Da Long

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Education

The University of Utah, Salt Lake City, Utah

Ph.D. student in Computer Science, GPA: 3.87, 2021 - Present, Expected: 2026

- Advisor: Shandian Zhe

The University of Arizona, Tucson, Arizona

B.S. in Computer Science, GPA: 4.0, 2019 - 2021

B.S. in Mathematics, GPA: 4.0, 2019 - 2021

Research Interests

AI for Physics: Spatio-temporal Forecasting, Generative Operator Learning, Surrogate Modeling

Probabilistic Learning: Generative Modeling, Bayesian Modeling, Gaussian Process

Work Experience

Lawrence Berkeley National Laboratory, Berkeley, CA

Student Researcher, Aug. 2024 - Dec. 2024

- Designed a hierarchical spatio-temporal Fourier transformer (StFT) for long-term forecasting, improving prediction stability and accuracy with uncertainty quantification.

Meta, Menlo Park, CA

Research Scientist Intern, May 2024 - Aug. 2024

- Integrated reinforcement learning into Meta's generative recommendation system, improving long-term performance.

Skills

Technical: Python, MATLAB, C, PyTorch, JAX, LaTeX

Research Experience

Spatio-temporal Fourier Transformer for Long-term Dynamics Prediction

- Designed a hierarchical Fourier transformer for multi-scale and multi-physics long-term spatio-temporal forecasting

Arbitrarily-Conditioned Multi-Functional Diffusion for Multi-Physics Emulation

- Proposed a flexible diffusion model framework for multi-physics systems to simulate diverse physical variables, addressing arbitrary conditional tasks

Solving Forward and Inverse Problems via an Invertible Neural Operator

- Invented an invertible neural operator to solve both PDE forward and inverse problems

Toward Efficient Kernel-Based Solvers for Nonlinear PDEs

- Developed a kernel learning framework to efficiently and effectively solve nonlinear PDEs

Learning High-frequent and Multi-scale Solutions via Gaussian Process

- Solving high-frequent and multi-scale PDEs by selecting and learning high-frequent components through a spectral mixture kernel

Kernel Method for Operator Learning

- Outperformed leading methods such as FNO and DeepONet in noisy and sparse datasets

Gaussian Process for ODE/PDEs Discovery via Spike-and-Slab Priors

- Succeeded in recovering the underlying equations in noisy and sparse datasets using spike-and-slab priors, while state-of-the-art methods failed

Gaussian Process for Solving ODE/PDEs

- Developed a Gaussian process framework to solve ODE/PDEs and quantified uncertainties in solutions through variational inference

Academic Services

Reviewer

- AISTATS 2023, ICML 2022, Neural Networks

Teaching Experience

The University of Utah
Teaching Mentorships
- CS 6350 Machine Learning (Fall 2022)
- CS 6190 Probabilistic Machine Learning (Spring 2023)

Publications

$*$ indicates equal contribution.

- **Long D.**, Xu Z., Yuan Q., Yang Y., & Zhe S., Invertible Fourier Neural Operators for Tackling Both Forward and Inverse Problems. In *International Conference on Artificial Intelligence and Statistics (AISTATS 2025)*.
- **Long D.**, Xing W., Krishnapriyan A., Kirby R., Zhe S., & Mahoney M., Equation Discovery with Bayesian Spike-and-Slab Priors and Efficient Kernels. In *International Conference on Artificial Intelligence and Statistics (AISTATS 2024)*.
- Fang S.*, Cooley M.*, **Long D.***, Li S., Kirby R., & Zhe S., Solving High Frequency and Multi-Scale PDEs with Gaussian Processes. In *International Conference on Learning Representations (ICLR 2024)*.
- **Long D.**, Mrvaljevic N., Zhe S., & Hosseini B., A Kernel Approach for PDE Discovery and Operator Learning. In *Physica D: Nonlinear Phenomena*.
- **Long D.**, Wang Z., Krishnapriyan A., Kirby R., Zhe S., & Mahoney M. (2022). AutoIP: A United Framework to Integrate Physics into Gaussian Processes. In *International Conference on Machine Learning (ICML 2022)*.

Papers in Submission

- **Long D.**, Zhe S., Williams S., Oliker L., & Bai Z., Spatio-temporal Fourier Transformer (StFT) for Long-term Dynamics Prediction.
- **Long D.**, Xu Z., Yang G., Narayan A., & Zhe S., Arbitrarily-Conditioned Multi-Functional Diffusion for Multi-Physics Emulation.
- Xu Z.*, **Long D.***, Xu Y., Yang G., Zhe S., & Owhadi H., Toward Efficient Kernel-Based Solvers for Nonlinear PDEs.
- Li Y., Chen K., **Long D.**, Xu Z., Xing W., Hochhalter J., & Zhe S., Pseudo Physics-Informed Neural Operators.