

# 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.

## Referrer

- Prof. [Xiaolei Fang](#) (NCSU)- Advisor of Research Intern [xfang8@ncsu.edu](mailto:xfang8@ncsu.edu)
- Prof. [Vince D. Calhoun](#) (TReNDS;GSU&GAtech&Emory)- Collaborator [vcalhoun@gsu.edu](mailto:vcalhoun@gsu.edu)
- Prof. [Zhengyang Zhou](#) (USTC)- Advisor of the Summer Research [zzy0929@ustc.edu.cn](mailto:zzy0929@ustc.edu.cn)
- Prof. [Zhifu Tao](#) (AHU)- Undergraduate Tutor [jeff.tao@ahu.edu.cn](mailto: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: 3.88/4.00 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  
 Collaborate with the Ph.D Yuda Bi; Under the supervision of 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