

ZIYI ZHANG

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EDUCATION

Texas A&M University

Ph.D. Candidate/M.S. in Computer Engineering; Advisor: [Nick Duffield](#)

College Station, TX

08/2019 - Present

University of Glasgow

B.Eng (Honors) in Electronics and Electrical Engineering

Glasgow, UK

09/2015 - 06/2019

University of Electronic Science and Technology of China

B.Eng in Electronic Information Engineering

Chengdu, China

09/2015 - 06/2019

PUBLICATIONS

- **Z. Zhang**, S. Ren, X. Qian, and N. Duffield, "Learning flexible time-windowed Granger causality integrating heterogeneous interventional time series data", *Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2024. [Link]
- **Z. Zhang**, S. Ren, X. Qian, and N. Duffield, "Towards invariant time series forecasting in smart cities", *Companion Proceedings of the ACM Web Conference 2024 (WWW)*, 2024. [Link]
- **Z. Zhang**, D. Li, Z. Zhang, and N. Duffield, "Mining spatiotemporal mobility patterns using improved deep time series clustering", *International Society for Photogrammetry and Remote Sensing (ISPRS) International Journal of Geo-Information*, 2024. [Link] ([The Jack Dangermond Award-2024 Best Paper](#) [Link])
- **Z. Zhang**, D. Li, Z. Song, N. Duffield, and Z. Zhang, "Location-aware social network recommendation via temporal graph networks", *ACM SIGSPATIAL Workshop on Location-based Recommendations, Geosocial Networks and Geoadvertising (LocalRec)*, 2023. [Link]
- **Z. Zhang**, D. Li, N. Duffield, and Z. Zhang, "A time series clustering algorithm for analyzing the changes of mobility pattern caused by COVID-19", *ACM SIGSPATIAL Workshop on Animal Movement Ecology and Human Mobility (HAniMob)*, 2021. [Link]
- Y. Han, **Z. Zhang**, D. Li, and J. Du, "Causality-based big data analysis of information cascade in communication networks", *IEEE Global Communications Conference (GLOBECOM)*, 2024.
- N. Hu, **Z. Zhang**, N. Duffield, X. Li, B. Dadashova, D. Wu, S. Yu, X. Ye, D. Han, and Z. Zhang, "Geographical and temporal weighted regression: examining spatial variations of COVID-19 mortality pattern using mobility and multi-source data", *Computational Urban Science*, 2024. [Link]
- D. Li, Z. Zhang, B. Alizadeh, **Z. Zhang**, N. Duffield, M. A. Meyer, C. M. Thompson, H. Gao, and A. H. Behzadan, "A reinforcement learning-based routing algorithm for large street networks", *International Journal of Geographical Information Science (IJGIS)*, 2023. [Link]
- W. Liu, **Z. Zhang**, B. Han, and C. Zhu, "Action tree convolutional networks: skeleton-based human action recognition", *Advances in Multimedia Information Processing (PCM)*, 2018. [Link]

WORK EXPERIENCE

Texas A&M University

Graduate Research Assistant

College Station, TX

01/2020 - Present

- Conduct research on machine learning and causality in sequential or time series data, focusing on theoretical foundations and real-world applications such as recommender systems, supply chain optimization, and anomaly detection.
- Improve decision-making through geo-spatiotemporal analysis, with applications in pandemic modeling, traffic and mobility optimization, disaster response, and environmental monitoring.

Smiths Interconnect

Internship, Software Engineer

Suzhou, China

07/2018 - 09/2018

- Conducted exploratory data analysis on historical probe sales and inventory data to identify trends, seasonality, and anomalies; Implemented machine learning-based demand forecasting models for supply chain management.
- Collaborated with strategists to make decisions that reduced stock and improved inventory turnover ratio by 15%.

RESEARCH EXPERIENCE

Learning Causal Structure from Time Series Data

Advisor: Xiaoning Qian, Nick Duffield

12/2023 - Present

- Proposed a theoretical-guaranteed method that simultaneously infers flexible time-windowed Granger causality and identifies unknown interventional targets at the edge level from heterogeneous interventional time series data.
- Solved the identifiability issue of Granger causality in the context of imperfect intervention with unknown targets.
- Improved accuracy and interpretability in detecting Granger causality from both linear and non-linear synthetic heterogeneous interventional time series data, as well as in real-world fraud, threat, and anomaly detection tasks.

Out-of-Distribution Time Series Forecasting

Advisor: Xiaoning Qian, Nick Duffield

12/2022 - 12/2023

- Investigated the out-of-distribution (OOD) generalization problem of multivariate time series forecasting and provided theoretical insights for the prevalence of domain shifts within heterogeneous time series data.
- Developed a causality-invariant approach that integrates invariant learning into time series forecasting models (e.g. *LSTM* and *Transformer*) to address the OOD generalization problem of multivariate time series forecasting.
- Reduced *RMSE* and *MAE* by 20% in forecasting real-world multi-site and multi-pollutant air quality time series.

Geo-Spatiotemporal Analysis for Enhanced Decision-Making

Advised by: Zhe Zhang, Nick Duffield

01/2020 - 09/2022

- Integrated the dynamic time warping-based *K-means* clustering algorithm into the *seq2seq* model, with a novel cluster-specific optimization strategy, to address challenges in high dimensionality, noise, outliers, and time shifts.
- Revealed significant differences in mobility changes between rural and urban areas, as well as the impact of public response and health considerations on mobility, by applying the method to mobility data during the pandemic.

Recommendation System for Academic Networking

First Place in 2022 TAMIDS Student Data Science Competition

01/2022 - 04/2022

- Built a novel dataset *Scholars@TAMU* from scratch, enriched with detailed information such as researcher profiles (e.g., gender, age, and location), publication abstracts, publication years, and historical collaboration data.
- Implemented a social recommendation system to simultaneously capture geo-spatial and temporal dependencies, with a relative lift by 7.5% on *AUC* to help researchers better identify potential collaborators using *PySpark*.

Action Tree Convolutional Networks for Human Activity Recognition

PyTorch, Linux, Action Tree, Graph Convolutional Networks (GCNs)

01/2018 - 07/2018

- Proposed a novel method integrating action trees and graph convolutional networks for skeleton-based human activity recognition, effectively capturing relationships between joints and body parts to improve generalizability.
- Achieved improvements over state-of-the-art methods on real-world Kinetics and NTU-RGB+D datasets.

PROJECTS

Vehicle-Mounted Millimeter-Wave Radar Speed Measurement System

Field-Programmable Gate Array (FPGA), Fast Fourier Transform (FFT), Frequency Counting

- Proposed a method that combines FFT algorithm and frequency counting for vehicle speed measurement.
- Enhanced the accuracy of blind spot detection across a wide range of frequencies, ensuring reliable performance in both high and low frequency timing signals, thereby significantly improving overall vehicle safety.

Intelligent Pulse Detection System for Real-Time Health Monitoring

C/C++, ARM, Signal Processing

- Developed a real-time pulse detection system that collects and converts pulse signals into voltage signals.
- Implemented an advanced noise-filtering and signal amplification process to ensure precise and reliable pulse measurements for real-time health monitoring applications, and enhanced overall system efficiency.

ACADEMIC SERVICES

Member: Institute of Electrical and Electronics Engineers (IEEE); Association for Computing Machinery (ACM).

Reviewer: ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 2024; Digital

Government: Research and Practice (ACM Journals).

PROFESSIONAL TALKS

Deep Time Series Spatial Clustering for Mapping Covid-19 Spatiotemporal Mobility Patterns

International Cartographic Association; International Symposium on Location-Based Big Data and GeoAI.

08/2023

Link Prediction in Collaboration Networks

Texas A&M Institute of Data Science; TAMIDS Student Data Science Competition.

04/2022

Understanding Effectiveness of Covid-19 Social Distancing Measures

Texas A&M Institute of Data Science; TAMIDS Research Conference.

12/2021

Exploration of Potential Factors Affecting the Spread of Covid-19

American Association of Geographers (AAG); AAG Annual Meeting.

04/2021

SKILLS

Programming Languages: Python, SQL, C/C++, R, Java, LaTeX, MATLAB, JavaScript.

Toolkits: Pytorch, TensorFlow, Tableau, Scikit-learn, MXNet, Git, PySpark, Hive, Hadoop, Caffe, OpenCV.