

Xu Hu

Senior Undergraduate @ [AHU](#) / Visiting Student @ [NCSU](#)



[Research Gate](#)



[Github](#)



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<https://ise.ncsu.edu/fuzzy-neural/people/hu-han>



Research Interest

My research focuses on **time series analysis and spatio-temporal forecasting**, with applications ranging from industrial system monitoring to urban traffic prediction and financial market analysis. Besides, I am particularly interested in developing **diffusion models for complex data types**, having applied them to both medical imaging and irregular time series. My work aims to combine statistical modeling with deep learning approaches to solve real-world prediction and optimization problems.

Reference

- Prof. [Xiaolei Fang](#) (NCSU)- Advisor of Research Intern xfang8@ncsu.edu
- Prof. [Vince D. Calhoun](#) (TReNDS;GSU&GAtech&Emory)- Collaborator vcalhoun@gatech.edu
- Prof. [Zhengyang Zhou](#) (USTC)- Advisor of the Summer Research zzy0929@ustc.edu.cn
- Prof. [Zhifu Tao](#) (AHU)- Undergraduate Tutor jeff.tao@ahu.edu.cn

Education Background

Anhui University (Project “211”), Hefei, China

2021-2025

- B.E.c Economic Statistics, Department of Big Data and Statistics
- GPA: 4.16/5.00 WES: TBD Major Rank: 1/103 (Top 0.95%)
- **Main Courses:** Mathematics Analysis 1&2 (90&94), Advanced Algebra(87), Probability&Mathematical Statistics(89), Operation Research(97), Statistics(94), Bayesian Statistics(100), R Programming(95), Python Programming(95), Data Mining(93), Applied Statistical Analysis(95), Statistical Forecasting&Decision(96), Econometrics(Intermediate) (96), Time Series(91)

Publications

- [1] **Hu Xu**, Yu Jianwen, Xu Qin, Tao Zhifu, "Volatility information in high-frequency financial interval-valued time series: A direct modeling pattern". the Fluctuation and Noise Letters 2024, SCI: Q4.
- [2] ISBI (10/2024) in TReNDS, “Application of a Latent Diffusion Model for MRI Generation: Integrating 3D Autoencoder with KL Divergence Loss and a ViT-based Denoising Framework”, **the first author**.

Research Experience

ISE, Edward P. FITTS Department, North Carolina State University

Raleigh, USA

Student Intern, under the supervision of Prof. Shu-Cherng Fang and Prof. Xiaolei Fang 08/2024–12/2024

Adaptive Diffusion Models for Industrial Irregular Time Series Analysis

- Applied conditional diffusion models to sparse/irregular/missing time series data in industrial settings.
- Implemented domain adaptation, replacing Gaussian noise with Brownian motion-based noise to match real-world sensor data characteristics.

Path-Aware Wiener Process Framework for RUL Prediction

- Developed a novel deep learning framework combining attention mechanism with Wiener process for multi-condition Remaining Useful Life prediction.
- Designed a path-aware embedding module to capture operating condition transitions and duration effects through attention mechanism

- Implemented variational inference to model unit-to-unit degradation patterns and mutual information-based sensor attention

Data Science and Analytic Thrust, HK University of Science and Technology Guangzhou, China
Research Intern, under the supervision of Prof. Yuxuan Liang and Prof. Zhengyang Zhou 07/2024–08/2024

Spatio-Temporal Selective State Space(ST-Mamba) Model for Traffic Flow Prediction

- Be the first model without using graph modeling in the spatio-temporal model.
- Effectively capture the long-range dependency for traffic flow data.
- Employ the Mamba block to improve computational efficiency and accuracy.
- By ablation experiments, find some new conclusions of the SSM.

TReNDS lab, ECE, GSU&Georgia Tech&Emory Atlanta, USA
Research Intern, under the supervision of Prof. Vince D. Calhoun 05/2024–07/2024

Functional-to-structural MRI Image Translation based on Conditional Latent Diffusion: Biomarker Identification for Schizophrenia

- Utilizing an improved Diffusion Transformer (DiT) to achieve reverse generation from Functional Network Connectivity (FNC) to Gray Matter (GM).
- Introducing FNC matrix as a condition in the DiT model to guide the GM generation process.
- Revealing Subject-specific Biomarkers for Schizophrenia by Functional and Structural MRI Data.

Department of Big Data and Statistics, Anhui University Hefei, China
Undergraduate's Research Project, under the supervision of Prof. Zhifu Tao 03/2023-09/2023

Volatility Information in High-Frequency Financial Interval-Valued Time Series: A Direct Modeling Pattern

- Developed a novel VAR-NN forecasting model combining Vector Auto-regressive process, volatility information, and neural networks.
- Introduced four types of interval-valued data volatility information for more accurate predictions.
- Outperformed traditional methods in forecasting high-frequency financial data.

College of Computing and Data Science, NTU Singapore
AI Summer School & Award Best Project&Award Excellence Leadership 07/2023-08/2023

Location-based Demand Prediction & Resource Optimization System for California Bike-Sharing

- Real-time prediction and optimization of dynamic demand for bike-sharing systems
- Maximizing resource allocation efficiency and enhancing user experience
- Data-driven decision support for smart urban transport management using multidimensional data

Competition Awards

2023 ICM - American Undergraduate Mathematical Modeling Competition - Finalist 02/2023

Propose a solution about the network science and operation research

Award Global Grand Prize Nomination (top 0.17%)

- Applied Canonical Correlation Analysis to the United Nations' 17 Sustainable Development Goals.
- Use some advanced econometrics methods to analyse the factors influencing the progress.
- Utilized an LSTM to predict achievable goals over the next decade.
- Concluded with a sensitivity analysis, affirming the robustness of the model.

Honorary & Service & Leadership

- **The Student Assistant of the President in Anhui University**

The first junior undergraduate selected 06/2022-06/2023

- **National Scholarship, Outstanding Student Award, Academic Excellence Award etc.**

Skills

Professional Qualification: ACCA (2022): Pass the exam of BA,MA,FA; BEC Medium pass

Computer Skills: Python, R, PyTorch, LaTeX