

# Xin-Yang Liu

[xin-yang-liu.github.io](https://xin-yang-liu.github.io)

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## EDUCATION

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- **University of Notre Dame** Notre Dame, IN, USA  
*Ph.D. candidate - Computational Physics, Mechanical Engineering* Jan 2020 - Present
  - **Advisor:** Professor Wang, Jian-Xun
  - **Research interests:** Scientific Machine Learning, Dynamic Control, Computational Physics
- **Xi'an Jiaotong University** Xi'an, Shannxi, China  
*Bachelor of science - Energy & Power Engineering* Aug 2015 - June 2019

## PUBLICATIONS — Peer-reviewed paper

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- Liu, X.Y., Zhu, M., Lu, L., Sun, H. and Wang, J.X., 2024. [Multi-resolution partial differential equations preserved learning framework for spatiotemporal dynamics](#). *Communications Physics*, 7(1), p.31.
- Liu, X.Y. and Wang, J.X., 2021. [Physics-informed Dyna-style model-based deep reinforcement learning for dynamic control](#). *Proceedings of the Royal Society A*, 477(2255), p.20210618.
- Movahhedi, M.\*, Liu, X.Y.\*, Geng, B., Elemans, C., Xue, Q., Wang, J.X. and Zheng, X., 2023. [Predicting 3D soft tissue dynamics from 2D imaging using physics informed neural networks](#). *Communications Biology*, 6(1), p.541. \*Equal Contribution
- Du, P., Parikh, M.H., Fan, X., Liu, X.Y. and Wang, J.X., 2024. [CoNFILD: Conditional Neural Field Latent Diffusion Model Generating Spatiotemporal Turbulence](#). arXiv preprint arXiv:2403.05940. Accepted at *Nature Communication*
- Wang, Q., Ren, P., Zhou, H., Liu, X.Y., Liu, Y., Deng, Z., Zhang Y., Chengze, R., Liu, H., Wang, Z., Wang, J.X., Wen, J.R., Sun, H., 2024. [P<sup>2</sup>C<sup>2</sup>Net: PDE-Preserved Coarse Correction Network for efficient prediction of spatiotemporal dynamics](#). *Advances in Neural Information Processing Systems* 38

## PREPRINTS UNDER REVIEW

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- Liu, X.Y., Bodaghi, D., Xue, Q., Zheng, X. and Wang, J.X., 2024. [Asynchronous Parallel Reinforcement Learning for Optimizing Propulsive Performance in Fin Ray Control](#). arXiv preprint arXiv:2401.11349. Submitted to *Engineering with Computers*
- Liu, X.Y.\*, Parikh, M.H.\*, Fan, X., Du, P., Wang, Q., Chen, Y.F., Wang, J.X., 2024. [CoNFILD-inlet: Synthetic Turbulence Inflow Using Generative Latent Diffusion Models with Neural Fields](#) \*Equal Contribution

## PREPRINTS IN PREPARATION

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- Liu, X.Y., Fan, X., Wang, J.X., 2024. MuRFiV: A Multi-Resolution Finite-Volume Inspired Deep Learning Framework for Predicting Spatiotemporal Dynamics [Presented at Crunch seminar](#)
  - Fan, X., Liu, X.Y., Wang, M., Wang, J.X., 2024. Diff-FlowFSI: A JAX-Based Differentiable Solver for Turbulent Flow and Fluid-Structure Interactions
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## PROJECTS IN PROGRESS

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- **Liu, X.Y.**, Parikh, M.H., Fan, X., Wang, J.X., 2025. Divergence-Free Turbulence Inlet Generator with Denosing Diffusion
- Akhare, D., **Liu, X.Y.**, Sun, L., Wang, J.X., 2025 Flexible Offline Reinforcement Learning for Varying Sensor Distribution.
- Parikh, D., **Liu, X.Y.**, Wang, J.X., 2025 Strategies for Alleviating Memorization in Training Diffusion Models for Spatiotemporal Dynamics Generation

## CONFERENCE PRESENTATIONS

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- **Liu, X.Y.**, Fan, X., Wang, J.X. Integrating PDE Operators into Neural Network Architecture in A Multi-Resolution Manner for Spatiotemporal Prediction  
USACM Thematic Conference on Uncertainty Quantification for Machine Learning Integrated Physics Modeling (UQ-MLIP), Aug. 2024
- **Liu, X.Y.**, Fan, X., Wang, J.X. MuRFiV-Net: A Multi-Resolution Finite-Volume Inspired Neural Network for Predicting Spatiotemporal Dynamics  
American Physical Society Division of Fluid Dynamics (APS DFD), Nov. 2023
- **Liu, X.Y.**, Wang, J.X. Multi-Resolution and Finite-Volume Method inspired Neural Network (MuRFiV-Net) for PDE prediction  
International Congress on Industrial and Applied Mathematics (ICIAM), Aug. 2023
- **Liu, X.Y.**, Wang, J.X. Predicting parametric spatiotemporal dynamics by multi-resolution pde structure-preserved deep learning  
APS DFD, Nov. 2022
- **Liu, X.Y.**, Sun, H., Wang, J.X. Predicting parametric spatiotemporal dynamics by multi-resolution PDE structure-preserved deep learning  
Society of Engineering and Science, Oct. 2022
- **Liu, X.Y.**, Bodaghi, D., Zheng, X., Xue, Q., Wang, J.X. Off-Policy Reinforcement Learning for Finsh-Fin-Ray Control Trained in an Asynchronous Parallel Manner  
UQ-MLIP, Aug. 2022
- **Liu, X.Y.**, Bodaghi, D., Zheng, X., Xue, Q., Wang, J.X. Accelerating deep reinforcement learning with physics-informed models and asynchronous parallel training  
Society for Industrial and Applied Mathematics Uncertainty Quantification (SIAM UQ), Apr. 2022
- **Liu, X.Y.**, Bodaghi, D., Zheng, X., Xue, Q., Wang, J.X. Deep reinforcement learning for fish fin ray control  
APS DFD, December 2021
- **Liu, X.Y.**, Wang, J.X. Physics-informed Dyna-Style Model-Based Deep Reinforcement Learning for Dynamic Control.  
SIAM Annual Meeting, Jul. 2021

## HONORS AND AWARDS

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- USACM Thematic Conference on Uncertainty Quantification for Machine Learning Integrated Physics Modeling (UQ-MLIP) Travel Award  
Aug., 2024
- Society of Engineering Science Annual Technical Meeting (SES2022) funding support  
Oct., 2022
- USACM Thematic Conference on Uncertainty Quantification for Machine Learning Integrated Physics Modeling (UQ-MLIP) Travel Award  
Aug., 2022
- 16<sup>th</sup> U.S. National Congress on Computational Mechanics Conference Award  
May., 2021

## SKILLS

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- **Coding:** Python (Pytorch, Jax), Julia, Matlab, C++, CUDA
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