

RUIKUN LI

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Education

Tsinghua University (THU) Advised by Prof. Qingmin Liao and Prof. Yong Li M.Eng., Electronics and Communication Engineering	2023.9 – Present <i>GPA: 3.86/4.0</i>
Huazhong University of Science and Technology (HUST) B.Eng., Electronic Information Engineering	2019.9 – 2023.6 <i>GPA: 3.97/4.0 (rank 1)</i>

Research Interests

Over the past three years, my research was dedicated to modeling and forecasting the behavior of complex systems with physics-inspired AI. Specifically, my work has focused on leveraging *generative models*, *GNNs*, *meta-learning*, and *LLMs* to address challenges in multivariate time-series, stochastic processes, and spatio-temporal dynamics.

Publications

(†equal contribution, * corresponding author)

1. *WeightFlow: Learning Stochastic Dynamics via Evolving Weight of Neural Network*
Ruikun Li, Jiazen Liu, Huandong Wang*, Qingmin Liao, and Yong Li
Annual AAAI Conference on Artificial Intelligence (**AAAI**), 2026
2. *Predicting the Energy Landscape of Stochastic Dynamical Systems via Physics-informed Self-supervised Learning*
Ruikun Li, Huandong Wang*, Qingmin Liao, and Yong Li
International Conference on Learning Representations (**ICLR**), 2025
3. *Predicting the Dynamics of Complex System via Multiscale Diffusion Autoencoder*
Ruikun Li, Jingwen Cheng, Huandong Wang*, Qingmin Liao, and Yong Li
ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**KDD**), 2025
4. *Predicting Long-term Dynamics of Complex Networks via Identifying Skeleton in Hyperbolic Space*
Ruikun Li, Huandong Wang*, Jinghua Piao, Qingmin Liao, and Yong Li
ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**KDD**), 2024
5. *Learning Slow and Fast System Dynamics via Automatic Separation of Time Scales*
Ruikun Li, Huandong Wang*, and Yong Li
ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**KDD**), 2023
6. *Sparse Diffusion Autoencoder for Test-time Adapting Prediction of Complex Systems* [lead project and write paper]
Jingwen Cheng†, **Ruikun Li†**, Huandong Wang*, and Yong Li
Advances in Neural Information Processing Systems 38 (**NeurIPS**), 2025
7. *Artificial intelligence for complex network: Potential, methodology and application*
Jingtao Ding, ..., **Ruikun Li**, and Yong Li*
Companion Proceedings of the ACM on Web Conference (**WWW**) 2025,

Manuscripts (preprint)

1. *Predicting Dynamical Systems across Environments via Diffusive Model Weight Generation*
Ruikun Li, Huandong Wang*, Yuan Yuan, Jingtao Ding, Qingmin Liao and Yong Li
under review by **ICLR** 2026
2. *MLLM-based Discovery of Intrinsic Coordinates and Equations from High-Dimensional Dynamic System*
Ruikun Li, Yan Lu*, Biqing Qi, and Wanli Ouyang
under review by **ICLR** 2026
3. *Zero-Shot Forecasting of Network Dynamics through Weight Flow Matching* [lead project and write paper]
Shihe Zhou†, **Ruikun Li†**, Huandong Wang*, and Yong Li
under review by **WWW** 2026
4. *NonEquilibrium Foundations Should Underpin Generative Processes in Complex Systems* [conduct experiment]
Jiazen Liu†, **Ruikun Li†**, Huandong Wang*, Chang Liu, Jingtao Ding, Zihan Yu, and Yong Li
proudly rejected by **NeurIPS** 2025
5. *Multiscale structure-encoded pretraining for evolutionary microbial communities* [conduct experiment and write paper]
Ruikun Li†, Huandong Wang†, Qingmin Liao, Jiliang Hu*, and Yong Li*
under review by **Nature Communications**

6. Deep Synergetic Modeling of Slow-fast Dynamics in Complex Systems [conduct experiments]
Huandong Wang†, **Ruikun Li†**, Qingmin Liao, Jiang Tao, and Yong Li*
under review by Communications Physics

Research Experience

Generative Learning for Scientific Computing | Project Leader Nov. 2024 – Oct. 2025

- Designed a multiscale encoder and conditional diffusion decoder for efficient and accurate long-term spatiotemporal prediction (KDD'25).
- Developed a sparse probe encoder and a gradient-guided diffusion decoder for test-time adaptive prediction in complex systems (NeurIPS'25).
- Designed a physics-informed weight diffusion model to address the cross-environment generalization problem in spatiotemporal prediction (under review).
- Contributed to a perspective paper on non-equilibrium physics and generative models by designing and executing key experiments (under review).

Deep Learning for Stochastic Physics System | Project Leader May 2024 – April 2025

- Designed a codebook encoder and a graph neural Fokker-Planck equation to infer the underlying energy landscape from evolutionary trajectories (ICLR'25).
- Designed a weight-space neural differential equation to effectively predict the long-term evolution of probability distributions in stochastic processes (under review).
- Developed a multiscale encoder for individual, population, and generational levels, significantly improving the prediction of population evolution (under review).

Graph Learning for Complex Network | Project Leader Aug. 2023 – March 2024

- Designed a hyperbolic renormalization group method to identify the low-dimensional skeleton of network dynamics (KDD'24).
- Designed a physics-informed weight flow matching to address the cross-environment generalization problem in network dynamics (under review).
- Contributed to a survey on AI for complex systems, authoring the chapter on network dynamics (WWW'25).

Synergistic Modeling of Complex System | Core Member Nov. 2022 – June 2025

- Designed a time-lag autoencoder to identify the time scales of complex systems, facilitating the understanding of their intrinsic dynamics (KDD'23).
- Contributed to designing a dual-neural ODE predictor for synergistic slow-fast forecasting to accurately predict the long-term evolution of complex systems (under review).

Internship Experience

1. **Shanghai Artificial Intelligence Laboratory** | Research intern Sept. 2023 – Feb. 2024
Core member of the Astronomy project in the AI for Science department, focusing on complex visual-spatial reasoning of MLLMs.
2. **Zilliz** | Algorithm developer July 2023 – Oct. 2023
Developed dimension reduction techniques (tSNE, UMAP, MDS) to enhance vector database retrieval speed.
3. **Intel Corporation** | Algorithm developer June 2021 – June 2023
Applied MARL for energy-efficient hardware sleeping and AutoML with **BigDL** for traffic feature mining.

Honors & Awards

- National Scholarship (Graduate) 2025
- National Scholarship (Undergraduate) ×3 2020, 2021, 2022
- Merit Student ×3 2020, 2021, 2022
- Honors Degrees 2023

Professional Services

Conference Reviewer: ICLR'26, ICML'25, NeuIPS'25, KDD'25, AAAI'26, ECML-PKDD'25

Technical Skills

Programming Languages Python, C, Matlab, Shell
Professional Software Pytorch, Linux, Git, LaTeX