

TIAN LAN

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RESEARCH INTERESTS

Foundation models for time-series anomaly detection, causal discovery and graph learning for complex systems, and LLM/VLM-assisted scientific and industrial data analysis.

RESEARCH HIGHLIGHTS

- Developed foundation-model-oriented methods for zero-shot time-series anomaly detection, leading to a first-author **ICML 2026** publication.
- Proposed multi-task and functional DAG learning frameworks for multimodal and dynamic data, with publications in **KDD 2023**, **IEEE TASE**, and major revision at **INFORMS Journal on Computing**.
- Conducted research on graph and temporal representation learning for transportation, telecom, and industrial systems, resulting in publications at **NeurIPS** and **IEEE TASE**.

EDUCATION

Tsinghua University, Department of Industrial Engineering, *Ph.D. Student* 2023.7 - Present

- Advisor: Prof. Chen Zhang.
- Research focus: reliable structure learning and representation learning for complex temporal, graph-structured, and multimodal data.

Tsinghua University, Department of Industrial Engineering, *B.Eng.* 2019.7 - 2023.6

- GPA: **3.81/4.00**, ranked **14/83**.
- Core coursework: Probability, Statistical Inference, Statistical Learning, Algorithm Design and Analysis.

PUBLICATIONS

* indicates equal contribution.

Conference Papers

- **T. Lan***, H. D. Le*, J. Li*, W. He, M. Wang, C. Liu, C. Zhang. “Towards Foundation Models for Zero-Shot Time Series Anomaly Detection: Leveraging Synthetic Data and Relative Context Discrepancy,” **ICML 2026**.
- X. Gou, Z. Li, **T. Lan**, J. Lin, Z. Li, B. Zhao, C. Zhang, D. Wang, X. Zhang. “TraffiDent: Understanding the Interplay Between Traffic Dynamics and Incidents,” **NeurIPS 2025**.
- **T. Lan**, Z. Li, Z. Li, L. Bai, M. Li, F. Tsung, W. Ketter, R. Zhao, C. Zhang. “MM-DAG: Multi-task DAG Learning for Multi-modal Data,” **KDD 2023**.

Journal Papers

- X. Yang*, **T. Lan***, H. Qiu, C. Zhang. “Nonlinear Causal Discovery via Dynamic Latent Variables,” **IEEE Transactions on Automation Science and Engineering**, 2025.
- X. Yang, B. Niu, **T. Lan**, C. Zhang. “Federated Multi-task Bayesian Network Learning in Overlapping/Distinct Variables,” **IIE Transactions**, 2025.
- J. Lin, **T. Lan**, B. Zhang, K. Lin, D. Miao, H. He, J. Ye, C. Zhang, Y.-F. Li. “Multi-scenario Cellular KPI Prediction via Spatiotemporal GNN,” **IEEE Transactions on Automation Science and Engineering**, 2024.

Preprints

- Y. Yang, **T. Lan**, Y. Gao, Y. Lu, W. He, M. Wang, C. Liu, C. Zhang. “VETime: Vision Enhanced Zero-Shot Time Series Anomaly Detection,” arXiv preprint arXiv:2602.16681, 2026.
- **T. Lan**, H. D. Le, J. Li, W. He, M. Wang, C. Liu, C. Zhang. “AXIS: Explainable Time Series Anomaly Detection with Large Language Models,” arXiv preprint arXiv:2509.24378, 2025.
- **T. Lan**, J. Guo, C. Zhang. “Tensor State Space-based Dynamic Multilayer Network Modeling,” arXiv preprint arXiv:2506.02413, 2025.
- **T. Lan**, Y. Gao, Y. Lu, C. Zhang. “CICADA: Cross-Domain Interpretable Coding for Anomaly Detection and Adaptation,” arXiv preprint arXiv:2505.00415, 2025.
- **T. Lan**, Z. Li, J. Lin, Z. Li, L. Bai, M. Li, F. Tsung, R. Zhao, C. Zhang. “MultiFun-DAG: Multivariate Functional DAG,” major revision at **INFORMS Journal on Computing**; arXiv:2404.13836, 2024.

RESEARCH EXPERIENCE

Foundation Models for Zero-Shot Time-Series Anomaly Detection

2025 - Present

- Addressed zero-shot time-series anomaly detection under limited-label, cross-domain, and distribution-shift settings.
- Proposed a synthetic-data-driven training pipeline and relative context discrepancy objective to improve temporal representation learning and anomaly generalization.
- Produced a first-author **ICML 2026** publication on foundation models for time-series anomaly detection.

LLM- and Vision-Enhanced Time-Series Anomaly Detection

2025 - Present

- Explored the use of large language models and vision-language representations for explainable and zero-shot time-series anomaly detection.
- Designed methods for explanation generation, cross-domain adaptation, and human-readable anomaly reasoning in multivariate temporal data.
- Led or contributed to a series of preprints on LLM-assisted and vision-enhanced anomaly detection, including **AXIS**, **CICADA**, and **VETime**.

Causal Discovery for Multimodal and Functional Data

2022 - Present

- Developed causal discovery methods for multimodal observations, functional variables, and dynamic latent structures.
- Proposed multi-task DAG learning and functional DAG estimation frameworks for complex transportation and industrial datasets.
- Published related work in **KDD 2023** and **IEEE TASE**, with MultiFun-DAG under major revision at **INFORMS Journal on Computing**.

RESEARCH INTERNSHIP

SenseTime, Research Intern

2022.5 - 2023.5

- Worked on causal graph learning for traffic congestion analysis with heterogeneous urban traffic observations.
- Proposed a multi-task DAG learning framework to capture shared and location-specific causal structures across traffic intersections.

HONORS & AWARDS

- First-Class Comprehensive Scholarship, Tsinghua University, 2025.
- First-Class Comprehensive Scholarship, Tsinghua University, 2024.
- Special Prize, Tsinghua Artificial Intelligence Challenge, 2020.
- Silver Medal, National Olympiad in Informatics, 2018.
- Gold Medal, China Team Selection Competition, 2018.

ACADEMIC SERVICE

- Reviewer for IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Automation Science and Engineering, IJSE Transactions, KDD, and ICML.

TECHNICAL SKILLS

- **Programming:** Python, C/C++, R, Matlab.
- **Machine Learning:** time-series modeling, anomaly detection, graph neural networks, transformers, representation learning, domain adaptation.
- **Statistical Modeling:** causal discovery, Bayesian networks, probabilistic graphical models, functional data analysis, factor analysis.
- **Optimization & Inference:** gradient-based optimization, EM, variational inference, MCMC.