

## Research Interests & Past Works

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## Research Interests

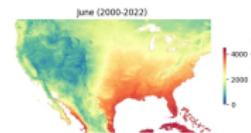
- **Machine Learning** (e.g., Matrix/Tensor computations, numerical optimization, supervised/unsupervised learning)
- **Data Mining** (e.g., Spatiotemporal data modeling, geospatial data analysis)



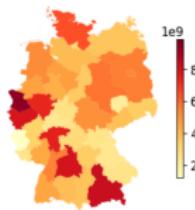
Transportation



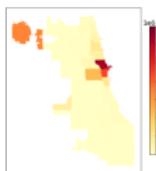
Mobile service



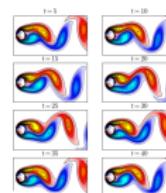
Climate



Energy



Mobility



Dynamical system

- **AI for Science** (e.g., Urban science, dynamical systems, computational social science)

## Past Works

### Spatiotemporal traffic data imputation:

1. X. Chen, Z. He, J. 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. (100+ citations)
2. X. Chen, Z. He, L. Sun (2019). A Bayesian tensor decomposition approach for spatiotemporal traffic data imputation. *Transportation Research Part C: Emerging Technologies*. 98: 73-84. (200+ citations, ESI highly cited paper)
3. X. Chen, Z. He, Y. Chen, Y. Lu, J. 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. (100+ citations)
4. X. Chen, J. Yang, L. Sun (2020). A nonconvex low-rank tensor completion model for spatiotemporal traffic data imputation. *Transportation Research Part C: Emerging Technologies*. 117: 102673. (100+ citations)
5. X. Chen, Y. Chen, N. Saunier, L. Sun (2021). Scalable low-rank tensor learning for spatiotemporal traffic data imputation. *Transportation Research Part C: Emerging Technologies*. 129: 103226.

## Past Works

### Spatiotemporal traffic data imputation:

6. X. Chen, M. Lei, N. Saunier, L. Sun (2022). Low-rank autoregressive tensor completion for spatiotemporal traffic data imputation. *IEEE Transactions on Intelligent Transportation Systems*. 23 (8): 12301-12310. (50+ citations, ESI hot paper)

### Spatiotemporal time series forecasting:

7. X. Chen, L. Sun (2022). Bayesian temporal factorization for multidimensional time series prediction. *IEEE Transactions on Pattern Analysis and Machine Intelligence*. 44 (9): 4659-4673. (150+ citations, ESI hot paper & ESI highly cited paper)
- X. Chen, X.L. Zhao, C. Cheng (2024). Forecasting urban traffic states with sparse data using Hankel temporal matrix factorization. *INFORMS Journal on Computing*. (UTD-24, minor revision for final decision)

### Spatiotemporal pattern discovery:

8. X. Chen, C. Zhang, X. Chen, N. Saunier, L. 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.

# Past Works

Open-source & reproducible research:

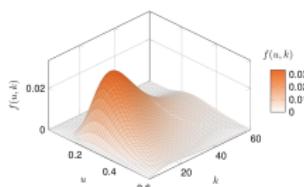
- <https://github.com/xinyuchen>

Algorithms



transdim  
**(1.1k stars)**

Tools



awesome-latex-drawing  
**(1.2k stars)**

Tutorials



latex-cookbook  
**(1.2k stars)**  
(THU Press)

## Future Plan

### Broad interests:

- Machine Learning
- Data Science/Mining
- AI for Science

### Research directions:

- Urban science (e.g., connection among infrastructure, mobile/mobility activities, urban development, and economy)
- Human mobility modeling (e.g., long-range sequence prediction)
- Geospatial data analysis (e.g., orthogonal mode decomposition)
- Intelligent & sustainable urban systems
- Optimization & decision making
- .....

**Goals:** Solving many scientific, mathematical, and engineering problems with AI algorithms.

- Spatiotemporal Data Modeling (STD) Initiative:

<https://spatiotemporal-data.github.io>

# Thanks for your attention!

Any Questions?

Slides: <https://xinychen.github.io/slides/sustech24.pdf>

## About me:

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