Wang Hao

Incoming Ph.D. Student, National University of Singapore (NUS)

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RESEARCH INTERESTS

- Structure-Preserving Operator Learning
- Scientific Machine Learning (SciML)
- Numerical Analysis for PDEs

EDUCATION

National University of Singapore (NUS), Incoming Ph.D. Student — Incoming

Zhejiang University, Mathematics and Applied Mathematics — 2022.09-Present

- GPA: 4.20/4.30 (93.70/100)
- **Relevant Coursework:** Real Analysis, Functional Analysis(H), PDE(H), Numerical Analysis.

PUBLICATIONS & MANUSCRIPTS

- **Hao Wang**, Qinghe Wang, Caiyou Yuan, Kailiang Wu. "Learning missing physics from legacy simulators with alternating neural integrators." **Manuscript accepted**, 2026.

RESEARCH EXPERIENCE

Research Intern — 2025.12-2026.04

Georgia Institute of Technology (Supervisor: Prof. Qi Tang)

- Collaborating weekly on advanced topics in structure-preserving operator learning for problems in plasma and fusion modeling.
- Independently designed a novel solution embedding a semi-Lagrangian discretization into a Fourier Neural Operator to bridge advection and diffusion-dominated regimes.
- Developed and validated a single model that accurately captures both sharp shock structures and smooth convection-diffusion behavior.

Research Intern — 2025.07-2025.08

Southern University of Science and Technology (Supervisor: Prof. Kailiang Wu)

- Single-handedly translated a conceptual framework (operator splitting with ML correction) into a mathematically rigorous and computationally robust model to bridge the model-reality gap.
- Conducted systematic analysis of the proposed operator-learning framework's stability and approximation properties.
- Implemented and benchmarked the framework on complex PDE systems, including Navier–Stokes, FitzHugh–Nagumo, and 1D compressible Euler equations.

RESEARCH PROJECTS

Zhejiang Province SRTP Project: Application and Optimization of Classical Computational Methods and Machine Learning Techniques in Flow Field Simulation — 2024.03-2025.05

Supervisor: Prof. Heyu Wang

- Worked with a finite element method program provided by my instructor (Prof. Wang He-Yu) to solve the Navier-Stokes equations, gaining hands-on experience in computational fluid dynamics.
- Currently working on integrating classical computational methods with machine learning to enhance simulation accuracy and reduce computational costs. Exploring different optimization techniques and loss functions to improve the performance of the PINN model.

HONORS & AWARDS

- **Chu Kochen Scholarship** (the highest honor bestowed upon ZJU students), Zhejiang University. 2025
- **National Scholarship** (Top 1%), Awarded by the Ministry of Education, China. 2023, 2024, 2025 (Thrice)
- **Bronze Award** at the Shing-Tung Yau College Student Mathematics Competition (Applied and Computational Mathematics category), 2025
- **First-Class Scholarship**, Zhejiang University. 2023, 2024, 2025 (Thrice)
- **Finalist** at the Mathematical Contest in Modeling (MCM/ICM), 2024

SEMINARS & READING GROUPS

- **Fourier Analysis Reading Group**, Zhejiang University. 2024.07 Studied *Fourier Analysis: An Introduction* (E. M. Stein & R. Shakarchi), covering fundamental concepts of Fourier series and transforms.
- **Finite Element Methods Reading Group**, Zhejiang University. 2024 Studied *The Mathematical Theory of Finite Element Methods* (S. C. Brenner & L. R. Scott), focusing on variational formulations, approximation theory, and error estimates.
- **Spectral Methods Group**, Zhejiang University. 2025 Studied *Spectral Methods: Algorithms, Analysis and Applications* (Jie Shen, Tao Tang, Li-Lian Wang), emphasizing spectral discretizations for PDEs, algorithmic implementation, and convergence analysis.

LEADERSHIP & INITIATIVES

Founder & Maintainer: "Rhythm of Mathematics" Resource Sharing Website 2024.06-Present

- Developed and launched an online platform for Zhejiang University students, dedicated to sharing learning experiences and resources for various mathematics courses.
- Collaborated with the Zhejiang University Youth League Committee to promote and support the platform.
- Curated and organized a comprehensive collection of study materials, notes, and peer advice to foster a collaborative learning environment within the mathematics department.

TECHNICAL SKILLS

- **Machine Learning:** Experienced in using PyTorch for setting up, training, and fine-tuning neural networks. Familiar with concepts such as convolutional neural networks (CNNs), Physics-Informed Neural Networks (PINNs).
- **Operating Systems:** Proficient in Linux, with experience in using command-line tools for simulation setup, code execution, and data processing.