Shiping Zhou

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Academic Position

Michigan State University, *East Lansing, MI*
Postdoctoral Research Associate *Aug. 2024 – present*
Postdoctoral mentor: Prof. Andrew J. Christlieb

Education

Missouri University of Science and Technology, *Rolla, MO*
Ph.D. in Mathematics (*Computational and Applied Mathematics Emphasis*) *Aug. 2019 – May 2024*
Advisor: Prof. Yanzhi Zhang

Shandong University, *Jinan, Shandong, China*
M.S. in Computational Mathematics *Sep. 2016 – Jun. 2019*
Advisor: Prof. Fuzheng Gao

Anhui University of Technology, *Ma'anshan, Anhui, China*
B.S. in Mathematics and Applied Mathematics *Sep. 2012 – Jul. 2016*

Research Interests

- Kinetic equations and structure-preserving numerical methods
- Hyperbolic and well-balanced shallow-water moment models
- Scientific machine learning for moment closures and reduced-order modeling
- Nonlocal and fractional PDEs: modeling, analysis, and fast solvers

Preprints and Manuscripts

7. Globally hyperbolic two-dimensional modified shallow water linearized moment equations and well-balanced finite-volume schemes, **S. Zhou**, J. Huang, and A. J. Christlieb, (under review).

6. Hyperbolic machine learning moment closures for the Vlasov–Poisson–BGK equations, A. J. Christlieb, S. Gong, J. Huang, N. A. Krupansky, and **S. Zhou** (in preparation).

5. A deterministic particle method for the relativistic Landau equation, **S. Zhou**, J. Hu, and A. J. Christlieb (in preparation).

4. An accurate parallel finite difference method for the variable-order fractional Laplacian in heterogeneous media, **S. Zhou**, and Y. Zhang (under review).

3. Data-driven approach for the solutions of time-dependent PDEs using convolutional neural network, **S. Zhou**, Y. Li, and Y. Zhang, (in preparation).

2. Nonlocal modeling of spatial fractional diffusion with truncated interaction domains and truncated kernel function singularity, **S. Zhou**, Y. Zhang, and M. Gunzburger, in revision (2025).

1. Analytical and computational aspects of the high-order fractional Laplacian, **S. Zhou**, J. P. Borthagaray, Y. Wu, and Y. Zhang, preprint (2023).

Published and Accepted Papers

6. Moment-enhanced shallow water equations with an effective wall closure for no-slip bottoms, **S. Zhou**, J. Huang, and A. J. Christlieb, *J. Comput. Phys.*, accepted (2026), arXiv:2506.14785.

5. Convolutional neural network-based reduced-order modeling for parametric nonlocal PDEs, Y. Wang, **S. Zhou**, and Y. Zhang, Comput. Methods Appl. Mech. Eng., 444 (2025), pp. 118084.

4. Fourier pseudospectral methods for the spatial variable-order fractional wave equations, X. Zhao, Y. Zhang, **S. Zhou**, Comput. Phys. Commun., 318 (2025), pp. 109876.

3. Parametric model reduction with convolutional neural networks, Y. Wang, **S. Zhou**, and Y. Zhang, Int. J. Numer. Anal. Mod., 21 (2024), pp. 716-738.

2. A novel and simple spectral method for nonlocal PDEs with the fractional Laplacian, **S. Zhou** and Y. Zhang, Comput. Math. Appl., 168 (2024), pp.133–147.

1. Weak Galerkin finite element method with second-order accuracy in time for parabolic problems, **S. Zhou**, F. Gao, B. Li, and Z. Sun, Appl. Math. Lett., 90 (2019), pp. 118–123.

Teaching

Recitation Instructor, MTH 235: Differential Equations (MSU) ..... *Fall 2026*
Recitation Instructor, MTH 133: Calculus II (MSU) ..... *Fall 2025*
140 students in total; **Supportive learning atmosphere: 4.13/5; respectful treatment: 4.46/5.**
Instructor, MATH 3304: Elementary Differential Equations (Missouri S&T) ..... *Spring 2023*
98 students in total; **Effectiveness average: 3.13/4.**
Lab Instructor, MATH 1214: Mathematics Calculus for Engineers I (Missouri S&T) .....*Fall 2020*
61 students in total; **Effectiveness average: 3.5/4.**

Talks and Posters

18. Hyperbolic machine learning moment closures for the Vlasov–Poisson–BGK equations, SIAM Conference on Computational Science and Engineering (CSE27), Pittsburgh, PA, 2027/2

17. Hyperbolic machine learning moment closures for the Vlasov–Poisson–BGK equations, 2026 SIAM New York–New Jersey–Pennsylvania Section Conference (NNP26), Rutgers University, New Brunswick, NJ, 2026/10

16. A deterministic particle method for the relativistic Landau equation, 2026 SIAM Annual Meeting (AN26), Cleveland, OH, 2026/7

15. A deterministic particle method for the relativistic Landau equation, Midwest Numerical Analysis Day 2026, University of Notre Dame, Notre Dame, IN, 2026/4

14. A deterministic particle method for the relativistic Landau equation, 28th International Conference on Numerical Simulation of Plasmas (ICNSP 2025), UCI, Irvine, CA, 2025/11

13. Moment-enhanced shallow water equations for non-slip boundary conditions, 2025 SIAM New York-New Jersey-Pennsylvania Section Conference, Penn State, State College, PA, 2025/10

12. Data-driven modeling of time-dependent nonlocal PDEs, CHaRMNET 2024 Annual Meeting, Virginia Tech, Blacksburg, VA, 2024/12

11. A novel and simple spectral method for nonlocal PDEs with fractional Laplacian, The 8th Annual Meeting of SIAM Central States Section, Lincoln, NE, 2023/10

10. A novel and simple spectral method for nonlocal PDEs with fractional Laplacian, Graduate Seminar at Missouri University of Science and Technology, Rolla, MO, 2023/4

9. Numerical studies on the high-order fractional Laplacian, Pi Day at Missouri University of Science and Technology, Rolla, MO, 2023/3

8. Accurate and efficient spectral method for fractional wave equations, Numerical Analysis Seminar at University of Pittsburgh, Pittsburgh, PA, 2023/2

7. Accurate and efficient spectral method for fractional wave equations, The 7th Annual Meeting of SIAM Central States Section, Stillwater, OK, 2022/10

6. Numerical studies on the high-order fractional Laplacian, Theoretical and Applied Aspects for nonlocal Models - Workshop of Banff International Research Station (BIRS), Online, 2022/7

5. Numerical methods for acoustic wave equations, Graduate Seminar at Missouri University of Science and Technology, Rolla, MO, 2022/4

4. Numerical studies on the high-order fractional Laplacian, The University of Kansas Numerical Analysis Day 2022, Lawrence, KS, 2022/3

3. Numerical studies on the high-order fractional Laplacian, Continuum Mechanics Seminar at University of Nebraska-Lincoln, Online, 2022/3

2. Numerical studies on the high-order fractional Laplacian, 4th Annual Meeting of the SIAM Texas-Louisiana Section, South Padre Island, TX, 2021/11

1. Numerical studies on the high-order fractional Laplacian, Midwest Numerical Analysis Day 2021, Rolla, MO, 2021/10

Department Service

- Committee Member, CMSE Colloquium and Brownbag Committee, Michigan State University *Sept. 2026–present*

Referee for Professional Journals

- Zeitschrift für angewandte Mathematik und Physik (ZAMP)
- Mathematics and Computers in Simulation

Skills

- Numerical analysis and modeling: nonlocal and fractional PDEs, hyperbolic moment systems, kinetic equations, and reduced-order models.
- Numerical methods: Fourier spectral and pseudospectral methods; finite-difference, finite-volume, and Galerkin methods; well-balanced and structure-preserving discretizations; deterministic particle methods.
- Scientific machine learning: convolutional neural networks for reduced-order modeling and time-dependent PDE solvers; hyperbolicity-aware learned moment closures; PyTorch.
- Research computing: C++, MATLAB, Python, and Fortran; FFT-based and matrix-free solvers; OpenMP and Slurm workflows; reproducible numerical verification; LaTeX and Git.

Professional Membership

- Society for Industrial and Applied Mathematics (SIAM) *Jan. 2021 – present*

Awards

- Gaoxiong Gan Scholarship, Missouri S&T, 2022, 2023, & 2024
- Paul W. Eloe Graduate Research Award, Missouri S&T, 2022 & 2023
- 8th Annual Meeting of SIAM Central State Section Travel Award, 2023
- First place at the Pi Day Celebration Poster Session, Missouri S&T, 2023
- Graduate Education Travel Fund, Missouri S&T, 2023
- Nonlocal School on Fractional Equations (NSFE) Travel Award, 2022
- Mathematics and Statistics Alumni Endowed Scholarship, Missouri S&T, 2022
- 7th Annual Meeting of SIAM Central State Section Travel Award, 2022