

Xin-Yang Liu

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EDUCATION

- **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

- **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
- **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*. Accepted at *Engineering with Computers*
- 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. [P²C²Net: PDE-Preserved Coarse Correction Network for efficient prediction of spatiotemporal dynamics](#). *Advances in Neural Information Processing Systems* 38

PREPRINTS UNDER REVIEW

- **Liu, X. Y.***, Parikh, M.H.*, Fan, X., Du, P., Wang, Q., Chen, Y.F. and Wang, J.X., 2024. [CoNFILd-inlet: Synthetic Turbulence Inflow Using Generative Latent Diffusion Models with Neural Fields](#). *arXiv preprint arXiv:2411.14378*. *Equal Contribution

PREPRINTS IN PREPARATION

- **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

PROJECTS IN PROGRESS

- **Liu, X.Y.**, Wang, J.X., 2025. What caused artificial Pressure fluctuation in incompressible flow with Synthetic inlet ?
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- 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

- **Liu, X.Y.**, Fan, X., Wang, M. and Wang, J.X. Diff-FlowFSI: A GPU-accelerated, JAX-based Differentiable CFD Solver for Turbulent Flow and Fluid-Structure Interactions
American Physical Society Division of Fluid Dynamics (APS DFD), Nov. 2024
- **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 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

- 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
- 16th U.S. National Congress on Computational Mechanics Conference Award May., 2021

TEACHING ASSISTANCE EXPERIENCE

- **Graduate level:** Computational Fluid Dynamics (2 semesters), Bayesian Data Assimilation
 - **Undergraduate level:** Fluid Mechanics (3 semesters), Compressible Flow, Aerospace Design
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