

Shiqi Wu

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EDUCATION

- National University of Singapore** Singapore
Ph.D. - Mathematics GPA: 4.83/5.00 August 2022 - July 2026
Research Field - AI for science: I am interested in AI for science, particularly in leveraging deep learning techniques and designing specialized structures and algorithms based on physical properties to tackle long-term prediction and control challenges in complex, high-dimensional dynamic systems. Recently, I have also been working on control problems, planning algorithms, and fine-tuning multi-modal foundation models.
Courses: Algorithms at scale, Deep Learning and its Application, Linear System, Advanced optimization...
- Nanjing University** Nanjing, China
Bachelor of Science - Computational Mathematics GPA: 4.40/5.00 September 2018 - July 2022
Courses: Graduate Numerical Computing, Data Structure, Parallel Computing, Probabilities, Real Analysis, Functional Analysis, Optimization, Statistics, Graduate Analysis, Advanced Numerical Methods of PDE, ...

SKILLS SUMMARY

- Programming:** Proficient in Python (applicable to machine learning, Tensorflow, Pytorch), C/C++, MATLAB, cuda
- Skills:** Machine Learning, Deep Learning, Reinforcement Learning, Multi-modal Foundation Models, High-Performance Computing, Parallel Computing
- Languages:** Mandarin(Native), English(Professional Working)

PROJECTS

- Learning Dynamics of Nonlinear Field-Circuit Coupled Problems** NUS, Singapore
Graduate Researcher, Supervised by Prof. Qianxiao Li, Recipient of Young Scientist Award Dec 2023 - Dec 2024
 - Hybrid AI for Complex System Prediction:** Developed a hybrid model combining first-principles physics and machine learning, achieving 1% prediction error on a 7000-dimensional nonlinear field-circuit system.
 - Training Strategy Development:** Designed and implemented a Non-intrusive Model Combination algorithm, fusing a physics-based state-space model with a Koopman-type deep neural network, enabling a 1000x speedup over traditional methods.
 - Transformer-Based Model Development:** Engineered a transformer-like encoder for Koopman-based dictionary learning, enhancing high-dimensional system representation.
 - Research and Publication:** Led the research pipeline, including model construction, algorithm optimization, and experiment validation. Authored and published the research in *International Journal for Numerical Methods in Engineering* (JCR Q1, top-tier CFD journal).
- Non-intrusive model combination for learning dynamical systems** NUS, Singapore
Graduate Researcher Supervised by Prof. Qianxiao Li, Recipient of Young Scientist Award Dec 2022 - Oct 2023
 - Hybrid Algorithm Development:** Developed a novel non-intrusive algorithm that seamlessly integrates physics-based and machine learning models, providing a unified framework for model combination.
 - Proving and Optimizing ML Algorithms:** Proved the algorithm's linear convergence under specific assumptions and incorporated efficient acceleration techniques to enhance performance across various machine learning tasks.
 - ResNet-Based Model Development:** Designed and implemented experiments using ResNet-based architectures, demonstrating applicability in robotics control and cardiac electrophysiology modeling.
 - Research and Publication:** Led the research pipeline, including algorithm design, mathematical proof, and experimental validation. Authored and published the research in *Physica D: Nonlinear Phenomena* (JCR Q1, leading journal in nonlinear phenomena).
- Graph Wavefront Algorithm: Fast sequence-to-graph alignment algorithm** Harvard University, USA
Research Intern Supervised by Prof. Heng Li, Recipient of Sloan Fellowship Mar 2021 - Jun 2022
 - Scalable Sequence-to-Graph Alignment:** Proposed and developed the core concept of the Gwfa algorithm, enabling sequence-to-graph alignment with up to 10,000x speedup over existing exact algorithms.
 - Optimized C Prototype Development:** Implemented the initial C-based prototype, designing efficient data structures for storage and retrieval, laying the groundwork for large-scale validation and pruning optimizations.
 - Experimental Validation:** Conducted small-scale experimental verification, demonstrating the feasibility and accuracy of the algorithm.
 - Open-Source Algorithm Contribution:** Developed the foundational exact algorithm, which was later integrated as the core algorithm in MiniGraph, a widely recognized tool in bioinformatics with 400+ GitHub stars.

TEACHING EXPERIENCE

- **Advanced Data Science Project** NUS, Singapore
Teaching Assistant *Jan 2025-May 2025*
 - Mentor total 48(8 teams) postgraduates in Statistics data science projects, covering time series analysis, natural language processing (NLP), and computer vision.
 - Provide technical guidance, helping students develop methodologies, refine models, and correct technical misconceptions. Reviewed their implementations, identified and clarified technical misconceptions, and guided them in troubleshooting coding issues.
 - Facilitate effective communication between students and faculty, ensuring project alignment and research clarity.

PUBLICATIONS

- Wu, Shiqi, Gérard Meunier, Olivier Chadebec, Qianxiao Li, and Ludovic Chamoin. “Learning Dynamics of Nonlinear Field-Circuit Coupled Problems with a Physics-Data Combined Model.” *International Journal for Numerical Methods in Engineering*(2025). Accepted for publication.
- Wu, Shiqi, Ludovic Chamoin, and Qianxiao Li. “Non-intrusive model combination for learning dynamical systems.” *Physica D: Nonlinear Phenomena*(2024).
<https://www.sciencedirect.com/science/article/abs/pii/S0167278924001039>
- Zhang, Haowen, Shiqi Wu, Srinivas Aluru, and Heng Li. “Fast sequence to graph alignment using the graph wavefront algorithm.” *arXiv preprint arXiv:2206.13574* (2022). <https://arxiv.org/abs/2206.13574>

CONFERENCES AND WORKSHOPS

- **14th AIMS Conference** - Dec 2024
Contributed Talk: “Non-intrusive model combination for learning dynamical systems.”
- **AI for Science and Nobel Turing Challenge Initiative (AI4Sci/NTCI) Conference** - July 2024
Poster Presentation: “Non-intrusive model combination for learning dynamical systems.”