

## Academic Appointments

- 06/2021–  
present **Associate Professor**  
Academy of Mathematics and Systems Science  
Chinese Academy of Sciences
- 01/2019–  
05/2021 **Postdoctoral Scholar (Hosted by Michael I. Jordan)**  
Department of Electrical Engineering & Computer Science  
University of California, Berkeley

## Education

- 2015–2018 **Ph.D in Computer Science**  
Major: Theoretical Machine Learning  
School of Computing and Information Sciences, Florida International University, FL
- 2013–2015 **M.S. in Physics**  
Major: Theoretical Physics  
Department of Physics, University of Massachusetts, Dartmouth, MA
- 2008–2011 **M.S. in Mathematics**  
Major: Pure Mathematics  
Thesis: Nekhoroshev Estimates for Infinite-Dimensional Reversible System with Chain Structure,  
Advisor: Xiaoping Yuan  
School of Mathematical Science, Fudan University, Shanghai, China
- 2002–2006 **B.S. in Mathematics**  
Major: Pure and Applied Mathematics  
School of Mathematical Science, Ocean University of China, Qingdao, China

## Research Interests

- Optimization for Machine Learning
- Numerical Analysis and Scientific Computing
- Data Assimilation
- Nonlinear Sciences and Stochastic Sciences
- Fluid Dynamics (Turbulence, Geophysical and Astrophysical)

## Journal Publications

- **On the Hyperparameters in SGD with Momentum**  
**Bin Shi**  
To appear in Journal of Machine Learning Research, 2024.
- **Linear convergence of Forward-Backward Accelerated Algorithms without Knowledge of the Modules of the Strong Convexity**  
Bowen Li, **Bin Shi** and Ya-Xiang Yuan  
SIAM Journal on Optimization, 34(2):2150-2168, 2024.

- **The Sampling Method for Optimal Precursors of ENSO Events**  
Bin Shi and Junjie Ma  
Nonlinear Processes in Geophysics, 31(1):165–174, 2024.
- **On Learning Rates and Schrödinger Operators**  
Bin Shi, Weijie J. Su and Michael I. Jordan  
Journal of Machine Learning Research, 24(379):1–53, 2023.
- **An adjoint-free algorithm for conditional nonlinear optimal perturbations (CNOPs) via sampling**  
Bin Shi and Guodong Sun  
Nonlinear Processes in Geophysics, 30(3):263–276, 2023.
- **Understanding the Acceleration Phenomenon via High-Resolution Differential Equations**  
Bin Shi, Simon S. Du, Michael I. Jordan, and Weijie J. Su  
Mathematical Programming, Series A, 195(1):79–148, 2022.
- **Conjugate and Cut Points in Ideal Fluid Motion**  
Theodore D. Drivas, Gerard Misiólek, Bin Shi and Tsuyoshi Yoneda  
Annales Mathématiques du Québec, 46(1):207–225, 2022.

## Conference and Workshop Papers

- **Acceleration via Symplectic Discretization of High-Resolution Differential Equations**  
Bin Shi, Simon S. Du, Weijie J. Su and Michael I. Jordan  
Proceedings of the 33rd International Conference on Neural Information Processing Systems, (NeurIPS 2019).
- **A Conservation Law Method in Optimization**  
Bin Shi, Tao Li and Sundaraja S. Iyengar  
The Tenth Workshop on Optimization for Machine Learning  
The Thirty-first Annual Conference on Neural Information Processing Systems, (NeurIPS 2017).

## Monographs

- **Mathematical Theories of Machine Learning - Theory and Applications**  
Bin Shi and Sundaraja S. Iyengar  
Springer International Publishing, 2020

## Preprints

- **Gradient Norm Minimization of Nesterov Acceleration:  $o(1/k^3)$**   
Shuo Chen, Bin Shi and Ya-xiang Yuan  
arXiv preprint <https://arxiv.org/abs/2209.08862>, submitted
- **Optimal Disturbances of Blocking: A Barotropic View**  
Bin Shi, Dehai Luo and Wenqi Zhang  
arXiv preprint <https://arxiv.org/abs/2210.06011>, submitted
- **Proximal Subgradient Norm Minimization of ISTA and FISTA**  
Bowen Li, Bin Shi and Ya-xiang Yuan  
arXiv preprint <https://arxiv.org/abs/2211.01610>, submitted

- **Revisiting the Acceleration Phenomenon via High-Resolution Differential Equations**  
Shuo Chen, **Bin Shi** and Ya-Xiang Yuan  
arXiv preprint <https://arxiv.org/abs/2212.05700>, submitted
- **Linear Convergence of ISTA and FISTA**  
Bowen Li, **Bin Shi** and Ya-Xiang Yuan  
arXiv preprint <https://arxiv.org/abs/2212.06319>, submitted
- **On Underdamped Nesterov Acceleration**  
Shuo Chen, **Bin Shi** and Ya-Xiang Yuan  
arXiv preprint <https://arxiv.org/abs/2304.14642>, submitted
- **Understanding the ADMM Algorithm via High-Resolution Differential Equations**  
Bowen Li, **Bin Shi**  
arXiv preprint <https://arxiv.org/abs/2401.07096>, submitted
- **Understanding the PDHG Algorithm via High-Resolution Differential Equations**  
Shuo Chen, **Bin Shi**  
arXiv preprint <https://arxiv.org/abs/2403.11139>, submitted
- **A Lyapunov Analysis of Accelerated PDHG Algorithms**  
Xueying Zeng, **Bin Shi**  
arXiv preprint <https://arxiv.org/abs/2407.18681>, submitted

## Grants and Funding

- **Co-PI: National Science Foundation of China, #12241105**  
Developing 4D-Var Strongly Coupled Assimilation System of Climate System Models Based on Statistical Machine Learning
- **Co-PI: CAS Project for Young Scientists in Basic Research, #YSBR-034**  
Mathematical Principles of Deep Learning

## Professional Experience

Journal Review	<b>Mathematical Reviews/MathSciNet</b> <b>Mathematical Programming (MP)</b> <b>SIAM Journal on Optimization (SIOPT)</b> <b>SIAM Journal on Control and Optimization (SICON)</b> <b>SIAM Journal on Mathematical Analysis (SIMA)</b> <b>SIAM Journal on Numerical Analysis (SINA)</b> <b>Numerische Mathematik (NM)</b> <b>Mathematics of Computation (MCOM)</b> <b>Communications in Mathematical Sciences (CMS)</b> <b>Journal of Machine Learning Research (JMLR)</b> <b>Transactions on Machine Learning Research (TMLR)</b> <b>Journal of Computational Mathematics (JCM)</b> <b>Computational Optimization and Applications (CoA)</b> <b>Numerical Algorithms (NA)</b> <b>Journal of Global Optimization (JOGO)</b> <b>Journal of Optimization Theory and Applications (JOTA)</b> <b>Journal of Mathematical Fluid Mechanics (JMFM)</b> <b>IEEE Access</b>
Conf. Review	<b>ICML, NeurIPS, ICLR</b>

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## References: Machine Learning and Applied Mathematics

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## References: Atmospheric Science and Oceanography

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