Ziyue LI

Assistant Professor in Machine Learning
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Current Appointment

Assistant Professor in Machine Learning 03.2022 - present
Department of Information Systems, University of Cologne Cologne, Germany

Research Interests

My research interests focus on: **resource-efficient machine learning models for spatiotemporal decision intelligence and industrial analytics**.

Our works have been published as 20+ papers in top-tier AI conferences (IJCAI, AAAI, KDD, ICLR, NeurIPS), 9 papers in top journals (TKDE, TITS, TMM), awarded with **10+ best paper awards**, and also deployed in real industries as **well-proven products**, especially in smart mobility.

Methodology:

- efficient data analytics: high-dimension data, tensor decomposition, generative (Bayesian) models;
- efficient deep learning: self-supervised learning, transfer/meta-learning, Large Language Models;

Application:

- time-series data and spatiotemporal data (traffic, energy, earth)
- intelligent transport systems (prediction, clustering, anomaly detection, traffic control systems)

Academic Background

The Hong Kong University of Science and Technology Hong Kong
Ph.D. in Industrial Engineering and Decision Analytics 09.2017 - 11.2021
- Concentration: Graph Machine Learning, and Advisor: Prof Fugee Tsung
- GPA: 3.6/4.0
- Hong Kong PhD Fellowship and Excellent Research Award (Highly Prestigious)

Xi'an Jiaotong University Xi'an, China
Bachelor of Engineering in Mechanical Engineering (Major in Data Analytics) 06.2013 - 06.2017
Bachelor of Economics in Finance 06.2015 - 06.2017
- GPA: 3.76/4.3 Ranking: 6th/255, Top 2%
- Outstanding Graduates Award, National Scholarship Award

University of New South Wales Sydney, Australia
Bachelor Research Visiting in Mechanical and Manufacturing Engineering 2015
- Concentration: Data Analytics-based Fault Detection, and Advisor: Dr Wade Smith
- GPA: HD (High Distinction), highest possible score

Scientific Activities

Assistant Professor in Machine Learning 03.2022 - present
Department of Information Systems, University of Cologne Cologne, Germany

Chief Machine Learning Scientist 03.2022 - 12.2023
Institute of Energy Economics, University of Cologne Cologne, Germany

Research Stays

Visiting Scholar (Host: Prof. Jian Shi) 01.2023 - 04.2022
School of Industrial and Systems Engineering, Georgia Institute of Technology Atlanta, GA, U.S.A

Visiting Research Assistant (Host: Prof. Hao Yan) 07.2019 - 09.2019 and 07.2022 - 10.2022
School of Computing and Augmented Intelligence, Arizona State University Phoenix, AZ, U.S.A

Industrial Experience

My three-year experience in the industry gives me the unique advantage of industrial-level high quality in delivering solutions, multi-project management ability, and leadership.

Senior Research Scientist (Tech Lead, Remote) 03.2022 - present
Data Mining Researcher 03.2021 - 03.2022
Shared Research Center, SenseTime S-Lab Hong Kong and Singapore

- Led a team of 10 researchers (3 full-time, 5 interns, 1 project manager), conducted front-tier research in smart mobility and spatiotemporal analysis, and delivered 5+ pipelines of AI-driven products, including:
  - One LLM-based Text-to-SQL system for large-scale database query
  - One LLM-based agent system to automate complex corporate task planning and tool usage
  - One machine learning-based traffic data infrastructure platform
  - Traffic Signal Control Systems based on optimization-based and Reinforcement Learning: deployed in an actual city, with 26% higher efficiency.
  - One causal inference-based Traffic congestion management and cause analysis: deployed in an actual city.
  - Developed our own LLMs for traffic domain knowledge and traffic data analysis.
- Corresponding research work published in CIKM, KDD, AAAI, ICLR, AAMAS, TMM, and more, with topics including:
  - Self-supervised learning and contrastive learning.
  - Reinforcement Learning.
  - Resource-efficient domain adaptation, transfer learning, and meta-learning.

Research Project Manager 09.2020 - 08.2021
Hong Kong Metro MTR Co.-HKUST R&D Project Hong Kong

- Research collaboration with MTR and Computer Science Dept, HKUST, developing an Intelligent Transport System (ITS) based on data-driven methods, with publications in AAAI, ICDE, SIGSPATIAL, and DAMI.
- Delivered the solution for demand prediction, station clustering, and passenger pattern mining.

Cloud Computing Scientist 09.2019 - 02.2020
Nokia Bell Labs Stuttgart, Germany

- Research in serverless computing, machine learning systems based on Amazon Web Service (AWS), and Bell Labs KNIX MicroFunctions.
- Conducted data transmission latency analysis, serverless system component profiling and optimization, and serverless ML inference and training (NLP, CV models) in AWS and KNIX.

Research Grant and Proposal Writing Experience

Research Grant at the University of Cologne:

1. "Towards Efficient Electricity Market based on Meta Reinforcement Learning Agents" **(Pending)**
   - Agency/Company: DFG
   - Role: PI
   - Collaborators: Prof. Wolfgang Ketter (University of Cologne, Germany)
   - Intended Period of Contract: 30.05.2024 - 30.05.2026
   - Details: This project focuses on developing a meta-reinforcement-learning-based agent for smart energy trading under various market mechanisms and dynamics. My team will mainly focus on the

algorithm designing of the meta agent, and Prof. Ketter's team will focus on market simulation and mechanism design. I led the team in project ideation, task allocation, and proposal writing.

2. "On Developing Video Traffic Data based Intelligent Transport Fundamental Core Technique" **(On-going)**, **ID: NGLM-011**
   - Agency/Company: S-Lab, Singapore
   - Role: Co-PI
   - Collaborators: Prof. Cheng Long (Nanyang Technological University, Singapore)
   - Amount: 867,000 S$ (592,468.09 Euro)
   - Period of Contract: 15.03.2023 - 14.06.2025
   - Details: This project focuses on a deep learning-based solution for improving vision-based traffic data quality, including mission data completion, kriging, and prediction. Both My team and Prof. Long's team focus on ideation, model/algorithm design, and experiments. Our team particularly also focuses on industrial feasibility, deployment, and project management. Both I and Prof Long contributed to the proposal writing and presentation. The output includes publications in IEEE MDM'24 [C17], IEEE TKDE'24 [J5], KDD'24 [R1], ECCV'24 [R5].
3. "Intelligent Traffic Congestion Decision Systems based on Spatiotemporal and Multi-modal Data" **(Finished), ID: STTHU/2204**
   - Agency/Company: S-Lab, China
   - Role: Co-PI
   - Collaborators: Prof. Chen Zhang (Tsinghua University, China)
   - Amount: 300,000 CNY (38,925.44 Euro)
   - Period of Contract: 01.05.2022 - 01.05.2023
   - Details: This project focuses on causal inference models to better explain and analyze traffic congestion patterns. Both I and Prof. Zhang's team focus on ideation, proposal composition, model/algorithm design, experiments, and project management. Our team particularly particularly deployed the research outputs as industrial products. The research output includes publications in IEEE CASE'23 [C4], KDD'23 [C5], JASA'24 [R6].

Proposal Writing at the Hong Kong University of Science and Technology

1. **Foshan-Hong Kong Technology Funding**, "Multi-stage process monitoring and optimization based on big data analytics and machine learning", *2021-2023*
   - **PI**: Fugee Tsung (Ziyue Li, Yinghui Huang); **Grant**: 4,811,634 HK$ (569,641.30 Euro), **ID**: FSPM02202003.
2. **Innovation and Technology Commission**, "Trial: A Big Data Trial Scheme for Smart Transportation Crowd Monitoring ", *2019-2021*
   - **PI**: Fugee Tsung (Ziyue Li, Man Li, Zhenli Song); **Grant**: 1,175,300 HK$ (139,141.80 Euro), **ID**: ITT/007/19GP.
3. **RGC - General Research Fund**, "Statistical Transfer Learning with Applications to Quality Control and Monitoring", *2019-2021*
   - **PI**: Fugee Tsung (Ziyue Li, Ke Zhang, Kai Wang, Longwei Chen, Zhenli Song); **Grant**: 632,421 HK$ (74,871.26 Euro), **ID**: RGC-16201718.
4. **RGC - General Research Fund**, "Statistical learning, prediction, and monitoring methods for urban rail transit systems", *2018-2020*
   - **PI**: Fugee Tsung (Zhenli Song, Ziyue Li, Kai Wang, Yinghui Huang); **Grant**: 443,950 HK$ (52,558.50 Euro), **ID**: RGC-16203917.

Scholarships and Individual Funding

During Ph.D. and After Ph.D.:

1. **ACM Young Researcher Travel Grant Award 2023 (Winner)** **Amount**: 1,000 USD
   - Funding Agency: ACM SIGSPATIAL (2023).
2. **Hong Kong Ph.D. Fellowship Scholarship Award** (2017-2020) **Amount**: 1,296,000 HKD
   - Highly-selective and prestigious, only 2 recipients in the department.
   - Funding Agency: Hong Kong Research Grants Council

3. **Best Thesis Award 2021 (2nd Runners-up)** **Amount**: 3,000 HKD
   - HKUST Three Minute Thesis Competition.
4. **1st Runners-up, Audience Award**, Hackathon@UST 2018 **Amount**: 15,000 HKD

During Bachelor Study:

1. **National First Prize**, "Challenge Cup" National Curricular Academic Science and Technology Contest: A data-driven study for land transfer in rural China *2015*
2. **Honored Graduate Award**, Xi'an Jiaotong University *2017*
3. **Regional First Prize**, 7th Mechanical Innovation & Design Competition *2016*
4. **National Scholarship**, Xi'an Jiaotong University *2016*
5. **1st-Runners-up Award**, XJTU Entrepreneurship Competition *2015*
6. **National Encourage Scholarships**, Xi'an Jiaotong University *2014, 2015*

International Awards and Prizes

1. **Peter Luh Young Researcher Award (Runner-up)** for the paper "Dynamic Causal Graph Convolutional Network for Traffic Prediction", selected 3/600, highly prestigious, IEEE Robotics and Automation Society (2023).
2. **Best Paper Award (Runner-up)** for the paper "Graph-aware Tensor Topic Models for Individualized Passenger Travel Pattern Clustering", Institute of Industrial and Systems Engineers (IISE), Quality Control and Reliability Engineering (QCRE) (2023).
3. **Best Student Paper Award** (Finalist) for the paper "Tensor Completion for High-dimensional Data with Graph-structured and Weakly-dependent Sample Dimension", IISE QCRE (2022).
4. **Best Applied Paper Award (Winner)** for the paper "Tensor Topic Models with Graphs and Applications on Individualized Travel Patterns" INFORMS Data Mining and Decision Analytics (DMDA) Workshop (2021).
5. **Best Theoretical Paper Award (Runner-Up)** for the paper "Low-Rank Robust Subspace Tensor Clustering for Metro Passenger Flow Modeling", INFORMS DMDA (2021).
6. **Best Conference Paper Award (Winner)** for the paper "Long-Short Term Spatiotemporal Tensor Prediction for Passenger Flow Profile", IEEE International Conference on Automation Science and Engineering (CASE) (2020): selected from 1/500, highly prestigious.
7. **Best Student Poster Award** (Finalist) for the paper "Profile Decomposition based Hybrid Transfer Learning for Cold-start Data Anomaly Detection", INFORMS Quality, Statistics, and Reliability (QSR) Section (2020).
8. **Best Student Paper Award** (Finalist) for the paper "Individualized Passenger Travel Pattern Multi-Clustering based on Graph Regularized Tensor Latent Dirichlet Allocation", INFORMS Data Mining (2020).
9. **Best Student Paper Award** (Finalist) for the paper "Tensor Completion for Weakly-Dependent Data on Graph for Metro Passenger Flow Prediction", INFORMS QSR Section (2020).

Professional Services

University Committee Service (Internal Service):

- Graduate Admission Committee for Ph.D., Key Research Initiatives (KRI) of Sustainable Smart Mobility, Summer 2024
- Marketing Committee, Cologne Institute of Information Systems, Winter 23/24 - present

Conference / Workshop Organizer:

- Anomaly Detection with Foundation Models (ADFM), IJCAI 2024
- The Second Workshop on Vision-based Industrial Inspection, ECCV 2024
- CVPR Workshop on Vision-based Industrial Inspection, CVPR 2023
- Spatial and Temporal Modeling for Decision Intelligence, IEEE CASE 2023

Challenge Organizer:

- Data Challenges on CVPR Workshop on Vision-based Industrial Inspection, CVPR 2023
  - Collaboration with Apple: we prepare dataset, online evaluation, and benchmarking

Conference Session Chair:

- KDD 2023: Session "Spatiotemporal Machine Learning",
- INFORMS Annual Meeting 2023: Sessions "Structure Learning from Heterogeneous Data" and "Spatiotemporal Decision Intelligence"
- CIKM 2022: "Temporal Data" and "Clustering"
- INFORMS Annual Meeting 2021: "Knowledge-integrated Data-driven Smart Transportation"

Council Member:

- Sub-Council (Public Communication) Member of INFORMS QSR Section (2024)
- Sub-Council (Public Communication) Member of INFORMS Data Mining Section (2024)

Professional Membership:

- Members of ACM SIGSPATIAL, IEEE, INFORMS Data Mining, INFORMS QSR, Institute of Industrial and Systems Engineers (IISE), Transportation Statistics Group of ASA

Conference Reviewing Service:

- NeurIPS 2024, IJCAI 2024, SIGKDD 2023, CVPR 2023, AAAI 2021-2024, ECAI 2023, ECML-PKDD 2022-2023, ICRA 2022-2024, ICIS 2023, IEEE CASE 2020-2023, INFORMS Best Paper Competition 2023

Journal Reviewing Service:

- IEEE Transactions on Intelligent Transportation Systems (T-ITS)
- IEEE Transactions on Automation Science and Engineering (T-ASE)
- Springer Pattern Analysis and Applications (PAAA)
- Transportation Research Part C (TR-C)
- IEEE Internet of Things Journal
- IET Software, GIScience Remote Sensing
- IISE Transactions

International Cooperations

Cooperations with the U.S. and Canada

- Prof. Michael Lepech, Stanford University, CA
- Prof. Jan Shi, Georgia Institute of Technology, Atlanta, GA
- Dr. Man Li, Georgia Institute of Technology, Atlanta, GA
- Prof. Lijun Sun, McGill University, Montreal, Canada
- Prof. Hua Wei, Arizona State University, Phoenix, AZ
- Prof. Hao Yan, Arizona State University, Phoenix, AZ

Cooperations within Europe

- Dr. Hao Li, TU Munich, Germany
- Prof. Wolfgang Ketter, University of Cologne, Germany
- Prof. Oliver Ruhnau, University of Cologne, Germany
- Prof. Stefano Canali, Politecnico di Milano, Italy
- Prof. Alessandra Angelucci, Politecnico di Milano, Italy

Cooperations with Top Universities in Asia

- Prof. Cheng Long, Nanyang Technological University (NTU), Singapore
- Prof. Fugee Tsung, The Hong Kong University of Science and Technology, Hong Kong
- Prof. Chen Zhang, Tsinghua University, China

Cooperations with Industries

- Dr. Ruichuan Chen, Distinguished Member of Technical Staff, The Bell Labs
- Dr. Rui Zhao, Chief Research Executive, SenseTime Research
- Dr. Meng Cao, Tech Lead Manager, Apple

Invited Talks

"Large Language Model in Smart Energy"
- Key Research Initiative of Sustainable Smart Energy & Mobility Workshop (Cologne, Germany), 2024

"Advanced Machine Learning in Smart Mobility"
- Georgia Institute of Technology (Atlanta, U.S.A), 2023
- Tsinghua University (Beijing, China), 2023

"Spatiotemporal Self-Supervised Learning"
- IISE Annual Meeting (New Orleans, U.S.A), 2023
- 3rd Workshop on Data-driven Intelligent Transportation (Atlanta, U.S.A), CIKM 2022

"Tensor Topic Models for Individual Travel Analysis"
- IISE Annual Meeting (New Orleans, U.S.A), 2023
- INFORMS QSR Flash Paper (Indianapolis, U.S.A), 2022
- INFORMS Annual Meeting (Maryland National Harbor, U.S.A), 2020

"Tensor Decomposition for Spatiotemporal Traffic Data"
- Data Science Symposium in Waseda University (Tokyo, Japan), 2020
- INFORMS Annual Meeting (Seattle, U.S.A), 2019

"Transfer Learning for Cold-Start Anomaly Detection"
- INFORMS Annual Meeting (Maryland National Harbor, U.S.A), 2020
- INFORMS Annual Meeting (Phoenix, U.S.A), 2018

Overview of Publications

Summary

- **Overall**: **31** peer-reviewed publications, of which **20** as corresponding author, **7** as first author
- **High-Quality**: **13** are in A*-ranked top-tier AI conferences/journals (e.g., IJCAI, AAAI, ICLR, NeurIPS, SIGKDD); **6** are in A-ranked top-tier AI conferences/journals (e.g., CIKM, AISTATS).
- **Impact**: since past 4 years, the Google Scholar Citation: **344**, h-Index: **11**, i10-Index: **12**
- **Conference**: **22** peer-reviewed conference proceedings
- **Journal**: **8** papers in journals with peer review, of which 8 international; 1 papers in journal reviewed by editorial board
- **Working Paper**: **15** papers are under review or available in ArXiv.

Refereed Conference Publications (All Peer-Reviewed)

- Notes: * indicates corresponding author; underlined authors are my mentees; I am in **boldface**.

[C22] J. Ruan, **Z. Li***, H. Jiang, J. Lu, H. Mao, R. Zhao, CoSLight: Co-optimizing Collaborator Selection and Decision-making to Enhance Multi-intersection Traffic Signal Control, Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**SIGKDD 2024**), *Oral*, *CORE Rank A* in Computer Science (A* - 7.47% of 803 ranked venues)*.

[C21] H. Jiang, **Z. Li***, X. Xiong, J. Ruan, J. Lu, H. Mao, R. Zhao, X-Light: Cross-City Traffic Signal Control Using Transformer on Transformer as Meta Multi-Agent Reinforcement Learner, The 33rd International Joint Conference on Artificial Intelligence (**IJCAI 2024**), *Oral*, *CORE Rank A**.

[C20] Y. Kong, J. Ruan, Y. Chen, B. Zhang, T. Bao, S. Shi, G. Du, X. Hu, H. Mao*, **Z. Li**, X. Zeng, R. Zhao, TPTU-v2: Boosting Task Planning and Tool Usage of Large Language Model-based Agents in Real-world Systems, The Twelfth International Conference on Learning Representations Workshop on LLM Agents (**ICLR 2024**). *CORE Rank A**.

[C19] B Zhang, H Mao*, J Ruan, Y Wen, Y Li, S Zhang, Z Xu, D Li, **Z Li**, R Zhao, "Controlling Large Language Model-based Agents for Large-Scale Decision-Making: An Actor-Critic Approach", The Twelfth International Conference on Learning Representations Workshop on LLM Agents (**ICLR 2024**). *CORE Rank A**.

[C18] Z Li, Y Nie, **Z Li***, L Bai, Y Lv, R Zhao, Non-Neighbors Also Matter to Kriging: A New Contrastive-Prototypical Learning, Proceedings of The 27th International Conference on Artificial Intelligence and Statistics (**AISTATS 2024**). *Oral*, *CORE Rank A (A - 14.45% of 803 ranked venues)*.

[C17] S Yang, Q Su, Z Li, **Z Li***, H Mao, C Liu, R Zhao, SQL-to-Schema Enhances Schema Linking in Text-to-SQL, The 35th Database and Expert Systems Applications Conferences and Workshops (**IEEE DEXA 2024**).

[C16] C Liu, S Yang, Q Xu, **Z Li***, C Long, Z Li, R Zhao, Spatial-Temporal Large Language Model for Traffic Prediction, The 25th IEEE International Conference on Mobile Data Management (**IEEE MDM 2024**). *CORE Rank B.*

[C15] H. Mao*, R. Zhao, **Z. Li**, Z. Xu, H. Chen, Y. Chen, B. Zhang, Z. Xiao, J. Zhang and J. Yin, "PDiT: Interleaving Perception and Decision-making Transformers for Deep Reinforcement Learning", the 23rd International Conference on Autonomous Agents and Multiagent Systems (**AAMAS 2024**). *Oral*, *CORE Rank A**.

[C14] J. Lu, J. Ruan, H. Jiang, **Z. Li***, H. Mao and R. Zhao, DuaLight: Enhancing Traffic Signal Control by Leveraging Scenario-Specific and Scenario-Shared Knowledge, the 23rd International Conference on Autonomous Agents and Multiagent Systems (**AAMAS 2024**). *Oral*, *CORE Rank A**.

[C13] **Z Li***, H Yan, C Zhang, L Sun, W Ketter, and F Tsung. Tensor Dirichlet Process Multinomial Mixture Model with Graphs for Passenger Trajectory Clustering. International Conference on Advances

in Geographic Information Systems (**ACM SIGSPATIAL 2023**). *CORE Rank A*;

- **ACM SIGSPATIAL Young Researcher Travel Grant Award**, **Winner**.

[C12] D Li, **Z Li***, Z Li, L Bai, Q Gong, L Sun, W Ketter, and R Zhao. A Critical Perceptual Pre-trained Model for Complex Trajectory Recovery. International Conference on Advances in Geographic Information Systems (**ACM SIGSPATIAL 2023**). *CORE Rank A*.

- **ACM SIGSPATIAL Young Researcher Travel Grant Award**, **Winner**.

[C11] J Ruan, Y Chen, B Zhang, Z Xu, T Bao, G Du, S Shi, H Mao*, **Z Li**, X Zeng, and R Zhao. TPTU: Large Language Model-based AI Agents for Task Planning and Tool Usage. The 37th Conference on Neural Information Processing Systems (**NeurIPS 2023**) - Workshop on Foundation Models for Decision Making. *CORE Rank A**.

[C10] Y. Chen, **Z. Li**, W. Ouyang and M. Lepech*, Adaptive Hierarchical SpatioTemporal Network for Traffic Forecasting, 2023 IEEE 19th International Conference on Automation Science and Engineering (**IEEE CASE 2023**), Auckland, New Zealand.

[C9] M. Jiang, A. Wang, **Z. Li***, and F. Tsung, A Unified Probabilistic Framework for Spatiotemporal Passenger Crowdedness Inference within Urban Rail Transit Network, 2023 IEEE 19th International Conference on Automation Science and Engineering (**IEEE CASE 2023**), Auckland, New Zealand.

[C8] L Wang, L Bai, **Z Li***, R Zhao and F Tsung, Correlated Time Series Self-Supervised Representation Learning via Spatiotemporal Bootstrapping, IEEE 19th International Conference on Automation Science and Engineering (**IEEE CASE 2023**), Auckland, New Zealand. *Qualis Rank A-*.

[C7] J. Lin, **Z. Li***, Z. Li, L. Bai, R. Zhao and C. Zhang, Dynamic Causal Graph Convolutional Network for Traffic Prediction, 2023 IEEE 19th International Conference on Automation Science and Engineering (**IEEE CASE 2023**), Auckland, New Zealand.

- **Peter Luh Young Researcher Award**, IEEE Robotics and Automation Society 2023.

[C6] T. Lan, **Z. Li***, Z. Li, L. Bai, M. Li, F. Tsung, W. Ketter, R. Zhao, and C. Zhang. MM-DAG: Multi-task DAG Learning for Multi-modal Data - with Application for Traffic Congestion Analysis. In Proceedings of the 29th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**SIGKDD 2023**). *Oral*, *CORE Rank A**.

[C5] H Ruan, Q Gong, Y Chen*, J Chen, **Z Li**, and X. Su. A Contrastive-Prototypical Privacy-preserving Heart Rate Prediction System for Drivers in Connected Vehicles. The 21st Annual International Conference on Mobile Systems, Applications and Services (**ACM MobiSys 2023**). *CORE Rank A*.

[C4] Z. Mao, **Z. Li***, D. Li, L. Bai, & R. Zhao. Jointly Contrastive Representation Learning on Road Network and Trajectory. The 31st ACM International Conference on Information & Knowledge Management (**CIKM 2022**). *CORE Rank A*.

[C3] **Z Li***, Tensor Topic Models with Graphs and Applications on Individualized Travel Patterns, 2021 IEEE 37th International Conference on Data Engineering (**ICDE 2021**). *Oral*, *CORE Rank A**.

- **Best Applied Paper Award**, INFORMS Data Mining and Decision Analytics Workshop 2021, **Finalist**.

[C2] **Z Li***, H Yan, C Zhang and F Tsung, Long-Short Term Spatiotemporal Tensor Prediction for Passenger Flow Profile in IEEE 16th International Conference on Automation Science and Engineering (**IEEE CASE 2020**).

- **Winner** of IEEE CASE 2020 **Best Conference Paper Award**.

[C1] **Z Li***, N D Sergin, H Yan, C Zhang, and F Tsung, "Tensor Completion for Weakly-Dependent Data on Graph for Metro Passenger Flow Prediction" AAAI Conference on Artificial Intelligence (**AAAI 2020**). *Oral*, *CORE Rank A**.

- **Best Student Paper Award**, Quality, Statistics, and Reliability (QSR) Section, INFORMS 2020, **Finalist Award**.

Refereed Journal Publications

Peer-Reviewed:

[J9] D Sergin Nurretin, J Hu, **Z Li**, C Zhang, F Tsung, H Yan. Low-Rank Robust Subspace Tensor Clustering for Metro Passenger Flow Modeling, INFORMS Journal on Data Science (**IJDS 2024**).

[J8] X Du, **Z Li***, Long C, Xing Y, Philip Yu, Chen H, FELight: Fairness-Aware Traffic Signal Control via Sample-Efficient Reinforcement Learning, IEEE Transactions on Knowledge and Data Engineering (**IEEE TKDE 2024**). *CORE Rank A**.

[J7] H Jiang, **Z Li***, Z Li, L Bai, H Mao, W Ketter, R Zhao, A General Scenario-agnostic Reinforcement Learning for Traffic Signal Control, IEEE Transactions on Intelligent Transportation Systems (**IEEE TITS 2024**). *CORE Rank A**.

[J6] K. Liu, S. Tang, **Z. Li***, and et al., Relation-Aware Distribution Representation Network for Person Clustering With Multiple Modalities, in IEEE Transactions on Multimedia (**IEEE MM 2023**), Vol. 14, Vo. 8, 2023. *CORE Rank A**.

[J5] **Z. Li**, H. Yan, K. Zhang and F. Tsung, "Profile Decomposition based Hybrid Transfer Learning for Cold-start Data Anomaly Detection". The ACM Transactions on Knowledge Discovery from Data (**ACM TKDD 2022**).

- **Best Student Poster Award**, QSR, INFORMS 2020, **Finalist Award**.

[J4] **Z Li***, H Yan, C Zhang, F Tsung, "Individualized Passenger Travel Pattern Multi-Clustering based on Graph Regularized Tensor Latent Dirichlet Allocation". Data Mining and Knowledge Discovery (**DAMI 2022**), Springer. *CORE Rank A*.

- **Best Student Paper Award**, Data Mining, INFORMS 2020, **Finalist Award**.

[J3] **Z Li***, H Yan, C Zhang, F Tsung, "Long-Short Term Spatiotemporal Tensor Prediction for Passenger Flow Profile" IEEE Robotics and Automation Letters (**IEEE RA-L 2020**).

- **Winner** of IEEE CASE 2020 **Best Conference Paper Award**.

[J2] A. Angelucci, **Z. Li,**, N. Stoimenova, S. Canali (2022)." The paradox of artificial intelligence system development process: the use case of corporate wellness programs using smart wearables". AI & Society.

Editorial Board-Reviewed:

[J1] F Tsung, **Z Li**, "Discussion of 'A novel approach to analysis of spatial and functional data over complex domains'" Quality Engineering, 2020, published.

Book Chapter

[B2] Y. Hao, **Z. Li**, X. Zhao, and J. Hu. "Sparse Decomposition Methods for Spatio-Temporal Anomaly Detection." In **Multimodal and Tensor Data Analytics for Industrial Systems Improvement**, pp. 185-206. Cham: Springer International Publishing, 2024.

[B1] Z. Li. "Incorporating Domain Knowledge into Big Data: with Application in Smart Manufacturing and Transportation". Hong Kong University of Science and Technology (Hong Kong), 2021.

Papers under Review

Submitted to Conferences:

[R15] W. Zhang, J. Ye, **Z. Li***, J. Li, F. Tsung, "DualTime: A Dual-Adapter Multimodal Language Model for Time Series Representation", The 38th Annual Conference on Neural Information Processing Systems (**NeurIPS 2024**), *CORE Rank A**, *under review.*

[R14] M. Li, **Z. Li***, L. Sun, F. Tsung, "Enabling Tensor Decomposition for Time-Series Classification via A Simple Pseudo-Laplacian Contrast", The 38th Annual Conference on Neural Information

Processing Systems (**NeurIPS 2024**), *CORE Rank A**, *under review.*

[R13] Q. Xu, C. Long, **Z. Li***, S. Ruan, Z. Li, R. Zhao, "KITS: Inductive Spatio-Temporal Kriging with Increment Training Strategy", The 38th Annual Conference on Neural Information Processing Systems (**NeurIPS 2024**), *CORE Rank A**, *under review.*

[R12] Z Li, X Wang, J Zhao, S Yang, G Du, X Hu, B Zhang, Y Ye, **Z Li***, R Zhao, PET-SQL: A Prompt-enhanced Two-stage Text-to-SQL Framework with Cross-consistency, The 38th Annual Conference on Neural Information Processing Systems (**NeurIPS 2024**), *CORE Rank A**, *under review.*

- Our method is **ranked as the TOP-1 in Text-to-SQL worldwide Leaderboard**.

[R11] B Zhang, Y Ye, G Du, X Hu, Z Li, S Yang, CH Liu, R Zhao, **Z. Li***, H Mao, Benchmarking the Text-to-SQL Capability of Large Language Models, The 38th Annual Conference on Neural Information Processing Systems (**NeurIPS 2024**), *CORE Rank A**, *under review.*

[R10] G. Sui, Z. Li, **Z. Li***, S. Yang, J. Ruan, H. Mao, and R. Zhao. Reboost Large Language Model-based Text-to-SQL, Text-to-Python, and Text-to-Function - with Real Applications in Traffic Domain, **ICDE 2024**, *under review.*

[R9] Q. Xu, X. Liu, L. Zhu, G. Lin, C. Long*, **Z. Li**, Z. Rui, "Hybrid Mamba for Few-Shot Segmentation", The 38th Annual Conference on Neural Information Processing Systems (**NeurIPS 2024**), *CORE Rank A**, *under review.*

[R8] H. Jiang, X. Xiong, **Z. Li***, H. Mao, G. Sui, J. Ruan, Y. Cheng, R. Zhao, "GuideLight: 'Industrial Solutions' Guidance for More Practical Traffic Signal Control Agents", IEEE/RSJ International Conference on Intelligent Robots and Systems (**IEEE IROS 2024**), *CORE Rank A*, *under review.*

[R7] Q. Xu, G. Lin, C. Loy, C. Long*, **Z. Li**, R. Zhao, "Eliminating Feature Ambiguity for Few-Shot Segmentation", The 18th European Conference on Computer Vision, **ECCV 2024**, *CORE Rank A**, *under review.*

Submitted to Journals:

[R6] M. Li, **Z. Li***, "Robust Self-Supervised Deep Tensor Decomposition for Corrupted Time Series Data", IEEE Transactions on Knowledge and Data Engineering (**IEEE TKDE**) 2024+, *CORE Rank A**, *under review.*

[R5] J. Hu, **Z. Li**, C. Zhang, F. Tsung, H. Yan, "Tensor Completion for High-dimensional Data with Graph-structured and Weakly-dependent Multi-Sample Dimensions", IEEE Transactions on Automation Science and Engineering (**IEEE TASE**) 2024+, *under review.*

[R4] T Lan, **Z Li**, J Lin, Z Li, L Bai, M Li, F Tsung, C Zhang*, MultiFun-DAG: Multivariate Functional Directed Acyclic Graph, **Journal of the American Statistical Association**, 2024+, *under review.*

[R3] Y. Li, **Z. Li***, O. Ruhnau, P. Peter Kai, W. Ketter, Predict and Explain the Energy Crisis in Germany during the Russia-Ukraine War, **Nature Energy**, 2024+, *under review.*

[R2] P. Guo, P. Jin, Y. Zhang, L. Bai, **Z. Li***, Online Test-Time Adaptation of Spatial-Temporal Forecasting, **IEEE Transactions on Intelligent Transportation Systems**, 2024+, *under review.*

[R1] Z. Li, **Z. Li***, X. Hu, G. Du, Y. Nie, F. Zhu, L. Bai, R. Zhao, VisionTraj: A Noise-Robust Trajectory Recovery Framework based on Large-scale Camera Network, **IEEE Transactions on Intelligent Vehicles**, 2024+, *under review.*

Teaching Experience

Summary:

- **Teaching at University of Cologne**: I have two courses per semester on average, each of them is 2 weekly hours.
- **Diverse Teaching Portfolio**: I have taught diverse course for students from diverse background, such as deep learning (course titled "Advanced Data Analytics") to business analytics students, reinforcement learning (course titled "Decision Making under Uncertainty") to information system student, statistics (course titled "Quality Engineering") to management students.
- **High Rating**: Some of my courses, Advanced Seminar Machine learning, have been rated full star 5.0/5.0 or 4.9/5.0 for two consecutive years.
- **Teaching Focus**: My main teaching focus is general machine learning, deep learning, statistics, convex optimization, and so on.

Lecturing:

At the University of Cologne:

Semester	Course	Level	# Enroll	Eval.
SS'24, WS'23/24,	Seminar Machine Learning	UG	4, 16	**4.9/5.0**
WS'23/24, WS'22/23	Decision Making under Uncertainty	PG	4, 3	N/A*
WS'23/24	Advanced Data Analytics	PG	23	**4.1/5.0**
SS'23, WS'22/23, SS'22	Advanced Seminar Machine Learning	PG	8, 3, 14	**5.0/5.0**

* *only courses with more than 5 students can be evaluated.*

At Georgia Institute of Technology:

- Guest Instructor, **"Advanced Machine Learning for Smart Mobility"** (PhD), Winter 2023
  - Designed the contents and assignments in "Tensor-based Smart Transportation" and "Deep Learning-based Smart Mobility, Energy, and Earth"

At EWI gGmbH:

- Instructor, **"Machine Learning Bootcamp"** (PhD), EWI gGmbH Winter 23/24
  - Took care of the one-week boot camp in machine learning, with the topic in machine learning basics, time-series prediction, anomaly detection, LLM for time-series data, and so on.

At the Hong Kong University of Science and Technology

- Teaching Assistant, **"Engineering Management"** (Undergraduate) Spring, 2020
- Co-instructor, **"Quality Engineering"** (Undergraduate) Spring, 2019
- Teaching Assistant, **"Six Sigma Quality Management"** (Graduate) Fall, 2018

Student Advising:

- Notes: My students mainly come from collaboration and industry, whom I supervised as sincerely and committedly as my own PhD students, with one group discussion and one individual discussion weekly.

Supervised Advisees from Industry (I serve as their line manager):

- Haoyuan Jiang (Msc, Baidu Inc)
  - Topics: Reinforcement-Learning-based Traffic Signal Control
  - Supervision Period: 06.2022 - 10.2023 (under my supervision, conducting research from zero to one, and one to excellence!)
  - Research Output under My Supervision: IJCAI'24 [C12], AAMAS'24 [C11], IEEE TITS'24 [J4], KDD'24 [R5], IEEE IROS'24 [R6]

- Zhishuai Li (Ph.D., SenseTime Research)
  - Topics: Spatiotemporal Learning, Intelligent Transport Systems
  - Supervision Period: 03.2022 - present
  - Research Output under My Supervision: ICLR'24 [C16], AISTATS'24 [C9], ICDE'24 [R10], SIGSPATIAL'24 [R2], KDD'23 [C5], IEEE CASE'23 [C4], SIGSPATIAL'23 [C3]

Co-supervised Students from Academic Collaboration:

- Sun Yang (Msc, Peking University, China)
  - Topics: LLM-based Decision Intelligence
  - Supervision Period: 10.2023 - present
  - Research Output under My Supervision: IEEE MDM'24 [C17], NeurIPS'24 [R11], ICLR'24 [C16], ICDE'24 [R10]
- Philipp Kai Peter (Ph.D., University of Cologne, Germany)
  - Topics: Spatiotemporal Causal Learning
  - Supervision Period: 03.2023 - present
  - Research Output under My Supervision: Nature Energy [R4]
- Qianxiong Xu (Ph.D., Nanyang Technological University, Singapore)
  - Topics: Few-shot Segmentation, Spatiotemporal Learning
  - Supervision Period: 02.2023 - present
  - Research Output under My Supervision: IEEE MDM'24 [C17], KDD'24 [R1], ECCV'24 [R5]
- Chenxi Liu (PostDoc, Nanyang Technological University, Singapore)
  - Topics: LLM-based Spatiotemporal Learning
  - Supervision Period: 02.2023 - present
  - Research Output under My Supervision: IEEE MDM'24 [C17]
- Man Li (PostDoc, Georgia Institute of Technology, U.S.A)
  - Topics: Tensor Self-Supervised Learning for Time-Series Analysis
  - Supervision Period: 09. 2022 - present
  - Research Output under My Supervision: KDD'23 [C5], JASA [R6], IEEE TKDE'24 [R11], NeurIPS'24 [R7]

Supervised Master and Bachelor Thesis:

- Julius Junker (Msc in Business Analytics, On-going), "Identifying Optimal Location for Next EV Charging Station based on Multi-Modal Data"
  - **Collaboration with German Space Agency (DLR)**.
- Mete Keltek (BS in Information Systems, On-going), "Large Language Model (LLM)-based Vulnerability Scanning for Website"
  - **The work will be submitted to the KDD 2024 Undergraduate Consortium**.
- Yulin Li (Msc in Information Systems, Summer 2023), "Forecasting and Causal Analysis for Natural Gas Demand in Germany after Russian-Ukraine War"
  - **The extended work is under review of Nature Energy**.
- Minh Bui Cong (Msc in Information Systems, On-going), "Spatiotemporal Causal Analysis of Traffic Incident's Impact on Traffic Flows"
- Servando Pizarro (Msc in Business Analytics, On-going), "Retrieval-Augmented Generation (RAG)-based Annual Report Engineering"
- Ricarda Beck (Msc in Information Systems, On-going), "Spatiotemporal Prediction for Multi-source International Cargo Demand"
- Nils Hornstein (BS in Information Systems, Winter 22/23), "Deep Causal Analysis for the Impacts of Climate Change on Natural Disaster: with Case Study in Wildfires"
- Sarah Löhnert (BS in Information Systems, Summer 2023), "The Causal Relations of Renewable Energy on the Electricity Price: A Case Study based on Solar Energy in Germany"

- Tobias Becker (BS in Information Systems, Summer 2023) "Sentiment Analysis on Twitter Based on Machine Learning - A Case Study of Russia's War in Ukraine"
- Tim Suchan (BS in Information Systems, Winter 23/24) "Detection of ADHD on Social Media Using BERT-based Time Series Classification"

Reference

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