Xu Hu

Senior Undergraduate @ AHU / Visiting Student @ NCSU

Research Gate Github

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Research Interest

- System Informatics and Industrial Big Data Analytics
- Data Fusion for Process Modeling, Monitoring, Diagnosis, Prognostics, and Decision Making
- Data Science, Deep Learning, and Statistical Learning
- Spatiotemporal Field Modeling and Prediction
- Biomedical Engineering, Brain Image, MRI

Referrer

- Prof.Xiaolei Fang (NCSU)- Advisor of Research Intern xfang8@ncsu.edu
- Prof.Vince D. Calhoun (TReNDS;GSU&GAtech&Emory)- Collaborator vcalhoun@gsu.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: 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", **as the first author**.

Research Experience

ISE, Edward P. FITTS Department, North Carolina State University Raleigh, USA
Student Intern, under the supervision of Prof. Xiaolei Fang and Prof. Shu-Cherng 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