JIAWEI LU

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Research Interests

Intelligent transportation systems and sustainable mobility solutions

Machine learning powered supply chain management

ACADEMIC POSITIONS

Postdoctoral Scholar **Georgia, U.S. Mar 2023 - present**

H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology

Advisor: Pascal Van Hentenryck

Postdoctoral Scholar **Arizona, U.S. Nov 2022 – Feb 2023**

School of Sustainable Engineering and the Built Environment, Arizona State University

Advisor: Xuesong (Simon) Zhou

EDUCATION

Arizona State University **Arizona, U.S. 2018-2022**

Ph.D. of Engineering in Transportation, Transportation Engineering

Southeast University **Nanjing, China 2015-2018**

Master of Engineering in Transportation, Transportation Engineering

Southeast University **Nanjing, China 2011-2015**

Bachelor of Engineering in Transportation, Traffic Engineering

PUBLICTIONS

Journal Publications (*corresponding author)

- Cheng, Q., Lin, Y., and **Lu, J**, 2024. Dynamic Systems Modeling and Integrated Transportation Demand-and-Supply Management with a Polynomial Arrival Queue Model. *Journal of Transportation Engineering, Part A: Systems*.
- Nie, Q., Ou, J., Zhang, H., **Lu, J.**, Li, S. and Shi, H., 2024. A robust integrated multi-strategy bus control system via deep reinforcement learning. *Engineering Applications of Artificial Intelligence*.
- **Lu, J.**, Li, C., Wu, X. B. and Zhou, X. S., 2023. Physics-informed neural networks for integrated traffic state and queue profile estimation: A differentiable programming approach on layered computational graphs. *Transportation Research Part C*.
- **Lu, J.**, Nie, Q., Mahmoudi, M., Ou, J., Li, C. and Zhou, X.S., 2022. Rich arc routing problem in city logistics: Models and solution algorithms using a fluid queue-based time-dependent travel time representation. *Transportation Research Part B*.
- **Lu, J.**, and Zhou, X. S., 2023. Virtual track networks: A hierarchical modeling framework and open-source tools for simplified and efficient connected and automated mobility (CAM) system design based on general modeling network specification (GMNS). *Transportation Research Part C*.
- **Lu, J.**, Nie, Q., Wang, Y., Xia, J., Lu, Z. and Ou, J., 2023. Reliable Traffic State Identification Using High-Resolution Data: A Consistent Offline-Online Dynamic Time Warping Based Time Series Clustering Approach. *Transportation Research Record*.
- Song, Y., Hu, X., **Lu, J**. and Zhou, X., 2022. Analytical approximation and calibration of roundabout capacity: A merging state transition-based modeling approach. *Transportation Research Part B*.
- Wu, X.B., **Lu, J.***, Wu, S. and Zhou, X.S., 2021. Synchronizing time-dependent transportation services: Reformulation and solution algorithm using quadratic assignment problem. *Transportation Research Part B*.
- Tang, Q., Hu, X., **Lu, J.** and Zhou, X., 2021. Analytical characterization of multi-state effective discharge rates for bus-only lane conversion scheduling problem. *Transportation Research Part B*.
- Ou, J., **Lu, J.**, Xia, J., An, C. and Lu, Z., 2019. Learn, assign, and search: real-time estimation of dynamic origin-destination flows using machine learning algorithms. *IEEE Access*.

- Ji, Y., **Lu, J.**, Chen, X. and Hu, B., 2016. Prediction model of bus arrival time based on particle swarm optimization and wavelet neural network. *Journal of Transportation Systems Engineering and Information Technology*.
- Zhou, X.S., Cheng, Q., Wu, X., Li, P., Belezamo, B., **Lu, J.**, and Abbasi, M., 2022. A meso-to-macro cross-resolution performance approach for connecting polynomial arrival queue model to volume-delay function with inflow demand-to-capacity ratio. *Multimodal Transportation*.

Manuscripts Submitted for Journal Publication

- **Lu, J.***, Riley, C., Gurumurthy, K. M. and Van Hentenryck, P., 2023. Revitalizing Public Transit in Low Ridership Areas: An Exploration of On-Demand Multimodal Transit Systems. arXiv preprint arXiv:2308.01298.
- **Lu, J.***, Ye, T., Chen, W. and Van Hentenryck, P., 2023. Boosting Column Generation with Graph Neural Networks for Joint Rider Trip Planning and Crew Shift Scheduling.
- Kim, T., **Lu, J.**, Pendyala, R. M. and Zhou, X.S., 2022. Computational Graph-Based Mathematical Programming Reformulation for Integrated Transport Demand and Supply Models. *Transportation Research Part B*
  Link: https://ssrn.com/abstract=4250270

Conference Proceedings

- **Lu, J.**, Chen, X., Nie, Q., Hong, R. and Xia, J., 2018. K Shortest Path Searching for Time-Dependent Road Networks. *In CICTP 2017: Transportation Reform and Change—Equity, Inclusiveness, Sharing, and Innovation*.
- **Lu, J.**, Wang, Y., Zhang, N., Chen, X. and Xia, J., 2018. Generating Alternative Pre-Trip Guidance for Metro Users by Considering Travel Time and Trip Feeling. *In CICTP 2017: Transportation Reform and Change—Equity, Inclusiveness, Sharing, and Innovation.*
- **Lu, J.**, Xue, H., Chen, G., Zhou, Y. and Xia, J., 2016, October. Comparative Evaluation of the Traffic Flow Volatility Forecasting Models. *In International Conference on Communication and Electronic Information Engineering (CEIE 2016)*.

INVITED TALKS

- Joint freeway traffic state and queue profile estimation using heterogeneous data sources: Differentiable programming reformulation on a layered computational graph
  Georgia Institute of Technology, Virtual meeting, 2023
- osm2gmns: an open-source python package for transportation network preparation and manipulation from OpenStreetMap
  Georgia Institute of Technology, Virtual meeting, 2022
- Problem decomposition in large-scale synchronized transportation networks: From classical quadratic assignment model to emerging logistics applications
  Southeast University, Virtual meeting, 2021
- Transportation demand-supply modeling using multi-resolution networks
  University of Maryland - College Park, ITS-ITE UMD Student Chapter, Virtual meeting, 2021

PRESENTATIONS

- Revitalizing Public Transit in Low Ridership Areas: An Exploration of On-Demand Multimodal Transit Systems
  Transportation Research Board (TRB) 103th Annual Meeting, Washington, D.C., 2024
- Physics-Informed Neural Networks for Integrated Traffic State and Queue Profile Estimation: A Differentiable Programming Approach on Layered Computational Graphs
  The Institute for Operations Research and the Management Sciences (INFORMS), Phoenix, AZ, 2023
- Building Multimodal Network Models for Every City Using OpenStreetMap: Challenges and Opportunities
  Transportation Research Board (TRB) 102th Annual Meeting, Washington, D.C., 2023
- Traffic system state identification with integrated traffic state, model parameter and queue profile estimation: Nonlinear programming reformulation with differentiable traffic state variables across resolutions
  Transportation Research Board (TRB) 102th Annual Meeting, Washington, D.C., 2023
- Reliable Traffic State Identification Using High-Resolution Data: A Consistent Offline-Online Dynamic Time Warping Based Time Series Clustering Approach
  Transportation Research Board (TRB) 102th Annual Meeting, Washington, D.C., 2023
- A Big Data Driven Framework to Estimating Vehicle Volume Based on Mobile Device Location Data

Transportation Research Board (TRB) 102th Annual Meeting, Washington, D.C., 2023

- Open-Source Utilities for Building Macro, Meso and Micro Networks in Regional and State-Wide Traffic Analysis Applications
  ITS Arizona Students Transportation Summit, Virtual meeting, 2022
- Supporting Transportation Network Analysis, Modeling and Simulation through Open Data and Standards: Open-source Multiresolution Network Building Packages of osm2gmns and net2cell
  Transportation Research Board (TRB) 101th Annual Meeting, Washington, D.C., 2022
- DTALite-virtual Cyber Tracks: Open Source Modeling Framework for Real-time Management of Large Fleets of Self-Driving Cars
  The Institute for Operations Research and the Management Sciences (INFORMS), Seattle, WA, 2019
- Simlite: An Open Modeling Framework for Integrated Traffic Flow Simulation and Optimization
  The Institute for Operations Research and the Management Sciences (INFORMS), Seattle, WA, 2019

PROJECTS

- Chatham Area Transit Authority (CAT): On-Demand Multimodal Transit System Development 2023 - present
- Argonne National Laboratory: Development of Multi-Scale Traffic Flow Simulation Model for Urban Mobility Applications 2022-2023
- Arizona Department of Transportation: Loop 101 Mobility Project 2021-2022
- U.S. Department of Transportation: Multiresolution Modeling for Traffic Analysis 2020-2021
- Maricopa Association of Governments: Advisory Services for the Development of MAG Integrated ABM-DTA Modeling System 2019-2020

OPEN-SOURCE SOFTWARE DEVELOPMENT

- osm2gmns (**Jiawei Lu**, Xuesong Zhou)
  osm2gmns, as a data conversion tool, can directly convert the OSM map data to node and link network files in the GMNS format. Users can convert and model drivable, walkable, railway, or aeroway networks with a single line of Python code. User's guide: *https://osm2gmns.readthedocs.io*. **Number of downloads: 82,731** (as of 3/14/2024)

- net2cell (**Jiawei Lu**, Xuesong Zhou)
  For any given networks that meet the GMNS standard, net2cell helps users automatically build mesoscopic and lane-by-lane cell-based microscopic transportation networks to accommodate different modelling needs. User's guide: *https://github.com/jiawlu/net2cell*.

- DTALite (Xuesong Zhou, Peiheng Li, **Jiawei Lu**)
  DTALite is an open-source analysis, modeling, and simulation (AMS) library for efficiently macroscopic and mesoscopic traffic assignment based on General Modeling Network Specification (GMNS) format. User's guide: *https://github.com/asu-trans-ai-lab/DTALite*.

PROFESSIONAL SERVICES

Statistical Editor, Transportation Research Record

Journal Reviewer

- Transportation Research Part B, Part C
- European Journal of Operational Research
- Transportation Research Board
- IEEE Transactions on Vehicular Technology

VOLUNTEER WORKS

- AAA Forum on Impact of Vehicle Technologies and Automation on Users (2022, Group Discussion Assistant)
- Smart City Planning Project on the democracylab (2021, Student Leader)

HONORS & CERTIFICATES

- Best Article Award – Multimodal Transportation (2023)
- 2^{nd} price in the 2022 ITS Arizona Students Transportation Summit (2022)
- Outstanding Graduate Thesis Award in Southeast University (2018)
- National Scholarship in Southeast University (2017, 2018)