Xinyu Chen (Ph.D.)

Last update on December 18, 2023

CURRENT RESEARCH INTERESTS

❏ Machine Learning ❏ Spatiotemporal Data Modeling ❏ Intelligent Transportation
❏ Matrix/Tensor Computations ❏ Missing Data Imputation ❏ Smart Cities
❏ Low-Rank Models ❏ Time Series Analysis ❏ Human Mobility

CONTACT INFORMATION

✉ chenxy346@gmail.com
⌂ https://xinychen.github.io (homepage, 11k+ visitors)
○ xinychen
Google Scholar ✲ 953 citations (h-index: 11 & i10-index: 11)

BIOGRAPHY

In the whole year of 2024, I will be joining MIT's Department of Urban Studies and Planning as a Postdoctoral Research Associate with Prof. Jinhua Zhao, working on the Mens, Manus, and Machina (M3S) project and the US Department of Energy (DOE) project.

EDUCATION

🎓 **PhD in Civil Engineering (Transportation)** 2020.08 – 2023.12
🏛 Polytechnique Montreal (School of Engineering), *University of Montreal* Montreal, Canada

🏅 *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
🏅 *Outstanding Thesis Award* (by Sun Yat-Sen University) 2019.06
🏅 *National Scholarship* (by Ministry of Education of China) 2018.11

REFEREED JOURNAL PAPERS

Google Scholar: https://scholar.google.com/citations?user=mCrWO4wAAAAJ&hl

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

8. Xinyu Chen, Chengyuan Zhang, Xiaoxu Chen, Nicolas Saunier, Lijun Sun (2023). **Discovering dynamic patterns from spatiotemporal data with time-varying low-rank autoregression**. *IEEE Transactions on Knowledge and Data Engineering*. Early access.

doi https://doi.org/10.1109/TKDE.2023.3294440
≋ JCR-Q1 ▤ IF: 8.9 🏅 top-tier

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
≋ JCR-Q1 ▤ IF: 23.6 🏅 top-tier ✲ 100+ citations
🔥 ESI hot paper (top 0.1%) 🏆 ESI highly cited paper (top 1%)

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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

   ⪢ JCR-Q1   IF: 8.5   top-tier   ESI hot paper (top 0.1%)

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

   ⪢ JCR-Q1   IF: 8.3   top-tier

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

   ⪢ JCR-Q1   IF: 8.3   top-tier   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

   ⪢ JCR-Q1   IF: 8.3   top-tier   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

   ⪢ JCR-Q1   IF: 8.3   top-tier   200+ citations   ESI highly cited paper (top 1%)

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

   ⪢ JCR-Q1   IF: 8.3   top-tier   100+ citations

◆ **Co-author papers**

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

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

2. Pu Ren, Xinyu Chen, Lijun Sun, Hao Sun (2021). **Incremental Bayesian matrix/tensor learning for structural monitoring data imputation and response forecasting**. *Mechanical System and Signal Processing*. 158: 107734.

   doi 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**. *IEEE Transactions on Intelligent Transportation Systems*. 19 (8): 2505–2514.

   doi 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). *Proceedings of the World Conference of Transport Research.*
	TRB 2023: Xinyu Chen, Chengyuan Zhang, Lijun Sun, Nicolas Saunier (2023). **Nonstationary temporal matrix factorization for sparse traffic time series forecasting** (presentation only). *The 102nd Annual Meeting of Transportation Research Board.*
	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). *The 7th SIGKDD Workshop on Mining and Learning from Time Series (MiLeTS).*

PREPRINT AND SUBMITTED PAPERS	3. Xinyu Chen, Zhanhong Cheng, Nicolas Saunier, Lijun Sun (2022). **Laplacian convolutional representation for traffic time series imputation**. arXiv: 2212.01529.
	2. Xinyu Chen, Chengyuan Zhang, Xi-Le Zhao, Nicolas Saunier, Lijun Sun (2022). **Nonstationary temporal matrix factorization for multivariate time series forecasting**. arXiv: 2203.10651.
	1. Xinyu Chen, Lijun Sun (2020). **Low-rank autoregressive tensor completion for multivariate time series forecasting**. arXiv: 2006.10436.

ACADEMIC FUNDING	1. *City-Scale Traffic Data Imputation and Forecasting with Tensor Learning* • **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 **10+** scientific journals. • Applied Intelligence • Big Data Research • Expert Systems with Applications • IEEE Intelligent Transportation Systems Magazines • IEEE Open Journal of Signal Processing • IEEE Sensors Journal • IEEE Transactions on Intelligent Transportation Systems • IEEE Transactions on Knowledge and Data Engineering • INFORMS Journal on Computing • Scientific Reports • Transportmetrica B: Transport Dynamics • Transportation Research Part B: Methodological • Transportation Research Part C: Emerging Technologies

PROFESSIONAL MEMBERSHIPS	❒ Interuniversity Research Centre on Enterprise Networks, Logistics and Transportation (**CIRRELT**)	**Student Member**	2021 - present
	❒ Institute of Electrical and Electronics Engineers (**IEEE**)	**Student Member**	2022 - present

OPEN-SOURCE PROJECTS	I am leading some innovative projects on GitHub (**4k+** stars & **600+** forks & **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 models.	2018.09 - present
	○ xinychen/transdim ☆ 1k+ stars	

awesome-LaTeX-drawing: Drawing Bayesian networks, graphical models, tensor structures, and technical frameworks in LaTeX. (Most examples are from our research papers.)   2019.06 - present

 xinychen/awesome-latex-drawing   ☆ 1.1k+ stars

 LaTeX-cookbook: Academic writing with LaTeX: A tutorial (in Chinese). Published in *Tsinghua University Press*.   2021.05 - present

 xinychen/latex-cookbook   ☆ 1.1k+ stars

 tensor-learning: Python codes for low-rank tensor factorization, tensor completion, and tensor regression techniques.   2019.06 - present

 xinychen/tensor-learning   ☆ 150+ stars

 awesome-beamer: Creating presentation slides by using Beamer in LaTeX.   2020.11 - present

 xinychen/awesome-beamer   ☆ 80+ stars

 tracebase: Multivariate time series forecasting on high-dimensional and sparse Uber movement speed data.   2020.11 - present

 xinychen/tracebase   ☆ 40+ stars

PRESENTATION & TALK	❒ Matrix and Tensor Models for Spatiotemporal Traffic Data Imputation and Forecasting.	2023.12

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

❒ Laplacian convolutional representation for traffic data imputation.   2023.07

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

❒ Low-rank matrix and tensor methods for spatiotemporal traffic data modeling.   2023.05

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

❒ Low-rank matrix and tensor methods for spatiotemporal data modeling.   2023.04

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

❒ Low-rank matrix and tensor factorization for speed field reconstruction.   2023.03

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

❒ Spatiotemporal traffic data imputation and forecasting with tensor learning.   2022.05

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

❒ Nonstationary temporal matrix factorization for multivariate time series forecasting.   2022.05

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

❐ Bayesian temporal factorization for multidimensional time series prediction.   2021.03
- IFT 6760A Course (*Matrix and tensor factorization techniques for machine learning*)
- Slides: https://doi.org/10.5281/zenodo.4693404

SKILLS   ❐ **Language**: Chinese (native) & English (fluent)

❐ **Expertise**: Python/Matlab/Julia/R/Java; NumPy/PyTorch/CuPy; Jupyter Notebook; LaTeX; CSS/HTML.

REFERENCES   Please reach out to request a reference letter.

👤 **Prof. Nicolas Saunier** (advisor)

- Full Professor
- Département des génies civil, géologique et des mines (CGM)
- Polytechnique Montréal
- CIRRELT, RRSR, CIRODD & IVADO
- Homepage: http://n.saunier.free.fr/saunier/
- Email: nicolas.saunier@polymtl.ca

👤 **Prof. Lijun Sun** (co-advisor)

- Associate Professor
- Department of Civil Engineering
- McGill University
- Homepage: https://lijunsun.github.io
- Email: lijun.sun@mcgill.ca

👤 **Prof. Chun Cheng** (collaborator)

- Full Professor
- School of Economics and Management
- Dalian University of Technology
- Homepage: https://sites.google.com/site/chun123cheng/home
- Email: chun.cheng@polymtl.ca