

CURRENT
RESEARCH
INTERESTS

- ☐ Machine Learning
- ☐ AI for Science
- ☐ Matrix/Tensor Computations
- ☐ Data Science
- ☐ Signal Processing
- ☐ Spatiotemporal Data Modeling
- ☐ Urban Science
- ☐ Information Systems
- ☐ Optimization & Decision Making

CONTACT
INFORMATION

- ✉ chenxy346@gmail.com (primary)
- ✉ xinyuchen@mit.edu (official)
- 🏠 <https://xinyuchen.github.io> (homepage)
- 🏠 <https://sites.mit.edu/xinyuchen> (MIT sites)
- 🌐 [xinyuchen](https://xinyuchen.github.io)
- 🔍 [Google Scholar](#) 📈 1,204 citations (h-index: 12 & i10-index: 13)

BIOGRAPHY

Dr. Chen is now a Postdoctoral Associate at MIT's Department of Urban Studies and Planning (DUSP) with Prof. Jinhua Zhao, working on the Mens, Manus, and Machina (M3S) project and the US Department of Energy (DOE) project. (2024.04.01 – present)

EDUCATION

- 🎓 **PhD in Civil Engineering (Transportation)** 2020.08 – 2023.12
 🏛️ Polytechnique Montreal (School of Engineering), *University of Montreal*
 🏆 *IVADO PhD Excellence Scholarship & CIRRELT PhD Excellence Scholarship*
 - Thesis: *Matrix and Tensor Models for Spatiotemporal Traffic Data Imputation and Forecasting*
 - Advisor: Nicolas Saunier (full professor at Polytechnique Montreal)
 - Co-advisor: Lijun Sun (associate professor at McGill University)
- 🎓 **Master's degree in Traffic Information Engineering & Control** 2016.08 – 2019.06
 🏛️ *Sun Yat-Sen University* Guangzhou, China
 🏆 *Outstanding Thesis Award (top 2% in total)*
 - Thesis: *Imputing Spatiotemporal Missing Traffic Data by Bayesian Tensor Factorization Models*
 - Advisor: Zhaocheng He (full professor)
- 🎓 **Bachelor's degree in Traffic Engineering** 2012.09 – 2016.06
 🏛️ *Guangzhou University* Guangzhou, China
 - Thesis: *Modeling Vehicles' Time Headway with Log-Normal and Power-Law Distribution*
 - Advisor: Xiaodong Zang (full professor)

HONOURS
AND
AWARDS

- 🏆 *CIRRELT PhD Excellence Scholarship* (\$5,000) 2021.12
- 🏆 *IVADO PhD Excellence Scholarship* (\$100,000, by Institute for Data Valorisation) 2020.04
- 🏆 *National Scholarship* (by Ministry of Education of China) 2018.11

REFEREED
JOURNAL
PAPERS

Google Scholar: <https://scholar.google.com/citations?user=mCrW04wAAAAJ&hl>

◆ **First-author papers** (5 papers cited above 100 times)

10. Xinyu Chen, Xi-Le Zhao, Chun Cheng (2024). **Forecasting urban traffic states with sparse data using Hankel temporal matrix factorization**. *INFORMS Journal on Computing*. Accepted for publication.

🔗 <https://doi.org/10.1287/ijoc.2022.0197>








9. Xinyu Chen, Zhanhong Cheng, HanQin Cai, Nicolas Saunier, Lijun Sun (2024). **Laplacian convolutional representation for traffic time series imputation**. *IEEE Transactions on Knowledge and Data Engineering*. Early Access.

🔗 <https://doi.org/10.1109/TKDE.2024.3419698>

8. Xinyu Chen, Chengyuan Zhang, Xiaoxu Chen, Nicolas Saunier, Lijun Sun (2024). **Discovering dynamic patterns from spatiotemporal data with time-varying low-rank autoregression.** *IEEE Transactions on Knowledge and Data Engineering*. 36 (2): 504–517.
[doi](https://doi.org/10.1109/TKDE.2023.3294440) <https://doi.org/10.1109/TKDE.2023.3294440>
7. Xinyu Chen, Lijun Sun (2022). **Bayesian temporal factorization for multidimensional time series prediction.** *IEEE Transactions on Pattern Analysis and Machine Intelligence*. 44 (9): 4659–4673.
[doi](https://doi.org/10.1109/TPAMI.2021.3066551) <https://doi.org/10.1109/TPAMI.2021.3066551> 200+ citations
6. Xinyu Chen, Mengying Lei, Nicolas Saunier, Lijun Sun (2022). **Low-rank autoregressive tensor completion for spatiotemporal traffic data imputation.** *IEEE Transactions on Intelligent Transportation Systems*. 23 (8): 12301–12310.
[doi](https://doi.org/10.1109/TITS.2021.3113608) <https://doi.org/10.1109/TITS.2021.3113608>
5. Xinyu Chen, Yixian Chen, Nicolas Saunier, Lijun Sun (2021). **Scalable low-rank tensor learning for spatiotemporal traffic data imputation.** *Transportation Research Part C: Emerging Technologies*. 129: 103226.
[doi](https://doi.org/10.1016/j.trc.2021.103226) <https://doi.org/10.1016/j.trc.2021.103226>
4. Xinyu Chen, Jinming Yang, Lijun Sun (2020). **A nonconvex low-rank tensor completion model for spatiotemporal traffic data imputation.** *Transportation Research Part C: Emerging Technologies*. 117: 102673.
[doi](https://doi.org/10.1016/j.trc.2020.102673) <https://doi.org/10.1016/j.trc.2020.102673> 100+ citations
3. Xinyu Chen, Zhaocheng He, Yixian Chen, Yuhuan Lu, Jiawei Wang (2019). **Missing traffic data imputation and pattern discovery with a Bayesian augmented tensor factorization model.** *Transportation Research Part C: Emerging Technologies*. 104: 66–77.
[doi](https://doi.org/10.1016/j.trc.2019.03.003) <https://doi.org/10.1016/j.trc.2019.03.003> 100+ citations
2. Xinyu Chen, Zhaocheng He, Lijun Sun (2019). **A Bayesian tensor decomposition approach for spatiotemporal traffic data imputation.** *Transportation Research Part C: Emerging Technologies*. 98: 73–84.
[doi](https://doi.org/10.1016/j.trc.2018.11.003) <https://doi.org/10.1016/j.trc.2018.11.003> 200+ citations
1. Xinyu Chen, Zhaocheng He, Jiawei Wang (2018). **Spatial-temporal traffic speed patterns discovery and incomplete data recovery via SVD-combined tensor decomposition.** *Transportation Research Part C: Emerging Technologies*. 86: 59–77.
[doi](https://doi.org/10.1016/j.trc.2017.10.023) <https://doi.org/10.1016/j.trc.2017.10.023> 100+ citations

◆ Co-author papers

5. Ben-Zheng Li, Xi-Le Zhao, Xinyu Chen, Meng Ding, Ryan Wen Liu (2024). **Convolutional low-rank tensor representation for structural missing traffic data imputation.** *IEEE Transactions on Intelligent Transportation Systems*. Early Access.
[doi](https://doi.org/10.1109/TITS.2024.3430039) <https://doi.org/10.1109/TITS.2024.3430039>
4. Ben-Zheng Li, Xi-Le Zhao, Xiongjun Zhang, Teng-Yu Ji, Xinyu Chen, Michael K. Ng (2023). **A learnable group-tube transform induced tensor nuclear norm and its application for tensor completion.** *SIAM Journal on Imaging Sciences*. 16 (3): 1370–1397.
[doi](http://dx.doi.org/10.1137/22M1531907) <http://dx.doi.org/10.1137/22M1531907>
3. Lijun Sun, Xinyu Chen, Zhaocheng He, Luis F. Miranda-Moreno (2021). **Routine pattern discovery and anomaly detection in individual travel behavior.** *Networks and Spatial Economics*. 35.
[doi](http://dx.doi.org/10.1007/s11067-021-09542-9) <http://dx.doi.org/10.1007/s11067-021-09542-9>

	2. Pu Ren, Xinyu Chen, Lijun Sun, Hao Sun (2021). Incremental Bayesian matrix/tensor learning for structural monitoring data imputation and response forecasting . <i>Mechanical System and Signal Processing</i> . 158: 107734.  https://doi.org/10.1016/j.ymssp.2021.107734		
	1. Zhaocheng He, Kaiying Chen, Xinyu Chen (2018). A collaborative method for route discovery using taxi drivers' experience and preferences . <i>IEEE Transactions on Intelligent Transportation Systems</i> . 19 (8): 2505–2514.  http://doi.org/10.1109/TITS.2017.2753468		
CONFERENCE PAPERS	WCTR 2023: Xinyu Chen, Zhanhong Cheng, Nicolas Saunier, Lijun Sun (2023). Laplacian convolutional representation for traffic time series imputation (presentation only). <i>Proceedings of the World Conference of Transport Research</i> . TRB 2023: Xinyu Chen, Chengyuan Zhang, Lijun Sun, Nicolas Saunier (2023). Nonstationary temporal matrix factorization for sparse traffic time series forecasting (presentation only). <i>The 102nd Annual Meeting of Transportation Research Board</i> . KDD Time Series Workshop: Xinyu Chen, Mengying Lei, Nicolas Saunier, Lijun Sun (2021). Low-rank autoregressive tensor completion for spatiotemporal traffic data imputation (presentation only). <i>The 7th SIGKDD Workshop on Mining and Learning from Time Series (MiLeTS)</i> .		
SUBMITTED PAPERS	1. Xinyu Chen, Chengyuan Zhang, Xi-Le Zhao, Nicolas Saunier, Lijun Sun (2024). Forecasting sparse movement speed of urban road networks with nonstationary temporal matrix factorization .  <i>Transportation Science</i>  under review (1st round)		
ACADEMIC FUNDING	1. City-scale traffic data imputation and forecasting with tensor learning <ul style="list-style-type: none"> • Authors: Xinyu Chen, Nicolas Saunier (advisor) • Link: https://ivado.ca/en/scholarships-and-grants/phd-excellence-scholarships/  IVADO PhD Excellence Scholarship  \$100,000  September 1, 2020		
REVIEWING ACTIVITIES	I am serving as a reviewer for some scientific journals. <ul style="list-style-type: none"> • Accident Analysis and Prevention • Applied Mathematical Modeling • Cities • IEEE Open Journal of Signal Processing • IEEE Transactions on Intelligent Transportation Systems • IEEE Transactions on Knowledge and Data Engineering • INFORMS Journal on Computing • Mechanical System and Signal Processing • Scientific Reports • Signal Processing • Transportation Research Part B: Methodological • Transportation Research Part C: Emerging Technologies • Transportation Research Part E: Logistics and Transportation Review 		
PROFESSIONAL MEMBERSHIPS	<input type="checkbox"/> Interuniversity Research Centre on Enterprise Networks, Logistics and Transportation (CIRRELT) <input type="checkbox"/> Institute of Electrical and Electronics Engineers (IEEE)	Student Member Student Member	2021 – 2023 2022 – 2023

OPEN-SOURCE PROJECTS

I am leading some innovative projects on GitHub (4.5k+ stars & 500+ followers).

◆ Selected repositories

- 📦 **transdim**: Python codes for spatiotemporal data imputation and prediction using a variety of state-of-the-art machine learning (mainly including low-rank matrix and tensor methods) and deep learning.

🔗 [xinychen/transdim](https://github.com/xinychen/transdim) ☆ 1.1k+ stars

2018.09 - present
- 📦 **awesome-Latex-drawing**: Drawing Bayesian networks, graphical models, tensor structures, and technical frameworks in LaTeX.

🔗 [xinychen/awesome-latex-drawing](https://github.com/xinychen/awesome-latex-drawing) ☆ 1.2k+ stars

2019.06 - present
- 📦 **LaTeX-cookbook**: Academic writing with LaTeX: A tutorial (in Chinese). Published in *Tsinghua University Press*.

🔗 [xinychen/latex-cookbook](https://github.com/xinychen/latex-cookbook) ☆ 1.3k+ stars

2021.05 - present
- 📦 **Tensor4ML**: Tensor decomposition for machine learning with Python implementation.

🔗 [xinychen/Tensor4ML](https://github.com/xinychen/Tensor4ML) ☆ 200+ stars

2019.06 - present
- 📦 **tracebase**: Multivariate time series forecasting on high-dimensional and sparse Uber movement speed data.

🔗 [xinychen/tracebase](https://github.com/xinychen/tracebase) ☆ 40+ stars

2020.11 - present
- 📦 **spatiotemporal-data**: This project aims at supporting research for all aspects of spatiotemporal data modeling with machine learning and addressing many scientific, mathematical, industrial, and engineering problems in urban systems, optimization & decision making, signal processing, and network science.

🔗 <https://spatiotemporal-data.github.io> (1.1k+ visitors)

2023.11 - present

PRESENTATION & TALK

- ☐ Laplacian convolutional representation for traffic data imputation.

 - Dalian University of Technology (DUT)
 - Dalian, China
 - Slides: <https://xinychen.github.io/slides/LCR24.pdf>

2024.07
- ☐ Modeling temporal correlations and dynamics in spatiotemporal data systems.

 - Northeastern University (NEU)
 - Boston, USA

2024.05
- ☐ Matrix and Tensor Models for Spatiotemporal Traffic Data Imputation and Forecasting.

 - PhD Research Defense
 - Montreal, Canada
 - Slides: <https://xinychen.github.io/slides/defense.pdf>

2023.12
- ☐ Laplacian convolutional representation for traffic data imputation.

 - World Conference of Transport Research (WCTR 2023)
 - Montreal, Canada
 - Slides: <https://xinychen.github.io/slides/LCR.pdf>

2023.07
- ☐ Low-rank matrix and tensor methods for spatiotemporal traffic data modeling.

 - Southern University of Science and Technology (SUSTech)
 - Shenzhen, China
 - Slides: https://xinychen.github.io/slides/traffic_data_modeling_v1.pdf

2023.05

- ❑ Low-rank matrix and tensor methods for spatiotemporal data modeling.

 - Sichuan University (SCU)
 - University of Electronic Science and Technology of China (UESTC)
 - Chengdu, China
 - Slides: https://xinychen.github.io/slides/stdata_modeling.pdf

2023.04
- ❑ Low-rank matrix and tensor factorization for speed field reconstruction.

 - Research Group of Transport, Polytechnique Montreal
 - Montreal, Canada
 - Slides: https://xinychen.github.io/slides/MF_TF_SFR.pdf

2023.03
- ❑ Spatiotemporal traffic data imputation and forecasting with tensor learning.

 - IVADO Project Workshop
 - Montreal, Canada
 - Slides: https://xinychen.github.io/slides/phd_project_22summer.pdf

2022.05
- ❑ Nonstationary temporal matrix factorization for multivariate time series forecasting.

 - Hong Kong Machine Learning Meetup (virtual)
 - Slides: <https://xinychen.github.io/slides/notmf.pdf>

2022.05
- ❑ Bayesian temporal factorization for multidimensional time series prediction.

 - IFT 6760A Course (*Matrix and tensor factorization techniques for machine learning*)
 - Slides: <https://doi.org/10.5281/zenodo.4693404>

2021.03

SKILLS

- ❑ **Language:** Chinese (native) & English (fluent)
- ❑ **Expertise:** Python/Matlab/Julia/R/Java; NumPy/PyTorch/CuPy; Jupyter Notebook; LaTeX; CSS/HTML.