Zilong Zhao

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EDUCATION

Wuhan University, China *Expected June 2024*

Master of Science in **Cartography and Geographic Information Science**

- **Research interest:** Human Mobility, GIS, Urban Informatics, Intelligent Transportation Systems
- Supervisor: Luliang Tang, Qingquan Li.
- Average score: **91.16** / 100
- Honors: Outstanding Graduate Student (2022), Second Prize Scholarship (2022), Outstanding Freshman Scholarship for Graduate Students (2021), Laboratory Scholarship for Outstanding New Masters Students (2021, 10 persons)

Wuhan University, China *2019.03-2020.06*

Minor in **Business Administration**

- Cumulative GPA: 3.76 / 4.00

Wuhan University, China *2017.09-2021.06*

Bachelor of Engineering in **Geodesy and Geomatics Engineering**

- Cumulative GPA: **3.82** / 4.00, Average score: **91.09** / 100, Ranking: **3** / 265
- Honors: National Scholarship (2019, 2020), **National Encouragement scholarship** (2018), **First Prize Scholarship** (2019, 2020, **2%**), Outstanding Graduates (2021), Merit Student (2019, 2020), Excellent Student Cadre (2020), Advanced Individual of Social Work (2019), Outstanding Volunteer (2018)
- **Thesis Topic:** Traffic State Perception and Data Imputation Based on Spatio-Temporal Trajectory Data.

PUBLICATIONS

- **Zilong Zhao**, Luliang Tang, Mengyuan Fang, Xue Yang, Chaokui Li, Qingquan Li (2023). Toward urban traffic scenarios and more: A spatio-temporal analysis empowered low-rank tensor completion method for data imputation. **International Journal of Geographical Information Science**. DOI: 10.1080/13658816.2023.2234434. (SCI, **JCR Q1**, IF=5.7, **TOP Journal in GIS**))
- **Zilong Zhao**, Luliang Tang, Xue Yang, Huazu Zhang, Guangyue Li, and Qingquan Li (2023). Identifying Critical Urban Intersections from A Fine-grained Spatio-Temporal Perspective. **Travel Behaviour and Society**. (SSCI, JCR Q2, **IF=5.2**)
- **Zilong Zhao**, Mengyuan Fang, Luliang Tang, Xue Yang, Zihan Kan, and Qingquan Li. (2022). The impact of community shuttle services on traffic and traffic-related air pollution. **International Journal of Environmental Research and Public Health**, 19(22), 15128. DOI: 10.3390/ijerph192215128
- Luliang Tang, **Zilong Zhao***, Xue Yang, Zihan Kan, Qingquan Li, et al. (2022). Road crowd-sensing with high spatio-temporal resolution in big data era. **Acta Geodaetica et Cartographica Sinica**, 51(6):1070-1090. (**Corresponding author**, Top Chinese Journal)
- **Zilong Zhao** (2020). Research on application of differential grey neural network-AR model based on wavelet decomposition in the settlement prediction of metro tunnel. **Bulletin of Surveying and Mapping**, 2020(S1):99-103. (Chinese Core Journal)
- **Zilong Zhao**, Luliang Tang, Chang Ren, Xue Yang, Zihan Kan, Qingquan Li. (2023). Diagnosing Urban Traffic Anomalies by Integrating Geographic Information and Tensor Theory. **GIScience & Remote Sensing**. (Under Review)

- Guangyue Li, **Zilong Zhao***, Yang Chen, Luliang Tang, Jinghan Wang, Xu Chu, Chaokui Li. Towards Complex Urban Traffic Forecasting: A Fully Attentional Approach Enhanced by Graph Representation. **IEEE Transactions on Intelligent Transportation Systems**. (**Corresponding author**, JCR Q1, **IF=8.5**, Under review)
- Guangyue Li, **Zilong Zhao***, Xiaogang Guo, Luliang Tang, Huazu Zhang, Jinghan Wang. Towards integrated and fine-grained traffic forecasting: A spatio-temporal heterogeneous graph transformer approach. **Information Fusion**. (**Corresponding author**, JCR Q1, **IF=18.6**, Under review, **2nd round**)
- Zhiyu Yan, Xiaogang Guo, **Zilong Zhao**, Luliang Tang. Achieving fine-grained urban flood perception and spatio-temporal evolution analysis based on social media. **Sustainable Cities and Society.** (Under review)

RESEARCH EXPERIENCE

Refined assessment and spatio-temporal pattern mining of urban intersections *2022.03-2022.11*

Core researcher and developer, funded by the National Science Foundation of China (No. 41971405)

- Develop an urban Intersection Evaluation framework from a Fine-grained Spatio-Temporal perspective (IE-FST) to achieve accurate perception of urban intersections with high spatial and temporal resolution.
- Innovatively upgrades the intersection evaluation scale to turn-level, proposes the concept of Turning Sub-Node (TSN) and constructs a refined TSN topology network.
- Propose a Critical Fine-grained node Identification (CFI) algorithm to achieve multi-view, refined and dynamic evaluation of urban intersections.

Urban traffic anomaly diagnosis based on crowdsourcing big data *2021.09-2022.08*

Core researcher and developer, funded by the National Science Foundation of China (No. 41671442)

- A novel Spatio-Temporal constrained Low-Rank Sparse Tensor (ST-LRST) method is proposed to decompose urban traffic data into normal and anomalous components.
- Perform comprehensive analyses of the spatio-temporal characteristics of complex urban anomalies and reveal the mobility patterns under special events.

The impact of low-carbon transport on traffic and traffic-related air pollution *2021.03-2022.11*

Core researcher and developer, funded by the Fundamental Research Funds for the Central Universities

- Propose a complete framework to quantitatively assess the positive impacts of community shuttle services.
- Develop a novel method to adaptively generate shuttle stops with maximum service capacity based on crowd movement data, and design shuttle routes with minimum mileage by genetic algorithm.
- Conduct a fine-grained quantitative assessment of the extent to which community shuttle services alleviate traffic congestion and reduce traffic-related air pollution.

Urban sensing and data imputation based on spatio-temporal trajectory data *2020.10-2021.12*

Core researcher, funded by the National Key R&D Program of China (No. 2017YFB0503604)

- Adopt a manifold embedding approach to depict the local geometric structure of spatio-temporal domains, and propose a novel Spatio-Temporal constrained Low-Rank Tensor Completion (ST-LRTC) method.
- The proposed method achieves stable and accurate imputation results even in extreme scenarios with large missing rates or non-random missing patterns.
- This study won the **Grand Prize** of the 12th National College Students' Science and Technology Thesis Competition on Surveying and Mapping; **Excellent Bachelor's Thesis** of Wuhan University (2021).

Machine learning-driven settlement analysis and prediction for metro tunnels *2019.09-2020.10*

Core researcher and developer, funded by Wuhan University (No. S2019214021)

- A wavelet decomposition-based differential gray neural network-AR model is proposed to address the impact of non-stationary sequences on the prediction accuracy of gray neural networks.
- This study won the **First Prize** (Top 2) in the 15th Science and Technology Paper Competition of School of Geodesy and Geomatics, Wuhan University.

PROJECT EXPERIENCE

AI-based key technology for unmanned inspection of extra-high arch dams *2021.01-2022.12*

Core developer, funded by HuaNeng Lancang river hydropower INC. (No. XWDC2020/P26)

- Propose a UAV trajectory planning method for complex scenes of extra-high arch dams, which accounts for multiple constraints such as positioning signal, dam segment design, flight duration, and acquisition accuracy.
- Develop a collaborative acquisition technology for dam surface data from UAV swarms considering the spatial and temporal distribution characteristics of GNSS signals from arch dams.
- **Patent application:** A trajectory planning method for automatic inspection operation of extra-high arch dams by UAV (No. 202111411213X)

Turn-level traffic flow sensing and prediction technology based on spatio-temporal trajectory big data fusion *2020.05-2021.12*

Core researcher and developer, funded by Huawei Technologies Co., Ltd. (No. YBN2018095106)

- Develop a spatio-temporal analysis empowered low-rank tensor completion method for traffic data imputation, by considering the continuity, periodicity and transitivity of traffic flow.
- Construct a 'segment-turn' based traffic topology graph (named dyadic graph), and develop a fine-grained traffic prediction method with graph attention network to achieve turn-level prediction of traffic states.

Warehouse picking problems in large scale and complex scenarios *2020.03-2022.08*

Project Leader, funded by Jingdong Logistics, and DC Holdings

- Propose the concept of replacement recheck table and construct a dynamic adjustment algorithm applicable to multi-zone type warehouse and complex picking problems.
- Combined with the specific situation of enterprise logistics warehouse picking, realize multi-perspective and whole process of warehouse picking path optimization.

CONFERENCE PRESENTATIONS

- **The 2022 International Graduate Workshop on GeoInformatics** (IGWG2022), Session 2-1. "To what extent can community shuttle services enhance transport efficiency and improve the surrounding environment?" (Oral presentation).
- **The 18th Annual Conference on Theory and Methods of Geographic Information Science**, 2023. "Spatio-temporal low-rank sparse tensor model and its application in urban anomaly analysis" (Oral presentation).

COMPETITION AWARDS

- **National First Prize** in **National Mathematical Modeling Contest**, 2019.
- **Meritorious Winner** in **Interdisciplinary Contest in Modeling**, 2019.
- **Grand Prize** (**Top 1**) in MathorCup College Mathematical Modeling Challenge, 2020.
- **First Prize** (Top 2) in the 15th Science and Technology Paper Competition of School of Geodesy and Geomatics, 2020.
- **First Prize** in National University Students Electrical Math Modeling Competition, 2021.
- **Grand Prize** in the 12th National College Students' Science and Technology Paper Competition on Surveying and Mapping, 2021.
- **National Second Prize** in the 18th China Post-Graduate Mathematical Contest in Modeling, 2021.
- **Winning Prize** in Digital China Holdings Campus Geek Contest, 2022.
- **National Third Prize** in China Postgraduate 'Carbon Peaking and Carbon Neutrality' Innovation and Creativity Contest, 2022.