Xinyu Chen (Ph.D.)

Last update on December 12, 2023

Current Research Interests

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

Contact Information

chenxy346@gmail.com
https://xinychen.github.io (homepage)
xinychen
Google Scholar 950 citations (h-index: 11 & i10-index: 11)

Biography

Since January 1, 2024, I will be joining MIT's Department of Urban Studies and Planning as a Postdoctoral Associate, working on 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, ***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=mCrW04wAAAAJ&hl

◆ **First-author papers** (4 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.

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.

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%)

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.

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.

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.

https://doi.org/10.1016/j.trc.2020.102673
JCR-Q1 IF: 8.3 top-tier

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.

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.

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.

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.

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.

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.

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.

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

❒ 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.