Da Long

837 University Village, Salt Lake City, UT 84108

385-418-7953, u1368737@umail.utah.edu, long-da.github.io

Education

The University of Utah, Salt Lake City, Utah

Ph.D. student in Computer Science, GPA: 3.87, 2021 – Present

- 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 Scientific Discovery: Multi-Scale Spatiotemporal Dynamics Forecasting, Generative Operator Learning, Surrogate Modeling, Equation Discovery, Inverse Problem Modeling

Probabilistic Learning: Generative Modeling, Bayesian Modeling, Uncertainty Quantification, Approximate Inference, Gaussian Process

Skills

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

Research Experience

Hierarchical Fourier Transformer for Multi-Scale Spatiotemporal Forecasting

- Designed a hierarchical Fourier transformer for scalable multi-scale spatiotemporal forecasting

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

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

Solving Forward and Inverse Problems via an Invertible Neural Operator

- Developed 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 solution uncertainties through variational inference

Academic Services

Reviewer

- AISTATS 2023, ICML 2022, Neural Networks

Work Experience

Lawrence Berkeley National Laboratory, Berkeley, CA

Student Researcher, Aug. 2024 - Present

- Designed a scalable hierarchical Fourier transformer for long-term forecasting of multi-scale and multi-physics dynamics.

Meta, Menlo Park, CA

Research Scientist Intern, May 2024 - Aug. 2024

- Integrated reinforcement learning into Meta's generative recommendation system, enhancing long-term performance metrics across most tasks.

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.**, 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., Bai Z., Oliker L., & Williams S., Hierarchical Fourier Transformer for Long-Term Multi-Scale Spatiotemporal Dynamics Forecasting *(Submission in ICML 2025)*.
- **Long D.**, Xu Z., Yang G., Narayan A., & Zhe S., Arbitrarily-Conditioned Multi-Functional Diffusion for Multi-Physics Emulation *(Submission in AISTATS 2025)*.
- **Long D.**, Yang Y., & Zhe S., Invertible Fourier Neural Operators for Tackling Both Forward and Inverse Problems *(Submission in AISTATS 2025)*.
- Xu Z.*, **Long D.***, Xu Y., Yang G., Zhe S., & Owhadi H., Toward Efficient Kernel-Based Solvers for Nonlinear PDEs *(Submission in ICLR 2025)*.
- Li Y., Chen K., **Long D.**, Xing W., & Zhe S., Pseudo Physics-Informed Neural Operators *(Submission in ICLR 2025)*.