Jiawei Xue

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RESEARCH INTERESTS

- **Artificial Intelligence for Urban Science** [Paper J3]
  Using AI with human GPS data, web search data, street view data, and satellite image data to explore interactions between infrastructure and urban activities for sustainable urban development in developed and developing countries.
- **Physics-informed Machine Learning**
  Developing fused models with machine learning and physical equations that enjoy predictability and interpretability.
- **Graph Neural Networks** [Paper C8]
  Devising graph neural network architectures to perform spatio-temporal prediction tasks.
- **Transportation Modeling and Optimization**
  Modeling the transportation system, establishing and solving optimization problems for efficiency enhancement.

EDUCATION

- **Purdue University** — West Lafayette, IN, U.S.
  Ph.D. Candidate in Transportation Engineering; GPA: 3.85/4.00 — May 2020-Now
  Advisor: Prof. Satish V. Ukkusuri
- **Purdue University** — West Lafayette, IN, U.S.
  M.S.E. in Transportation Engineering; GPA: 4.00/4.00; Advisor: Prof. Satish V. Ukkusuri — Aug. 2018-May 2020
  Thesis: Structural and Dynamic Models for Complex Road Networks, May 2020
- **Tsinghua University** — Beijing, China
  B.E. in Civil Engineering; GPA: 88.1/100; Bachelor thesis advisor: Prof. Jianping Wu — Aug. 2015-July 2018
  Majored in Mathematics and Applied Mathematics; GPA: 87.4/100 — Aug. 2013-July 2015
  Admitted without National Entrance Examination

SKILLS

- **Programming Languages:** Python, Java, Julia
- **Frameworks:** PyTorch, Sklearn, CPLEX, Gurobi
- **Tools:** LaTeX, Git, MATLAB, QGIS, SAS
- **Languages:** Chinese, English

HONORS AND AWARDS

- Erin Flanigan Student Travel Award ($300), Purdue University, 2022.
- STV Civil Engineering Grad Assistantship Endowment, Purdue University, 2019.
- Andrews Fellowship, Purdue University, 2018.
- Tsinghua's Friend-Luo Jian First Price Scholarship, Tsinghua University, 2017.
- Meritorious Winner, Mathematical Contest In Modeling, 2017.

→ **Jiawei Xue**, Bizhong Liang, Lintao Hou. **Make "the Evergreen State" Green in Traffic, April 2017.** [Report]

- The Bronze Medal in the Chinese Mathematical Olympiad (CMO), Shenyang, Liaoning, 2013.
- The First Prize in the National High School Mathematics Contest & Province team admission, Zhejiang, 2012.

PROFESSIONAL EXPERIENCES

- **Purdue University, National Science Foundation Project** — West Lafayette, IN
  Research Assistant. Advisors: Dr. Ukkusuri, Dr. Washim Uddin Monda, Dr. Sandro Martinelli Reia. — Feb. 2022-Now
  - Is developing the agent-based model (ABM) with Sangung Park to simulate natural disaster recovery.
  - The model simulates the recovery of social-physical system, using Hurricane Harvey (2017) as an example.

◦ The model serves as the environment for subsequent decision making such as resource allocation.

- **Purdue University, Yahoo Japan Corporation [Paper]** West Lafayette, IN
  Research Assistant. Advisors: Dr. Ukkusuri, Dr. Jianzhu Ma, Dr. Takahiro Yabe, Dr. Kota Tsubouchi. Jan. 2021-Now
  ◦ Wrote Java and Python codes to extract and preprocess the human trajectories and **web search data** of more than 500K population and more than 1 year in Tokyo with colleagues from Yahoo Japan.
  ◦ Proposed the Social Awareness-Based Graph Neural Networks to predict multiwave COVID-19 cases.
  ◦ The paper was accepted by **the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (SIGKDD-22). [Paper C8]**

- **Purdue University, U.S. Department of Energy Project [METS-R Doc] [METS-R Code]** West Lafayette, IN
  Research Assistant. Advisors: Dr. Ukkusuri, Dr. Xinwu Qian, Zengxiang Lei. Jan. 2019-April 2022
  ◦ Helped to develop **the bus planning, eco-routing algorithms**, and charging station optimization.
  ◦ Wrote Java codes to implement the eco-routing algorithm, MATLAB codes to implement robust optimization using the CPLEX, Python codes on charging facility optimization using the Gurobi.
  ◦ Integrated the eco-routing, bus planning, station planning results into city-level traffic simulation.

- **Purdue University, National Science Foundation Project** West Lafayette, IN
  Research Assistant. Advisor: Dr. Ukkusuri. Aug. 2018-Sept. 2021
  ◦ Took over the traffic speed data, traffic flow data management work from previous colleagues.
  ◦ Assisted colleagues to propose the percolation-based network congestion model on traffic.

- **Beijing Daxing International Airport, Construction** Beijing, China
  Industry Internship. Advisors: Guoliang Zhang, Yuchuan Qian. Aug. 2017-Sept. 2017
  ◦ Assisted project managers from Hebei Construction Group to audit structure reports.

- **RWTH Aachen University** Aachen, Germany
  Undergraduate Research Internship. Advisors: Dr. Markus Oeser, Dr. Dawei Wang. June 2017-Aug. 2017
  ◦ Investigated stress-strain responses inside pavements under moving tires using ABAQUS simulation.

PUBLICATIONS

• Accepted Journal Articles

Overview: Nature Machine Intelligence × 1; **TR-Part D** × 1; **TR-Part E** × 1; **Sustainabe Cities and Society** × 1.

[**J4**]: Xiaowei Chen, **Jiawei Xue**, Zengxiang Lei, Xinwu Qian, Satish V. Ukkusuri, Online Eco-routing for Electric Vehicles Using Combinatorial Multi-Armed Bandit with Estimated Covariance. **Transportation Research Part D**, 2022. **[JCR Q1] [2021 impact factor: 7.0]**

[**J3**]: **Jiawei Xue**, Nan Jiang, Senwei Liang, Qiyuan Pang, Takahiro Yabe, Satish V. Ukkusuri, Jianzhu Ma. Quantifying the Spatial Homogeneity of Urban Road Networks via Graph Neural Networks. **Nature Machine Intelligence**, 2022. **[JCR Q1] [2021 impact factor: 25.9] [Code]**

→ This paper was selected as:
Cover paper of Volume 4 Issue 3, March 2022

→ This paper was discussed in following editorials / research highlights:
Nature Machine Intelligence: The graph connection, March 2022
Nature Computational Science: Gauging urban development with neural networks, April 2022

→ This paper was reported in following media:
Tech Xplore: Using graph neural networks to measure the spatial homogeneity of road networks, May 2022
Peking University News: Peking University publishes the research article about road networks, May 2022

[**J2**]: Tho V. Le, Satish V. Ukkusuri, **Jiawei Xue**, Tom Van Woensel. Designing Pricing and Compensation Schemes by Integrating Matching and Routing Models for Crowd-shipping Systems. **Transportation Research Part E**, 2021. **[JCR Q1] [2021 impact factor: 10.0]**

[**J1**]: Xinwu Qian, Tian Lei, **Jiawei Xue**, Zengxiang Lei, Satish V. Ukkusuri. Impact of Transportation Network Companies on Urban Congestion: Evidence from Large-scale Trajectory Data. **Sustainable Cities and Society**, 2020. **[JCR Q1] [2021 impact factor: 10.7]**

- **Accepted Conference Papers**

Overview: ACM SIGKDD × 1; **ISTTT** × 1; **DTA** × 1; **Gateways** × 1; **IEEE ITSC** × 4.

[**C8**]: **Jiawei Xue**, Takahiro Yabe, Kota Tsubouchi, Jianzhu Ma, Satish V. Ukkusuri. Multiwave COVID-19 Prediction from Social Awareness using Web Search and Mobility Data. Applied Data Science Track. The 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining **(SIGKDD-22)**, Washington DC, August 14-18, 2022. **[CCF-A Computer Science Conference] [Acceptance Rate: 25.9% (195/753)] [Code] [Oral Presentation] [YJ Covid-19 Prediction Data]**

[**C7**]: Xinwu Qian, **Jiawei Xue**, Satish V. Ukkusuri. Demand-adaptive Route Planning and Scheduling for Urban Hub-based High-capacity Mobility-on-demand Services. Poster presentation in: The 24th International Symposium on Transportation and Traffic Theory **(ISTTT-24)**, Beijing, July 24 to 26, 2022. **[# Accepted Papers: 52]**

[**C6**]: Christopher Thompson, Satish V. Ukkusuri, Hemant Gehlot, Zengxiang Lei, Rajat Verma, **Jiawei Xue**, Xinwu Qian, Xianyuan Zhan, Shawn Rice, Carol Song. The Development of A-RESCUE Online Task Management. **Gateways 2021.** **[Computer Science Conference]**

[**C5**]: Zengxiang Lei, **Jiawei Xue**, Xiaowei Chen, Charitha Saumya, Xinwu Qian, Mingyi He, Stanislav Sobolevsky, Satish V. Ukkusuri. ADDS-EVS: An Agent-based Deployment Decision-support System for Electric Vehicle Services. IEEE Intelligent Transportation Systems Conference **(ITSC-21)**, Indianapolis, IN, September 2021. **[METS-R Simulator]**

[**C4**]: Rajat Verma, Zengxiang Lei, **Jiawei Xue**, Jiauyen Shen, Hemant Gehlot, Satish V. Ukkusuri, Pamela Murray-Tuite. How Information Heterogeneity Influences Traffic Congestion During Hurricane Evacuation. IEEE Intelligent Transportation Systems Conference **(ITSC-21)**, Indianapolis, IN, September 2021.

[**C3**]: **Jiawei Xue**, Hemant Gehlot, Satish V. Ukkusuri. Braess's Paradox in Scale-free Networks. The 8th International Symposium on Dynamic Traffic Assignment **(DTA-21)**, Virtual Conference, June 2021. **[Presentation Video]**

[**C2**]: Xiaowei Chen, **Jiawei Xue**, Xinwu Qian, Juan Suarez, Satish V. Ukkusuri. Online Energy-optimal Routing for Electric Vehicles with Combinatorial Multi-arm Semi-bandit. IEEE Intelligent Transportation Systems Conference **(ITSC-20)**, Virtual Conference, September 2020.

[**C1**]: Xinwu Qian, **Jiawei Xue**, Stanislav Sobolevsky, Chao Yang, Satish V. Ukkusuri. Stationary Spatial Charging Demand Distribution for Commercial Electric Vehicles in Urban Area. IEEE Intelligent Transportation Systems Conference **(ITSC-19)**, Auckland, New Zealand, October 2019.

- **Accepted TRB Presentation Papers**

[**T6**]: **Jiawei Xue**, Sangung Park, Washim Uddin Mondal, Sandro Martinelli Reia, Satish V. Ukkusuri. Supporting Post-disaster Recovery with Agent-based Modeling on Multilayer Social-physical Networks. Transportation Research Board 102nd Annual Meeting **(TRB-23)**. [**Oral Presentation**]

[**T5**]: **Jiawei Xue**, Satish V. Ukkusuri. A Spatial Partitioning Algorithm of Urban Road Networks Based on Percolation Curves. Transportation Research Board 101st Annual Meeting **(TRB-22)**.

[**T4**]: Xinwu Qian, **Jiawei Xue**, Satish V. Ukkusuri. Modeling Disease Spreading with Adaptive Behavior Considering Local and Global Information Dissemination. Transportation Research Board 100th Annual Meeting **(TRB-21)**.

[**T3**]: Xinwu Qian, **Jiawei Xue**, Stanislav Sobolevsky, Chao Yang, Satish V. Ukkusuri. Optimal Charging Infrastructure Planning for Commercial Electric Vehicles with Stationary Spatial Demand Distribution. Transportation Research Board 99th Annual Meeting **(TRB-20)**.

[**T2**]: Xinwu Qian, **Jiawei Xue**, Zengxiang Lei, Juan Suarez, Satish V. Ukkusuri. Demand-adaptive Transit Design for Urban Transportation Hubs. Transportation Research Board 99th Annual Meeting **(TRB-20)**. [**Oral Presentation**]

[**T1**]: Xinwu Qian, Tian Lei, **Jiawei Xue**, Zengxiang Lei, Satish V. Ukkusuri. Understand the Impact of Taxi Network Companies on Urban Traffic Using Large-Scale Trajectory Data. Transportation Research Board 99th Annual Meeting **(TRB-20)**.

SERVICES

Reviewer:

◦ The 25th International Symposium on Transportation and Traffic Theory (ISTTT) (Co-review with Prof. Ukkusuri, January 2023)

◦ Journal of Big Data Analytics in Transportation (Independent, October 2022)

◦ Nature Sustainability (Co-review with Prof. Ukkusuri, August 2022)

◦ The 25th IEEE International Conference on Intelligent Transportation Systems (IEEE ITSC) × 2 (Independent, May 2022)

◦ Humanities & Social Sciences Communications (Independent, March 2022)

◦ The 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining × 2 (Co-review with Prof. Ukkusuri, March 2022)

◦ Journal of Big Data Analytics in Transportation (Independent, January 2022)

◦ Transportation Research Board 101st Annual Meeting × 2 (Independent, September 2021)

◦ PLOS One (Independent, April 2021)

◦ IEEE Transactions on Intelligent Transportation Systems (Co-review with Prof. Ukkusuri, March 2021)

◦ Proceedings of the National Academy of Sciences of the United States of America (Co-review with Prof. Ukkusuri, August 2020)

INVITED PRESENTATIONS

◦ **Artificial Intelligence in Urban Science Discovery: Graph Neural Networks**.

◦ **Optimization in Emerging Transportation Technologies: Adaptive Buses, Crowd-shipping Logistics**.
College of Transportation Engineering, Chang' An University, Xi' An, China — August 17, 2022
Independent Presentation

◦ **Harness Graph Neural Networks to Empower Urban Science Research**.
China Transportation Institute, Tongji University, Shanghai, China — June 20, 2022
Independent Presentation

◦ **COVID-19 Prediction using Human Mobility and Web Search Data**.
Yahoo Japan Corporation, Tokyo, Japan — December 9, 2021
Collaborative Presentation with Dr. Takahiro and Dr. Tsubouchi

COURSES IN PURDUE UNIVERSITY

Civil Engineering:	◦ CE 565: Traffic Engr Oper Cont (A+)	◦ CE 597: Data Science Smart Cities (A)
	◦ CE 597: Geospatial Modeling Analysis (A)	◦ CE 597: Nwk Anlys Cnctd Atnms Vhcl (A)
Computer Science:	◦ CS 590: Graphs In ML (A+)	◦ CS 592: AI for Scientific Discovery (A+)
	◦ CS 573: Data Mining (A)	◦ CS 580: Algorithm Design Analy & Impl (A)
	◦ CS 590: Randomized Algorithms (A)	◦ CS 577: Natural Language Processing (A)
	◦ CS 593: Reinforcement Learning (A)	◦ CS 515: Num Linear Algebra (B)
Operation Research:	◦ IE 535: Linear Programming (A+)	◦ IE 538: Nonlinear Optimization (A+)
	◦ IE 690: Opt Game Theory Uncertainty (A)	◦ IE 633: Dynamic Programming (A)
Statistics:	◦ STAT 525: Inter Statistical Method (A)	
Mathematics:	◦ MA 504: Real Analysis (A+)	◦ MA 544: Real Anlys Measur Thry (B)
Network Science:	◦ ECE 695: Str&Dms of Networks (A+)	

COURSE PROJECTS IN PURDUE UNIVERSITY

◦ [CE 565] **Jiawei Xue**. Network Macroscopic Fundamental Diagram-Informed Graph Learning for Traffic State Imputation, Dec. 2022. Dr. Yiheng Feng.

◦ [CS 593] **Jiawei Xue**. Best arm identification on graphical bandit with edge-specific bilinear rewards, May 2022. Dr. Kamyar Azizzadenesheli.

◦ [STAT 525] **Jiawei Xue**. Regression analysis of traffic congestion on urban road networks, May 2022. Dr. Min Zhang.

◦ [CS 592] **Jiawei Xue**. Physical ODE enhanced urban morning traffic prediction, Dec. 2021. Dr. Yexiang Xue.

◦ [IE 633] **Jiawei Xue**, Rajat Verma. On best arm selection for Markovian multi-armed bandits, May 2021. Dr. Harsha Honnappa.

◦ [CE 597 GMA] **Jiawei Xue**. Spatial and temporal analysis of traffic condition on urban road networks, Dec. 2020. Dr. Jie Shan.

◦ [CS 590 GML] Nan Jiang, Senwei Liang, Qiyuan Pang, **Jiawei Xue**. Prediction of Missing Links in Urban Road Networks in the USA, May 2020. Dr. Jianzhu Ma. **[extended to the paper J3]**

◦ [IE 633] **Jiawei Xue**. Airline seat supply competition during depression period, May 2020. Dr. Andrew Liu.

◦ [CE 597 NA-CAV] **Jiawei Xue**. Braess's paradox in scale-free networks, Dec. 2019. Dr. Ukkusuri. **[extended to the paper C3]**

◦ [ECE 695] **Jiawei Xue**. Metropolitan road network modeling using complex network method, Dec. 2019. Dr. Shreyas Sundaram.

◦ [CS 573] Tiantu Xu, **Jiawei Xue**, Xiaofeng Ou. Prediction of soccer player market values and best positions, May 2019. Dr. Ming Yin.

◦ [CE 597 DSSC] **Jiawei Xue**, Weigang Hou. Flight network in Midwest region, Dec. 2018. Dr. Satish V. Ukkusuri.

SPORTS

- **2022 Boilermaker Half-marathon** — West Lafayette, IN
  Finished the half-marathon with 1: 43: 56, which ranked 169 among 1,104 participants. — Oct. 22, 2022
- **2021 CNO Financial Indianapolis Monumental Half-marathon** — Indianapolis, IN
  Finished the half-marathon with 1: 47: 52, which ranked 1,151 among 5,137 participants. Bib number: 15183. — Nov. 6, 2021
- **2019 Boilermaker Half-marathon** — West Lafayette, IN
  Finished the half-marathon with 1: 50: 56, which ranked 298 among 1,187 participants. — Oct. 19, 2019
- **2018 Boilermaker Half-marathon** — West Lafayette, IN
  Finished the half-marathon with 1: 57: 28, which ranked 379 among 1,130 participants. — Oct. 13, 2018
- **2017 U-Run Tsinghua University Campus Half-marathon** — Beijing, China
  Finished the half-marathon with 2: 35: 24, which ranked 271 among ∼1,000 participants. — April 15, 2017