

# HAIXU WU (吴海旭)

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## EDUCATION

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- Tsinghua University, Software Engineering, PhD student 2020.8 - 2025.7
- Advised by Prof. [Mingsheng Long](#).
  - With honor: **Tsinghua Top Grade Scholarship** (10 per year, the highest honor for Tsinghua graduates) and **Tsinghua Outstanding Young Researcher** (10 per year, the highest honor for graduates in research).
- Tsinghua University, Software Engineering, Bachelor of Engineering 2016.8 - 2020.7
- With honor: **Outstanding Undergraduate** in Tsinghua University (Top 10%), and Beijing (Top 5%).
- Tsinghua University, Mathematical Science, Bachelor of Science (Second Degree) 2017.8 - 2020.7
- Graduated with A+ score for the final thesis (Top 5%).

## RESEARCH INTERESTS

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My research interests lie in deep learning and scientific machine learning, especially sequence modeling, physical world modeling and PDE solving. I want to create strong foundation models through scientific inspiration and theoretical support for modeling our ever-changing world, solving challenging science problems and advancing practical applications. My work has received more than [5,000 times citations](#). Here are representative ones:

1. Sequence modeling: [Flowformer](#) (ICML 2022), [TimesNet](#) (ICLR 2023).
2. Physical world modeling: [Autoformer](#) (NeurIPS 2021), [Corrformer](#) (Nature Machine Intelligence 2023).
3. PDE solving: [Transolver](#) (ICML 2023), [RoPINN](#) (NeurIPS 2024).

## JOURNAL ARTICLES

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[1] Interpretable Weather Forecasting for Worldwide Stations with a Unified Deep Model

**Haixu Wu**, Hang Zhou, Mingsheng Long#, Jianmin Wang#

*Nature Machine Intelligence (Nat. Mach. Intell.)*, 2023 [[PDF](#)][[Code](#)]

☆ [Cover Article for June Issue, 2023](#)

☆ [Youth Outstanding Paper Award Honorable Mention of WAIC 2024](#)

[2] PredRNN: A Recurrent Neural Network for Spatiotemporal Predictive Learning

Yunbo Wang\*, **Haixu Wu**\*, Jianjin Zhang, Zhifeng Gao, Jianmin Wang, Philip S. Yu, Mingsheng Long#

*IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2022 [[PDF](#)][[Code](#)]

☆ [ESI Highly Cited Paper, Hot Paper, Citation 400+](#)

[3] ModeRNN: Harnessing Spatiotemporal Mode Collapse in Unsupervised Predictive Learning

Zhiyu Yao, Yunbo Wang, **Haixu Wu**, Jianmin Wang, Mingsheng Long#

*IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2023 [[PDF](#)][[Code](#)]

## CONFERENCE PROCEEDINGS

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[1] RoPINN: Region Optimized Physics-Informed Neural Networks

**Haixu Wu**, Huakun Luo, Yuezhou Ma, Jianmin Wang, Mingsheng Long#

*Neural Information Processing Systems (NeurIPS)*, 2024 [[PDF](#)][[Code](#)][[Slides](#)]

[2] Transolver: A Fast Transformer Solver for PDEs on General Geometries

**Haixu Wu**, Huakun Luo, Haowen Wang, Jianmin Wang, Mingsheng Long#

*International Conference on Machine Learning (ICML)*, 2024 [[PDF](#)][[Code](#)][[Slides](#)] ([Spotlight Paper](#))

☆ [Integrated into NVIDIA Modulus as the Latest Neural PDE Solver](#)

[3] Solving High-Dimensional PDEs with Latent Spectral Models

**Haixu Wu**, Tengge Hu, Huakun Luo, Jianmin Wang, Mingsheng Long#

*International Conference on Machine Learning (ICML)*, 2023 [[PDF](#)][[Code](#)][[Slides](#)]

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\* Equal Contribution, # Corresponding Author

- [4] TimesNet: Temporal 2D-Variation Modeling for General Time Series Analysis  
**Haixu Wu\***, Tengge Hu\*, Yong Liu\*, Hang Zhou, Jianmin Wang, Mingsheng Long#  
*International Conference on Learning Representations (ICLR)*, 2023 [[PDF](#)][[Code](#)][[Slides](#)]  
☆ **Ranked 11th of the Most Cited Papers in ICLR 2023, Citation 700+**
- [5] Flowformer: Linearizing Transformers with Conservation Flows  
**Haixu Wu**, Jialong Wu, Jiehui Xu, Jianmin Wang, Mingsheng Long#  
*International Conference on Machine Learning (ICML)*, 2022 [[PDF](#)][[Code](#)][[Slides](#)]
- [6] Autoformer: Decomposition Transformers with Auto-Correlation for Long-Term Series Forecasting  
**Haixu Wu**, Jiehui Xu, Jianmin Wang, Mingsheng Long#  
*Neural Information Processing Systems (NeurIPS)*, 2021 [[PDF](#)][[Code](#)][[Slides](#)]  
☆ **Paper Digest Most Influential Paper of NeurIPS 2021, Citation 1900+**
- [7] MotionRNN: A Flexible Model for Video Prediction with Spacetime-Varying Motions  
**Haixu Wu\***, Zhiyu Yao\*, Jianmin Wang, Mingsheng Long#  
*IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021 [[PDF](#)][[Code](#)][[Slides](#)]
- [8] DeepLag: Discovering Deep Lagrangian Dynamics for Intuitive Fluid Prediction  
Qilong Ma\*, **Haixu Wu\***, Lanxiang Xing, Shangchen Miao, Mingsheng Long#  
*Neural Information Processing Systems (NeurIPS)*, 2024 [[PDF](#)][[Code](#)]
- [9] TimeXer: Empowering Transformers for Time Series Forecasting with Exogenous Variables  
Yuxuan Wang\*, **Haixu Wu\***, Jiaxiang Dong, Yong Liu, ..., Jianmin Wang, Mingsheng Long#  
*Neural Information Processing Systems (NeurIPS)*, 2024 [[PDF](#)][[Code](#)]
- [10] HelmFluid: Learning Helmholtz Dynamics for Interpretable Fluid Prediction  
Lanxiang Xing\*, **Haixu Wu\***, Yuezhou Ma, Jianmin Wang, Mingsheng Long#  
*International Conference on Machine Learning (ICML)*, 2024 [[PDF](#)][[Code](#)]
- [11] TimeSiam: A Pre-Training Framework for Siamese Time-Series Modeling  
Jiaxiang Dong\*, **Haixu Wu\***, Yuxuan Wang, Yunzhong Qiu, Li Zhang, Jianmin Wang, Mingsheng Long#  
*International Conference on Machine Learning (ICML)*, 2024 [[PDF](#)][[Code](#)]
- [12] TimeMixer: Decomposable Multiscale Mixing for Time Series Forecasting  
Shiyu Wang\*, **Haixu Wu\***, Xiaoming Shi, Tengge Hu, Huakun Luo, Lintao Ma, James Y. Zhang, Jun Zhou  
*International Conference on Learning Representations (ICLR)*, 2024 [[PDF](#)][[Code](#)]
- [13] SimMTM: A Simple Pre-Training Framework for Masked Time-Series Modeling  
Jiaxiang Dong\*, **Haixu Wu\***, Haoran Zhang, Li Zhang, Jianmin Wang, Mingsheng Long#  
*Neural Information Processing Systems (NeurIPS)*, 2023 [[PDF](#)][[Code](#)] (**Spotlight Paper**)
- [14] Non-stationary Transformers: Exploring the Stationarity in Time Series Forecasting  
Yong Liu\*, **Haixu Wu\***, Jianmin Wang, Mingsheng Long#  
*Neural Information Processing Systems (NeurIPS)*, 2022 [[PDF](#)][[Code](#)]
- [15] Anomaly Transformer: Time Series Anomaly Detection with Association Discrepancy  
Jiehui Xu\*, **Haixu Wu\***, Jianmin Wang, Mingsheng Long#  
*International Conference on Learning Representations (ICLR)*, 2022 [[PDF](#)][[Code](#)][[Slides](#)] (**Spotlight Paper**)  
☆ **Ranked 14th of the Most Cited Papers in ICLR 2022, Citation 500+**
- [16] Supported Policy Optimization for Offline Reinforcement Learning  
Jialong Wu, **Haixu Wu**, Zihan Qiu, Jianmin Wang, Mingsheng Long#  
*Neural Information Processing Systems (NeurIPS)*, 2022 [[PDF](#)][[Code](#)]
- [17] iTransformer: Inverted Transformers Are Effective for Time Series Forecasting  
Yong Liu\*, Tengge Hu\*, Haoran Zhang\*, **Haixu Wu**, Shiyu Wang, Lintao Ma, Mingsheng Long#  
*International Conference on Learning Representations (ICLR)*, 2024 [[PDF](#)][[Code](#)] (**Spotlight Paper**)  
☆ **Ranked 15th of the Most Cited Papers in ICLR 2024, Citation 300+**

## LARGE MODELS AND APPLICATIONS

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*Besides pure research, I also devote myself to promoting research to large models and real-world applications.*

- FengQing**, large meteorological model for medium-range forecasting, [co-first author](#) 2024
- Trained with more than 150TB of reanalysis data, can provide skillful global forecasts for future 10 days.
  - Deployed in China Meteorological Administration, online running till now. See [CCTV News](#).
- TimeMixer** for green computing of data center, [co-first author](#) 2024
- Deployed in Ant Group to predict the internet flow for autoscaling in the data center.
- Time-Series-Library** for deep time series analysis, [first author](#) 2023
- An easy-to-use library with more than 7,000 GitHub stars.
  - Ranking 12th (*Top 0.02%*) in all the 77,500 “Time Series” related [repositories on GitHub](#).
- Autoformer** & **Corrformer** for wind forecasting, [first author](#) 2022
- Deployed in the 2022 Winter Olympics to provide the skillful minutely wind forecast. See [News](#).
- MotionRNN** & **PredRNN** for precipitation nowcasting, [first author](#) 2022
- Deployed in China Meteorological Administration, online running till now.

## PROFESSIONAL ACTIVITIES

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- Reviewer for ICML, NeurIPS, ICLR, IEEE TPAMI, AISTATS, TMLR 2021 - Now
- ☆ [ICLR 2024 Outstanding Reviewer](#) [Link]
  - ☆ [NerIPS 2023 Top Reviewer](#) [Link]
- Teaching Assistant, Deep Learning, Instructor: Prof. [Mingsheng Long](#) 2022 - 2024
- Teaching Assistant, Machine Learning, Instructor: Prof. [Mingsheng Long](#) 2021 - 2023
- [Invited Talk](#) for *Mathematics Insights for Neural PDE Solvers* [Yau Center](#) @ 2024.11
- [Invited Talk](#) for *Exploration for Practical Neural PDE Solvers* [Ansys](#) @ 2024.10
- [Invited Talk](#) for *Large Models for Solving PDEs* [World AI Conference](#) @ 2024.7
- [Invited Talk](#) for *A Roadmap to Practical Neural PDE Solvers* [Peking University](#) @ 2024.6
- [Invited Talk](#) for *Foundation Model for Time Series* [AIOps Challenge](#) @ 2024.1
- [Invited Talk](#) for *From Autoformer to Corrformer: Deep Weather Forecasting* [CMA](#) @ 2023.7
- [Invited Talk](#) for *Foundation Models for General Time Series Analysis* [AI Time](#) @ 2022.8

## SELECTED AWARDS

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- National Scholarship, Ministry of Education (*Top 1%*) 2024
- Top 100 Worldwide Raising Star in Machine Learning**, AMiner Database 2024
- Rank 65th in Raising Star Leaderboard of the 2021-2023 machine learning area (*Top 0.2%*). [[Certificate](#)]
- Tsinghua Outstanding Young Researcher**, Tsinghua University 2023
- *10 students per year*, the highest honor for Tsinghua graduates in research. [[Certificate](#)]
- Tsinghua Top Grade Scholarship**, Tsinghua University 2022
- *10 students per year*, the highest honor for Tsinghua graduates. [[Certificate](#)]
- Technical Award for 2022 Winter Olympics**, China Meteorological Administration 2022
- *1 project per year*, awarded for excellent work in [Corrformer](#) deployed in [2022 Winter Olympics](#). [[News](#)]
- National Scholarship, Ministry of Education (*Top 1%*) 2022
- Outstanding Undergraduate in Tsinghua University (*Top 10%*), and Beijing (*Top 5%*) 2020

## SOCIAL SERVICES

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- Undergraduate Counselor for School of Software, Tsinghua University 2020.9 - 2024.6
- Responsible for 93 Undergraduate Students of Class 2020 at the School of Software.
  - Awarded as an Excellent Undergraduate Counselor in 2022 (*10 students per year*).