes for a family of stationary multiple-stable processes: the microscopic level", AMS Southeastern Virtual Sectional Meeting. 11/2021.

20. Talk: "New Representations and Limit Theorems for Hermite Processes", Stochastic Seminar, University of Utah, Salt Lake City (online), 11/2021.

21. Talk: "New Representations and Limit Theorems for Hermite Processes", Statistics Seminar, Purdue University, West Lafayette, 10/2021.

22. Talk: "Resampling Long-Range Dependent Time Series", Bernoulli-IMS 10th World Congress in Probability and Statistics, Seoul National University, South Korea (online) 07/2021.

23. Talk: "New Representations of Hermite Processes" Extreme Value Analysis Conference, University of Edinburgh, Edinburgh, United Kingdom (online), 07/2021.

24. Talk: "Long Memory and Conservative Flows on Multiple Stochastic Integrals" Probability Seminar (online), Cornell University, 04/2021.

25. Invited talk at CIRM (Centre International de Rencontres Mathematiques) Workshop, workshop on "Heavy Tails, Long-Range Dependence and Random Structures", CIRM, France, 10/2020 (Canceled due to COVID-19.).

26. Invited talk at AMS Sectional Meeting, Special Session on "Gaussian and non-Gaussian Stochastic Analysis", Purdue University, West Lafayette, 04/20. (Canceled due to COVID-19.)

27. Talk: "Leverage Score Sampling for Multidimensional Streaming Time Series", 2019 Joint Statistical Meetings (JSM), Denver, 08/2019.

28. Poster: "Online Decentralized Leverage Score Sampling for Streaming Multidimensional Time Series", The 22nd International Conference on Artificial Intelligence and Statistics (AISTAT 2019), Naha, Japan, 04/2019.

29. Talk: "A non-central limit theorem on heavy-tailed chaos", AMS Sectional Meeting, Auburn University, Auburn, 03/2019.

30. Talk: "A non-central limit theorem on heavy-tailed chaos", Research Seminar in Probability and Statistics, Tulane University, New Orleans, 03/2019.

31. Talk: "Leverage subsampling for vector autoregression", 12th International Conference on Computational and Financial Econometrics (CFE 2018), University of Pisa, Italy, 12/2018.

32. Talk: "A non-central limit theorem on heavy-tailed chaos" AMS Sectional Meeting, University of Michigan, Ann Arbor, 10/2018.

33. Talk: "Leverage subsampling for vector autoregression", Georgia Statistics Day, University of Georgia, Athens, 10/2018.

34. Talk: "Instability of ranks and inference under long memory", Workshop on Self-Similarity, Long-Range Dependence and Extremes, Banff International Research Station & Casa Matematica Oaxaca, Mexico, 06/2018.

35. Talk: "Resampling under Long Memory". Statistics Seminar, Department of Statistics, Purdue University, West Lafayette, 02/2018.

36. Talk: "The Long Memory Phenomenon". Statistics Seminar, Department of Mathematics and Statistics, Georgia State University, Atlanta, 09/2017.

37. Talk: "Self-Normalized Resampling of Time Series", The 1st International Conference on Econometrics and Statistics, Hong Kong University of Science and Technology, Hong Kong, 06/2017.

38. Talk: "Block Dependence and Resampling under Long Memory". Statistics Seminar, Chinese University of Hong Kong, Hong Kong. 06/2017.

39. Talk: "Between-Block Dependence under Long Memory". AMS Sectional Meeting, Indiana University, Bloomington, 04/2017.

40. Talk: "Block Dependence under Long Memory". Statistics Seminar, School of Industrial & Systems Engineering, Georgia Institute of Technology, Atlanta, 04/2017.

41. Talk: "Resampling under Long Memory". Stochastics Seminar, Department of Mathematics, The University of Tennessee, Knoxville, 03/2017.

42. Talk: "Self-Normalized Resampling of Long-Memory Time Series". The 10th ICSA International Conference, Shanghai Jiao Tong University, China, 12/2016.

43. Poster: "Self-Normalized Resampling of Long-Memory Time Series". Conference in Honor of Murray Rosenblatt, University of California San Diego, San Diego, 10/2016.

44. Talk: "The long Memory Phenomenon". Ying Xu Lab, Department of Biochemistry and Molecule Biology, University of Georgia, Athens, 09/2016.

45. Poster: "Self-Normalized Resampling of Time Series". The IMS 18th Meeting of New Researchers in Statistics and Probability, University of Wisconsin Madison, Madison, 07/2016.

46. Talk: "Self-Normalized Resampling of Long-Memory Time Series". Seminar, Department of Statistics, Southwestern University of Finance and Economics, China, 05/2016.

47. Poster: "Self-Normalized Resampling of Long-Memory Time Series". Workshop on Dependence, Stability, and Extremes, The Fields Institute, Toronto, 05/2016.

48. Talk: "Long Memory and Mon-Standard Limit Theorems". Applied Math Seminar, University of Massachusetts Lowell, Lowell, 02/2016.

49. Talk: "Self-Normalized Resampling for Time Series". Boston University Statistics and Probability Seminar, Boston University, Boston, 12/2015.

50. Talk: "Limit Theorems for Polynomial-Form Moving Average" CRM-PIMS Summer School in Probability, McGill University, Montreal, 06/2015

51. Poster: "Fractional Processes on Wiener Chaos and Non-Central Limit Theorems". Information Theory and Concentration Phenomena, Institute for Mathematics and and its Applications, University of Minnesota Twin Cities, Minneapolis, 04/2015

52. Talk: "Self-similar processes on Wiener Chaos". Boston University Statistics and Probability Seminar, Boston University, Boston, 12/2014.

53. Poster: "Fractional processes on Wiener Chaos and Non-Central Limit Theorems". Cincinnati Symposium on Probability Theory and Applications, University of Cincinnati, Cincinnati, 09/2014

54. Talk "Wiener chaos and Limit Theorems Under Strong Dependence" Boston University Student Statistics and Probability Seminar, Boston University, Boston, 03/2014.

55. Poster: "Fractional processes on Wiener Chaos and Non-Central Limit Theorems". Multifractal Analysis: From Theory to Applications and Back (5-day workshop), Banff International Research Station, Canada, 02/2014.

56. Talk: "Long-Range Dependence Meets Short-Range Dependence: Multivariate Limit Theorems". Satellite Summer School to the 7th International Conference on Lévy Processes, 07/2013.

57. Talk: "Limit Theorems Under Independence, Weak Dependence, and Long-Range Dependence". Boston University Student Statistics and Probability Seminar, Boston University, Boston, 09/2012.

Honors and Awards

- Junior Oberwolfach Fellow, 2024.
- Office of the Provost International Travel Funds, University of Georgia, 2016, 2018, 2022, 2023 , 2024.
- Travel Award, The 18th IMS New Researchers Conference, 2016.
- Itô Travel Award, International Mathematical Union, 2015.
- Dean's Fellowship, Boston University, 2011.
- Outstanding Undergraduate Thesis Award, Beijing Normal University, 2011.

Teaching Experience

- Mathematical Analysis (2-week bootcamp for beginning graduate students);
- Mathematical Statistics (undergraduate/graduate);
- Probability (undergraduate and graduate);
- Stochastic Processes (graduate);
- Time Series Analysis (undergraduate/graduate);
- Undergraduate Directed Study in Mathematical Analysis;
- High School Summer Camp in AI and Data Science.

Conference Organization

- Organized invited sessions for International Conference on Econometrics and Statistics (EcoSta) during 2021-2024.
- Organized an invited session for International Chinese Statistical Association (ICSA) 2023 China Conference.

Review Service

Associate Editor for

- *Journal of Statistical Planning and Inference* (2025 -)

Referee for the following journals:

- *Advances in Complex Systems*
- *Acta Mathematica Scientia*
- *Bernoulli*
- *Brazilian Journal of Probability and Statistics*
- *Computational Statistics and Data Analysis*
- *Environmental and Ecological Statistics*
- *Electronic Journal of Statistics*
- *Electronic Journal of Probability*
- *Fields Institute Communications Series*
- *IEEE Intelligent Systems*
- *IEEE Transactions on Information Theory*
- *Journal of Applied Probability*
- *Journal of Financial Econometrics*
- *Journal of Theoretical Probability*
- *Journal of the American Statistical Association*
- *Journal of Korean Statistical Society*
- *Physica A*

- *Sankhya B*
- *Scandinavian Journal of Statistics*
- *SIAM Journal on Mathematics of Data Science*
- *Stat*
- *Statistics & Probability Letters*
- *Stochastic Analysis and Applications*
- *Stochastic Models*
- *Stochastic Processes and their Applications*
- *Expert Systems with Applications*
- *The Annals of Probability*
- *The Annals of Statistics*

Invited reviewer for *Mathematical Reviews*

Proposal reviewer for National Science Foundation, Dutch Research Council.

Graduate Student Advisory

PhD Major Adviser of

- He Tang (2021 - 2025)
- Shiyuan Deng (2021 - 2024)
- Jiemiao Chen (2022 -)
- Vishal Routh (2022 -)

Master Major Adviser of

- Malika Dhakhwa (2022 - 2024)
- Hofner Doydora (2023)

Department Services

- Colloquium Organization Committee
- Curriculum Planning Committee
- Department Personnel Committee
- Department Advisory Committee
- Graduate Admission Committee
- Personnel Committee
- PhD Exam (Theory) Committee
- Research Development Committee
- Undergraduate Program Committee

University Services

- University Council Member

Skills

Languages: English (fluent), Mandarin Chinese (native).
Computer: R, Matlab, IDL, SAS, C, LaTex, Linux, Microsoft Office, Google Docs.