

Xishun Liao

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Updated in Oct. 2026

Summary

Dr. Xishun Liao is an Assistant Professor in the Department of Civil, Environmental and Construction Engineering at the University of Central Florida (UCF), affiliated with the Knights Digital Twin Initiative and the Center for Integrated Coastal Research (UCF Coastal). His research integrates urban geospatial intelligence, human behavior, intelligent transportation system, and AI to model human mobility and develop digital twins for intelligent transportation and autonomous mobility. He serves as an Associate Editor of the IEEE Open Journal of Intelligent Transportation Systems. His research has been showcased at the Consumer Electronics Show (CES) and recognized with the Best Paper Award at IEEE ITSC 2024.

Employment

Assistant Professor <i>University of Central Florida, Orlando, FL, USA</i>	Aug. 2025 – Present
Assistant Project Scientist (Advisor: Dr. Jiaqi Ma) <i>University of California, Los Angeles, CA, USA</i>	Oct. 2024 – Jul. 2025
Postdoctoral Scholar (Advisor: Dr. Jiaqi Ma) <i>University of California, Los Angeles, CA, USA</i>	Aug. 2023 – Sep. 2024
Research Intern <i>Honda Research Institute USA, San Jose, CA, USA</i>	Sep. 2021 – Mar. 2022

Education

Ph.D. in Electrical and Computer Engineering <i>University of California, Riverside, CA, USA</i> - Advisors: Dr. Matthew Barth and Dr. Guoyuan Wu - Dissertation: A Personalized Behavior-Aware Motion Planning Framework for Intelligent Vehicles Operation	Apr. 2019 – Jun. 2023
M.E. in Mechanical Engineering <i>University of Maryland, College Park, MD, USA</i> - Advisor: Dr. Nikhil Chopra - Areas of Expertise: Control System	Jan. 2017 – Dec. 2018
B.E. in Mechanical Engineering and Automation <i>Beijing University of Posts and Telecommunications, Beijing, China</i>	Sep. 2012 – Jun. 2016

Publications

Journal Publications

[J14] Deep Activity Model: A Generative Approach for Human Mobility Pattern Synthesis
Xishun Liao, Qinhua Jiang, Yifan Liu, Brian Yueshuai He, Chenchen Kuai, and Jiaqi Ma*
IEEE Transactions on Intelligent Transportation Systems, vol. 27, no. 6, pp. 6519-6536, June 2026.

[J13] Learning universal human mobility patterns with a foundation model for cross-domain data fusion
Haoxuan Ma1, Xishun Liao*1, Yifan Liu, Qinhua Jiang, Chris Stanford, Shangqing Cao, Jiaqi Ma
Transportation Research Part C: Emerging Technologies, vol. 180, no., pp. 105311, 2025.

[J12] A Review of Personalization in Driving Behavior: Dataset, Modeling, and Validation
Xishun Liao*, Zhouqiao Zhao, Matthew J. Barth, Amr Abdelraouf, Rohit Gupta, Kyungtae Han, Jiaqi Ma, and Guoyuan Wu
IEEE Transactions on Intelligent Vehicles, vol. 10, no. 2, pp. 1241-1262, Feb. 2025.

- [J11] Game Theoretic Application to Intersection Management: A Literature Review
Ziye Qin, Ang Ji, Zhanbo Sun*, Guoyuan Wu, Peng Hao, and Xishun Liao
IEEE Transactions on Intelligent Vehicles, vol. 10, no. 4, pp. 2589-2607, April 2025.
- [J10] Mobility AI Agents and Networks
Haoxuan Ma, Yifan Liu, Qinhua Jiang, Brian Yueshuai He, Xishun Liao*, and Jiaqi Ma
IEEE Transactions on Intelligent Vehicles, vol. 9, no. 7, Jul. 2024, pp. 5124-5129.
- [J9] Foundation Intelligence for Smart Infrastructure Services in Transportation 5.0
Xu Han, Zonglin Meng, Xin Xia, Xishun Liao, Yueshuai He, Zhaoliang Zheng, Yutong Wang, Hao Xiang, Zewei Zhou Letian Gao, Lili Fan, Yuke Li, and Jiaqi Ma*
IEEE Transactions on Intelligent Vehicles, vol. 9, no. 1, Jan. 2024, pp. 39-47.
- [J8] Driver Digital Twin for Online Prediction of Personalized Lane Change Behavior
Xishun Liao*, Xuanpeng Zhao, Ziran Wang, Zhouqiao Zhao, Kyungtae Han, Rohit Gupta, Matthew J. Barth, and Guoyuan Wu
IEEE Internet of Things Journal, vol. 10, no. 15, Aug. 2023, pp. 13235-13246.
- [J7] A Real-World Data-Driven Approach for Estimating Environmental Impacts of Traffic Accidents
Xishun Liao*, Guoyuan Wu, Lan Yang, and Matthew J. Barth
Transportation Research Part D: Transport and Environment, vol. 117, Apr. 2023, p. 103664
- [J6] Evaluating Cybersecurity Risks of Cooperative Ramp Merging in Mixed Traffic Environments
Xuanpeng Zhao, Ahmed Abdo, Xishun Liao, Matthew J. Barth, and Guoyuan Wu*
IEEE Intelligent Transportation Systems Magazine, vol. 14, no. 6, Nov.-Dec. 2022, pp. 52-65.
- [J5] Game Theory-Based Ramp Merging for Mixed Traffic with Unity-SUMO Co-Simulation
Xishun Liao*, Xuanpeng Zhao, Ziran Wang, Kyungtae Han, Prashant Tiwari, Matthew J. Barth, and Guoyuan Wu
IEEE Transactions on Systems, Man, and Cybernetics: Systems, vol. 52, no. 9, Sep. 2022, pp. 5746-5757.
- [J4] Cooperative Ramp Merging Design and Field Implementation: A Digital Twin Approach Based on Vehicle-to-Cloud Communication
Xishun Liao*, Ziran Wang, Xuanpeng Zhao, Kyungtae Han, Prashant Tiwari, Matthew J. Barth, and Guoyuan Wu
IEEE Transactions on Intelligent Transportation Systems, vol. 23, no. 5, May 2022, pp. 4490-4500.
- [J3] Co-Simulation Platform for Modeling and Evaluating Connected and Automated Vehicles and Human Behavior in Mixed Traffic
Xuanpeng Zhao, Xishun Liao, Ziran Wang, Guoyuan Wu, Matthew J. Barth, Kyungtae Han, and Prashant Tiwari
SAE International Journal of Connected and Automated Vehicles, vol. 5, no. 4, Apr. 2022.
- [J2] A Systematic Review of Autonomous Emergency Braking System: Impact Factor, Technology, and Performance Evaluation
Lan Yang, Yipeng Yang*, Guoyuan Wu*, Xiangmo Zhao, Shan Fang, Xishun Liao, Runmin Wang, and Mengxiao Zhang
Journal of Advanced Transportation, vol. 2022, Article ID 1188089, Apr. 2022.
- [J1] Driver Behavior Modeling using Game Engine and Real Vehicle: A Learning-Based Approach
Ziran Wang*, Xishun Liao, Chao Wang, David Oswald, Guoyuan Wu, Kanok Boriboonsomsin, Matthew J. Barth, Kyungtae Han, BaekGyu Kim, and Prashant Tiwari
IEEE Transactions on Intelligent Vehicles, vol. 5, no. 4, Dec. 2020, pp. 738-749.

Conference Publications

- [C14] GPS-Enhanced Tourist Mobility Modeling with Seasonal Spatial Priors and LLM-Based Activity Chain Generation
Yifan Liu, Yanling Sang, Xishun Liao, Morgan Sun, Bo Yang, Zhiyuan Zhang, Chris Stanford, Haoxuan Ma, Jiaqi Ma*
IEEE 29th International Conference on Intelligent Transportation Systems (ITSC), Naples, Italy, 2026
- [C13] Next-Generation Travel Demand Modeling with a Generative Framework for Household Activity Coordination (Best Paper Honorable Mention)
Xishun Liao, Haoxuan Ma, Yifan Liu, Yuxiang Wei, Brian Yueshuai He, Chris Stanford, Jiaqi Ma*
IEEE 28th International Conference on Intelligent Transportation Systems (ITSC), Gold Coast, Australia, 2025
- [C12] MobiVerse: Scaling Urban Mobility Simulation with Hybrid Lightweight Domain-Specific Generator and Large Language Models (Best Student Paper Honorable Mention)
Yifan Liu, Xishun Liao*, Haoxuan Ma, Jonathan Liu, Rohan Jadhav, Jiaqi Ma
IEEE 28th International Conference on Intelligent Transportation Systems (ITSC), Gold Coast, Australia, 2025

[C11] Human Mobility Modeling with Household Coordination Activities under Limited Information via Retrieval-Augmented LLMs

Yifan Liu, Xishun Liao*, Haoxuan Ma, Brian Yueshuai He, Chris Stanford, Jiaqi Ma

IEEE 28th International Conference on Intelligent Transportation Systems (ITSC), Gold Coast, Australia, 2025

[C20] Beyond 9-to-5: A Generative Model for Augmenting Mobility Data of Underrepresented Shift Workers

Haoxuan Ma, Xishun Liao*, Yifan Liu, Chris Stanford, Jiaqi Ma

IEEE 28th International Conference on Intelligent Transportation Systems (ITSC), Gold Coast, Australia, 2025

[C9] NUMOSIM: A Synthetic Mobility Dataset with Anomaly Detection Benchmarks

Chris Stanford, Suman Adari, Xishun Liao, Yueshuai He, Qinhua Jiang, Chenchen Kuai, Jiaqi Ma, Emmanuel Tung, Yinlong Qian, Lingyi Zhao, Zihao Zhou, Zeeshan Rasheed, and Khurram Shafique

32nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL) Atlanta, GA, USA, 2024

[C8] Semantic Trajectory Data Mining with LLM-Informed POI Classification (**IEEE ITSS Best Paper Award**)

Yifan Liu, Chenchen Kuai, Xishun Liao*, Haoxuan Ma, Brian Yueshuai He, and Jiaqi Ma

IEEE 27th International Conference on Intelligent Transportation Systems (ITSC), Edmonton, Canada, 2024

[C7] Exploring Vehicular Interaction from Trajectories Based on Granger Causality

Xishun Liao*, Guoyuan Wu, Matthew J. Barth, Rohit Gupta, and Kyungtae Han

2023 IEEE Intelligent Vehicles Symposium (IV), Anchorage, AK, USA, Jun. 2023

[C6] Inverse Reinforcement Learning and Gaussian Process Regression-based Real-time Framework for Personalized Adaptive Cruise Control

Zhouqiao Zhao*, Xishun Liao, Amr Abdelraouf, Kyungtae Han, Rohit Gupta, Matthew J. Barth, Guoyuan Wu

2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC), Bilbao, Bizkaia, Spain, Sep. 2023

[C5] Improving Truck Merging at Ramps in a Mixed Traffic Environment: A Multi-human-in-the-loop (MHuIL) Approach

Xuanpeng Zhao*, Xishun Liao, Guoyuan Wu, Kanok Boriboonsomsin, Matthew J. Barth

2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC), Bilbao, Bizkaia, Spain, Sep. 2023

[C4] Real-time Learning of Driving Gap Preference for Personalized Adaptive Cruise Control

Zhouqiao Zhao*, Xishun Liao, Amr Abdelraouf, Kyungtae Han, Rohit Gupta, Matthew J. Barth, Guoyuan Wu

2023 IEEE International Conference on Systems, Man, and Cybernetics (SMC), Honolulu, Oahu, HI, USA, Oct. 2023

[C3] Driver Profile Modeling Based on Driving Style, Personality Traits, and Mood States

Xishun Liao*, Shashank Mehrotra, Samson Ho, Yuki Gorospe, Xingwei Wu, and Teruhisa Mistu

2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC), Macau, China, Oct. 2022

[C2] Online Prediction of Lane Change with a Hierarchical Learning-Based Approach

Xishun Liao*, Ziran Wang, Xuanpeng Zhao, Zhouqiao Zhao, Kyungtae Han, Prashant Tiwari, Matthew J. Barth, and Guoyuan Wu

2022 International Conference on Robotics and Automation (ICRA), Philadelphia, PA, USA, May 2022

[C1] A Digital Twin Paradigm: Vehicle-to-Cloud Based Advanced Driver Assistance Systems

Ziran Wang*, Xishun Liao, Xuanpeng Zhao, Kyungtae Han, Prashant Tiwari, Matthew J. Barth, and Guoyuan Wu

IEEE 91st Vehicular Technology Conference (VTC2020-Spring), Virtual Conference, May 2020

Book Chapter

[B1] Driver Behavior-Aware Cooperative Ramp Merging for Intelligent Vehicles

Xishun Liao*, Xuanpeng Zhao, Ziran Wang, Matthew J. Barth, Guoyuan Wu, and Kyungtae Han

Towards Human-Vehicle Harmonization, vol. 3, pp. 193 – 210, De Gruyter

Technical Reports

[R3] AI for Cross-Domain Mobility Data Fusion, Human Activity Generation, and Travel Demand Modeling

Xishun Liao, Yifan Liu, Haoxuan Ma, Jiaqi Ma

UCLA: Mobility Center of Excellence, 2026.

[R2] Connectivity-Based Cooperative Ramp Merging in Multimodal and Mixed Traffic Environment

Guoyuan Wu*, Xuanpeng Zhao, Xishun Liao, Kanok Boriboonsomsin, Matthew J. Barth

No. PSR-21-20. METRANS Transportation Center in California, 2022.

[R1] Estimating the Impacts of Automatic Emergency Braking (AEB) Technology on Traffic Energy and Emissions

Guoyuan Wu*, Xishun Liao, Lan Yang, Matthew J. Barth

No. PSR-MT-19-26-a. Pacific Southwest Region University Transportation Center (UTC), 2021.

Patent

[P1] Profile modeling

Xishun Liao, Shashank Mehrotra, Chun-Ming Samson Ho, and Teruhisa Misu

U.S. patent application 17/869,426, Filed Jul. 2022, Published Jan. 2024

Honors and Awards

- Best Paper Award, IEEE 27th International Conference on Intelligent Transportation Systems (ITSC) Oct. 2024
- Best Presentation Award, At 3rd Annual Conference of Next-Generation Transportation Systems (NGTS-3) May 2023
- Esther F. Hays Graduate Fellowship Jun. 2021
- UCR Dean's Distinguished Fellowship Award Apr. 2019
- BUPT Scholarship Award Jun. 2015 & Jun. 2014

Professional Activities

As a Committee/Member

- Associate Editor, IEEE Open Journal of Intelligent Transportation Systems (OJ-ITS) 2026 – Present
- Associate Editor, IEEE International Conference on Intelligent Transportation Systems (ITSC) 2026
- Associate Editor, IEEE Intelligent Vehicles Symposium (IV) 2025
- Associate Editor, IEEE Forum for Innovative Sustainable Transportation Systems (FISTS) 2025
- Member of Association for Computing Machinery (ACM) Oct. 2024 – Present
- Review Editor of Frontiers in Sustainable Cities Apr. 2022 – Present
- Member of Intelligent Transportation Systems Society (ITSS), IEEE Sep. 2020 – Present
- Member of Institute of Electrical and Electronics Engineers (IEEE) Sep. 2020 – Present

Conference Organization and Service

- Organizer, 1st Workshop on UrbanState: Multimodal Urban Sensing and Representation for Autonomous Mobility, WACV 2027
- Organizer, 1st Workshop on World Action Models for WAM-AD: Autonomous Driving, WACV 2027
- Organizer, 4th Workshop on Internet of Things in Intelligent Transportation Systems, ITSC 2026
- Organizer, Integrating Artificial Intelligence and Geospatial Intelligence: Innovative Methods and Applications in Human Mobility Modeling, ITSC 2025
- Session Chair of 2022 IEEE 25th ITSC, Macau, China 2022
- Speaker of 2022 ITSS Summer School on Cooperative Interactive Vehicles, Lake Tahoe, CA 2022
- Speaker of Science, Technology, and Engineering Partnership Conference (STEPCon) 2019 – 2022
- Onsite support and speaker of US DOT. on CES 2020, Las Vegas, NV 2020

As a Reviewer

- Reviewer of Nature Communication Sep. 2025 – Present
- Reviewer of MDPI Sensors Sep. 2024 – Present
- Reviewer of Scientific Reports Aug. 2024 – Present
- Reviewer of Mechanical Systems and Signal Processing Jul. 2023 – Present
- Reviewer of Proceedings of the Institution of Mechanical Engineers, Part D Jun. 2023 – Present
- Reviewer of IEEE International Conference on Systems, Man, and Cybernetics (SMC) May 2023 – Present
- Reviewer of International Conference on Intelligent Robots and Systems Apr. 2023 – Present
- Reviewer of IEEE Internet of Things Journal Jan. 2023 – Present
- Reviewer of IEEE Transactions on Intelligent Transportation Systems Nov. 2022 – Present
- Reviewer of Engineering Applications of Artificial Intelligence Oct. 2022 – Present
- Reviewer of Frontiers in Sustainable Cities Apr. 2022 – Present
- Reviewer of IEEE Transactions on Intelligent Vehicles Apr. 2022 – Present
- Reviewer of IEEE Robotics and Automation Letters Mar. 2022 – Present
- Reviewer of SAE China Event Technical Papers Mar. 2022 – Present
- Reviewer of IEEE Vehicular Technology Conference Feb. 2022 – Present
- Reviewer of IEEE Open Journal of Intelligent Transportation Systems Jan. 2022 – Present

• Reviewer of IET Intelligent Transport Systems	Jun. 2021 – Present
• Reviewer of SAE International Journal of Connected and Automated Vehicles	Jul. 2020 – Present
• Reviewer of IEEE International Conference on Intelligent Transportation Systems (ITSC)	Apr. 2020 – Present
• Reviewer of IEEE Intelligent Vehicles Symposium	Apr. 2020 – Present
• Reviewer of Transportation Research Record (TRR)	Feb. 2020 – Present
• Reviewer of TRB Annual Meeting	Sep. 2019 – Present

Invited Talks

• <i>From Cross-Domain Data to Emergent Traffic: AI Agents and AI Networks</i> Invited Talk, Trustworthy AI for Traffic Operation and Control Workshop, ITSC	2026
• <i>From Cross-Domain Data to Emergent Traffic: AI Agents and AI Networks</i> Keynote, 4th International Conference on Functional Materials and Civil Engineering (CONF-FMCE)	2026
• <i>Building Digital Twins for Smarter Mobility: AI Agents and AI Networks</i> Invited Talk, Friday Transportation Seminar, University of South Florida	2026
• <i>Mobility Digital Twin with AI Agents and AI Networks</i> Session: From Streets to Systems: Cross-Domain Digital Twins in Urban Transportation Invited Talk, INFORMS	2025

Teaching

Applied Numerical Methods for Civil Engineering (UCF CGN 3405)	Fall 2026
• Teach numerical methods for solving civil and environmental engineering problems • Cover equation solving, interpolation, numerical calculus, differential equations, and linear programming	
Mobility in Smart Cities: Technologies and Application Areas (UCF TTE6533)	Spring 2026
• Delivered a semester of lectures independently as the sole instructor of the graduate course • Introduced applications and research developments in intelligent transportation systems with a focus on data-driven technologies and simulation tools	
Transportation Systems Analysis (UCLA CEE 185/285)	Spring 2025
• Conducted lectures (4 hours per week) independently as a rotating lecturer of the course • Introduced automation, simulation, AI application in transportation engineering	
Traffic Operations and Control (UCLA CEE 181/281)	Fall 2024
• Conducted lectures (4 hours per week) independently as a rotating lecturer of the course • Introduced Data Driven and Deep Learning-Based Demand Modeling	

Mentoring

Mentoring at UCF

- Reeshad Khan, Postdoctoral Scholar in Department of Civil, Environmental and Construction Engineering
- Hao Cheng, Ph.D. student in Department of Civil, Environmental and Construction Engineering
- Haoyan Wang, Ph.D. student in Department of Civil, Environmental and Construction Engineering
- Jingtao Lao, Ph.D. student in Department of Civil, Environmental and Construction Engineering
- Yiming Liao, M.S. student in Department of Electrical and Computer Engineering @ Rutgers University
- Viswanadh Varun Kumar Jasti, M.S. student in Department of Computer Science
- Nguyen Dinh Huy (Bill) Tran, M.S. student in Department of Civil, Environmental and Construction Engineering
- Malayna Hayford, M.S. student in Department of Civil, Environmental and Construction Engineering
- Josefina Hofmann, M.S. student in Department of Civil, Environmental and Construction Engineering

Mentored Students at UCLA

- Qinhua Jiang, Ph.D. candidate in Civil and Environmental Engineering Department
- Yifan Liu, Ph.D. student in Civil and Environmental Engineering Department
- Haoxuan Ma, Ph.D. student in Civil and Environmental Engineering Department
- Chenchen Kuai M.S. student in Civil and Environmental Engineering Department
- Mohammad Reza Sadoughi, M.S. student in Civil and Environmental Engineering Department
- Yaofa Gong, M.S. student in Civil and Environmental Engineering Department
- Bruce Zhang, B.S. student in Statistics & Data Science Department
- Yanling Sang, M.S. student in Civil and Environmental Engineering Department
- Yuxiang Wei, M.S. student in Civil and Environmental Engineering Department

Mentored Students at UCR

- Xuanpeng Zhao, M.S. & Ph.D. student in Electrical and Computer Engineering
- Xiaofeng Zhang, B.S. student in Electrical and Computer Engineering

Media Exposures

- *Scientists Propose a New Method of Data Mining to Add Semantic Information to GPS Tracks and Enrich Behavior Modeling*, MIT Technology Review China & DeepTech China, Aug. 2024
- *NCST Partner CE-CERT Takes Eco-Driving Simulator to CES*, National Center for Sustainable Transportation, Jan. 2020
- *Steering into the Future of Connected and Automated Vehicles*, UCR News, Jul. 2019