

Shuyang (Ray) Bai

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RESEARCH INTERESTS Long-range dependence, heavy tails, limit theorems for sums and extremes, time series, 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
Beijing Normal University, Beijing, China, 09/2007-07/2011
B.S. in Mathematics and Applied Mathematics

MANUSCRIPTS

1. Shuyang Bai, Tang He. “Joint sum-max limit for a class of long-range dependent processes with heavy tails.” (2022) Under preparation.
2. Shuyang Bai, Ting Zhang. “Tail adversarial stability for regularly varying linear processes and their extensions.” (2022) arXiv:2205.00043. Under revision.
3. Shuyang Bai, Yizao Wang. “Phase transition for extremes of a family of stationary multiple-stable processes.” (2022) arXiv:2110.07497. Under revision.
4. Rui Xie, Shuyang Bai, Ping Ma. “Optimal Sampling Designs for Multi-dimensional Streaming Time Series with Application to Power Grid Sensor Data” (2022). Under revision.

PUBLICATIONS

1. Shuyang Bai, Yizao Wang. “Tail processes for stable-regenerative model.” (2022). arXiv:2110.07499. To appear in *Bernoulli*.
2. Shuyang Bai. “Limit theorems for conservative flows on multiple stochastic integrals.” *Journal of Theoretical Probability* 35.2 (2022): 917-948.
3. Shuyang Bai. “Representations of Hermite processes using local time of intersecting stationary stable regenerative sets.” *Journal of Applied Probability* 57.4 (2020): 1234-1251.

4. 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.
5. Shuyang Bai, Murad S. Taqqu. “Limit theorems for long-memory flows on Wiener chaos.” *Bernoulli* 26.2 (2020): 1473-1503.
6. 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.
7. Shuyang Bai, Murad S. Taqqu. “Sensitivity of the Hermite rank.” *Stochastic Processes and their Applications* 129.3 (2019): 822-840.
8. 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.
9. 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.
10. Shuyang Bai, Murad S. Taqqu. “On the validity of resampling methods under long memory.” *The Annals of Statistics* 45.6 (2017): 2365-2399.
11. 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.
12. 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.
13. Shuyang Bai, Murad S. Taqqu. “The universality of homogeneous polynomial forms and critical limits”. *Journal of Theoretical Probability* 29.4 (2016): 1710-1727.
14. 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. Shuyang Bai and Murad S. Taqqu. “Structure of the third moment of the generalized Rosenblatt distribution.” *Statistics & Probability Letters* 94 (2014): 2473-2485.
20. Shuyang Bai and Murad S. Taqqu. “Generalized Hermite processes, discrete chaos and limit theorems.” *Stochastic Processes and their Applications* 124.4 (2014): 144-152.
21. Shuyang Bai and Murad S. Taqqu. “Multivariate limits of multilinear polynomial-form processes with long memory.” *Statistics & Probability Letters* 83.11 (2013): 2473-2485.

22. 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

- 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.
- Talk: “Tail Adversarial Stability”, online talk, Joint Statistical Meeting, Washington DC, 08/2022.
- Talk: “Can a Local Cluster Always Reveal the Global Extremal Index?”, Workshop on Heavy Tails, Long-Range Dependence, and Beyond, CIRM, France, 07/2022.
- Talk: “Tail Adversarial Stability”, Long memory and Extremes Online Seminar, 04/2022.
- Talk: “Phase transition of extremes for a family of stationary multiple-stable processes: the microscopic level”, AMS Spring Central Sectional Meeting. 03/2022.
- Talk: “Extremes for a Family of Multiple-Stable Processes”, Long memory and Extremes Online Seminar, 01/2022.
- Talk: “Phase transition of extremes for a family of stationary multiple-stable processes: the microscopic level”, AMS Southeastern Virtual Sectional Meeting. 11/2021.
- Talk: “New Representations and Limit Theorems for Hermite Processes”, Stochastic Seminar, University of Utah, Salt Lake City (online), 11/2021.
- Talk: “New Representations and Limit Theorems for Hermite Processes”, Statistics Seminar, Purdue University, West Lafayette, 10/2021.
- Talk: “Resampling Long-Range Dependent Time Series”, Bernoulli-IMS 10th World Congress in Probability and Statistics, Seoul National University, South Korea (online) 07/2021.
- Talk: “New Representations of Hermite Processes” Extreme Value Analysis Conference, University of Edinburgh, Edinburgh, United Kingdom (online), 07/2021.
- Talk: “Long Memory and Conservative Flows on Multiple Stochastic Integrals” Probability Seminar (online), Cornell University, 04/2021.
- Invited talk at CIRM (Centre International de Rencontres Mathématiques) Workshop, workshop on “Heavy Tails, Long-Range Dependence and Random Structures”, CIRM, France, 10/2020 (Canceled due to COVID-19).
- 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.)
- Talk: “Leverage Score Sampling for Multidimensional Streaming Time Series”, 2019 Joint Statistical Meetings (JSM), Denver, 08/2019.
- 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.
- Talk: “A non-central limit theorem on heavy-tailed chaos”, AMS Sectional Meeting, Auburn University, Auburn, 03/2019.

- Talk: “A non-central limit theorem on heavy-tailed chaos”, Research Seminar in Probability and Statistics, Tulane University, New Orleans, 03/2019.
- Talk: “Leverage subsampling for vector autoregression”, 12th International Conference on Computational and Financial Econometrics (CFE 2018), University of Pisa, Italy, 12/2018.
- Talk: “A non-central limit theorem on heavy-tailed chaos” AMS Sectional Meeting, University of Michigan, Ann Arbor, 10/2018.
- Talk: “Leverage subsampling for vector autoregression”, Georgia Statistics Day, University of Georgia, Athens, 10/2018.
- 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.
- Talk: “Resampling under Long Memory”. Statistics Seminar, Department of Statistics, Purdue University, West Lafayette, 02/2018.
- Talk: “The Long Memory Phenomenon”. Statistics Seminar, Department of Mathematics and Statistics, Georgia State University, Atlanta, 09/2017.
- 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.
- Talk: “Block Dependence and Resampling under Long Memory”. Statistics Seminar, Chinese University of Hong Kong, Hong Kong. 06/2017.
- Talk: “Between-Block Dependence under Long Memory”. AMS Sectional Meeting, Indiana University, Bloomington, 04/2017.
- Talk: “Block Dependence under Long Memory”. Statistics Seminar, School of Industrial & Systems Engineering, Georgia Institute of Technology, Atlanta, 04/2017.
- Talk: “Resampling under Long Memory”. Stochastics Seminar, Department of Mathematics, The University of Tennessee, Knoxville, 03/2017.
- Talk: “Self-Normalized Resampling of Long-Memory Time Series”. The 10th ICOSA International Conference, Shanghai Jiao Tong University, China, 12/2016.
- Poster: “Self-Normalized Resampling of Long-Memory Time Series”. Conference in Honor of Murray Rosenblatt, University of California San Diego, San Diego, 10/2016.
- Talk: “The long Memory Phenomenon”. Ying Xu Lab, Department of Biochemistry and Molecule Biology, University of Georgia, Athens, 09/2016.
- 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.
- Talk: “Self-Normalized Resampling of Long-Memory Time Series”. Seminar, Department of Statistics, Southwestern University of Finance and Economics, China, 05/2016.
- Poster: “Self-Normalized Resampling of Long-Memory Time Series”. Workshop on Dependence, Stability, and Extremes, The Fields Institute, Toronto, 05/2016.
- Talk: “Long Memory and Mon-Standard Limit Theorems”. Applied Math Seminar, University of Massachusetts Lowell, Lowell, 02/2016.

- Talk: “Self-Normalized Resampling for Time Series”. Boston University Statistics and Probability Seminar, Boston University, Boston, 12/2015.
- Talk: “Limit Theorems for Polynomial-Form Moving Average” CRM-PIMS Summer School in Probability, McGill University, Montreal, 06/2015
- 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
- Talk: “Self-similar processes on Wiener Chaos”. Boston University Statistics and Probability Seminar, Boston University, Boston, 12/2014.
- Poster: “Fractional processes on Wiener Chaos and Non-Central Limit Theorems”. Cincinnati Symposium on Probability Theory and Applications, University of Cincinnati, Cincinnati, 09/2014
- Talk “Wiener chaos and Limit Theorems Under Strong Dependence” Boston University Student Statistics and Probability Seminar, Boston University, Boston, 03/2014.
- 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.
- Talk: “Long-Range Dependence Meets Short-Range Dependence: Multivariate Limit Theorems”. Satellite Summer School to the 7th International Conference on Lévy Processes, 07/2013.
- 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

- Office of the Provost International Travel Funds, University of Georgia, 2016, 2018.
- 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 Session “Recent advances in analysis of dependent data”. The 4th International Conference on Econometrics and Statistics (EcoSta 2020), Yonsei University, Seoul, South Korea, 07/2020 (postponed to 2021 due to COVID-19).

REVIEW SERVICE

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*
- *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*
- *Scandinavian Journal of Statistics*
- *Stat*
- *Statistics & Probability Letters*
- *Stochastic Analysis and Applications*
- *Stochastic Models*
- *Stochastic Processes and their Applications*
- *The Annals of Probability*
- *The Annals of Statistics*

Invited reviewer for *Mathematical Reviews*

Proposal reviewer for National Science Foundation

GRADUATE
STUDENT
ADVISORY

PhD Major Adviser of

- He Tang (2021 -)
- Shiyuan Deng (2021 -)

Master Major Adviser of

- Malika Dhakhwa (2022 -)
- Chong Zhao (2022 -)

PhD Advisory Committee Member of

- Jiacheng Li (2021 -)
- Shenjie Min (2020 -)
- Xiao Di (2020 -)
- Honghe Jin (2019 -)
- Binglin Li (2019 -)
- Qihu Zhang (2019 - 2021)
- Huimin Hu (2019 -)
- Wenhao Pan (2018)
- Yan Du (2018 - 2020)
- Weifeng Wang (2018 -)
- Murilo Massaru Da Silva (2017 - 2020)
- Jiankun Zhu (2016 - 2019)
- Adel Bedoui (2016 - 2017)

Master Advisory Committee Member of

- Zixuan Zhao (2021)
- Yasemin Inceoglu (2018)
- Ho Suk Choi (2018)
- Cun Wang (2017)
- Sooyoung Kim (2017)

DEPARTMENT
SERVICES

- Department Personnel Committee (2022-)
- Department Advisory Committee (2020 - 2021)
- Undergraduate Program Committee (2020- 2022)
- Graduate Admission Committee (2016 - 2018)
- Colloquium Organization Committee (2017 spring, fall)
- Graduate Exam (Theory) Committee (2017 -)
- Research Development Committee (2018, 2019-2020, 2021 -)

UNIVERSITY
SERVICES

- University Council Member (2018 - 2021)

SKILLS

Languages: English (fluent), Mandarin Chinese (native).

Computer: R, Matlab, IDL, SAS, C, LaTeX, Linux, Microsoft Office, Google Docs.