Shuigen Liu

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Employment

2025 – present	**Research Fellow**, Department of Mathematics, National University of Singapore

Education

2021 – 2025	**Ph.D. in Mathematics**, National University of Singapore Advisors: Prof. Xin T. Tong and Prof. Weizhu Bao **Visiting student**, MIT, Jul – Dec 2024 (Host: Prof. Youssef Marzouk)
2017 – 2021	**B.S. in Mathematics**, Peking University

Research Interests

My research lies at the intersection of computational mathematics, applied probability and statistics. I focus on analysis and development of algorithms for high-dimensional sampling and uncertainty quantification, with applications in Bayesian inference and inverse problems. I am particularly interested in localization methods for sampling. I also work on ensemble Kalman methods for high-dimensional inference.

Keywords: Sampling, uncertainty quantification, localization, dimension reduction, data assimilation.

Publications

[5] Localized diffusion models. Georg A. Gottwald, **Shuigen Liu**, Youssef Marzouk, Sebastian Reich, and Xin T. Tong, arXiv:2505.04417 (2025).

[4] Stein's method for marginals on large graphical models. Tiangan Cui, **Shuigen Liu**, and Xin T. Tong, arXiv:2410.11771 (2025).

[3] Estimate of Koopman modes and eigenvalues with Kalman filter. Ningxin Liu, **Shuigen Liu**, Xin T. Tong, and Lijian Jiang, arXiv:2410.02815 (2024).

[2] Local MALA-within-Gibbs for Bayesian image deblurring with total variation prior. Rafael Flock, **Shuigen Liu**, Yiqiu Dong, and Xin T. Tong, *SIAM J. Sci. Comput.*, 47 (2025), pp. A2127–A2153.

[1] Dropout ensemble Kalman inversion for high dimensional inverse problems. **Shuigen Liu**, Sebastian Reich and Xin T. Tong, *SIAM J. Numer. Anal.*, 63 (2025), pp. 685–715.

Teaching

National University of Singapore

TA	Finite Element Method, Spring 2025
TA	Essential Data Analytics Tools: Numerical Computation, Spring 2024
TA	Calculus for Computing, Spring 2023 and Fall 2023
TA	Essential Data Analytics Tools: Convex Optimization, Spring 2023

Awards

2024	Faculty of Science PhD Conference Award, National University of Singapore
2024	Overseas Research Immersion Award, National University of Singapore
2021	President's Graduate Fellowship, National University of Singapore
2021	Outstanding Undergraduate, Peking University

Service

Reviewer for: SIAM/ASA Journal on Uncertainty Quantification, Journal of Machine Learning Research, Statistics and Computing.

Conferences

Jul 2025	Efficient Sampling Algorithms for Complex Models, IMS NUS, Singapore.
Jun 2025	MATRIX Research Program: Bayesian Learning of Very High-Dimensional Physical Process Models, MATRIX, Melbourne, Australia.
May 2025	2025 STU-NUS PhD Forum, Shanghai Jiao Tong University, Shanghai, China.
Oct 2024	FDS Conference: Recent Advances and Future Directions for Sampling, Yale University, New Haven, U.S.
Feb 2024	2024 SIAM Conference on Uncertainty Quantification (UQ24), Trieste, Italy.
Aug 2023	2023 International Congress on Industrial and Applied Mathematics (ICIAM 2023), Waseda University, Tokyo, Japan.
Jun 2023	Foundations of Computational Mathematics 2023 Conference (FoCM 2023), Sorbonne University, Paris, France.
Jul 2022	2022 International Conference on Scientific Computation and Differential Equations (SciCADE 2022), University of Iceland, Reykjavík, Iceland.