

# RUIKUN LI

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## Education

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Tsinghua University (THU)

Advised by Prof. Qingmin Liao and Prof. Yong Li  
M.Eng., Electronics and Communication Engineering

2023.9 – Present

GPA: 3.86/4.0

Huazhong University of Science and Technology (HUST)

B.Eng., Electronic Information Engineering

2019.9 – 2023.6

GPA: 3.97/4.0 (rank 1)

## Research Interests

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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

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(†equal contribution, \* corresponding author)

1. *WeightFlow: Learning Stochastic Dynamics via Evolving Weight of Neural Network*  
**Ruikun Li**, Jiazhen 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)

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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 ICLR2026
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]  
Jiazhen 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<sup>†</sup>, **Ruikun Li<sup>†</sup>**, 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, NeurIPS’25, KDD’25, AAAI’26, ECML-PKDD’25

**Technical Skills**

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