# Wan Li

(+1) 835-231-1353 | liw2@ornl.gov | Webpage

## RESEARCH INTERESTS

- Modeling, simulation, and optimization of urban traffic network
- Traffic control system design and optimization with CAVs
- Transportation big data analytics with ML/AI
- Transportation Energy

## EDUCATION

University of Washington | Civil and Environmental Engineering | *Ph.D.* 2016-2019

Louisiana State University | Civil and Environmental Engineering | *M.S.* 2012-2014

Sun Yat-sen University | Traffic Engineering | *B.S.* 2008-2012

## PROFESSIONAL EXPERIENCES

**Oak Ridge National Laboratory**, Knoxville, TN, US |*Research Associate Staff* 2022-Present

- **Co-PI,** US Department of Energy (DOE) project "Demonstrating Rapidly Deployable Artificial Intelligence (AI) Based Adaptive Signal Timing Optimization to Urban Areas", $1.5M, 2024-2027.
- **Co-PI,** US Department of Energy (DOE) project "Charging Tennessee: Advancing Public Vehicle Fleet Electrification", $1M, 2025-2027.
- **PI,** US DOE project "Rural Reimagined: Building an EV Ecosystem and Green Economy for Transforming Lives in Economically Distressed Appalachia", $300k, 2022-2025.
- **Lead Researcher,** US DOE project "Integrated Control of Vehicle Speeds and Traffic Signals for Reducing Congestion and Energy Use" . 2021-2024.
- **Lead Researcher,** US DOE project "Envisioning the Future of Zero-emission Transportation at Airports" . 2024-2025.
- **Lead Researcher,** US DOE project "Applying Artificial Intelligence based Signal Coordination and Controls for Optimized Mobility for Nimitz Highway and Ala Moana Boulevard Arterial in Honolulu" . 2021-2024.
- **Lead Researcher,** LDRD project "AI for Electric Motor Design" . 2024.
- **Lead Researcher,** LDRD project "AI Foundation Models for Time Series Prediction" . 2023-2024.
- **Lead Researcher,** LDRD project "Cross-sector Spatiotemporal Energy Analysis Framework" . 2023-2024.
- **Lead Researcher,** US DOE project "ORNL Support of EEMS at American center of Mobility : Centralized Control of Connected and Autonomous Vehicles" . 2022-2023.

**Oak Ridge National Laboratory**, Knoxville, TN, US |*Postdoc* 2019-2022

- **Lead Researcher,** US DOE "TransitMo: Energy and Mobility Impacts of Innovative Shared Mobility Technologies" . 2021-2022.
- **Lead Researcher,** US DOE project "National wide Energy and Mobility Impacts of Electric Air Taxis on Road Traffic" . 2021-2022
- **Lead Researcher,** US DOE project "Deployment Priority of Public Charging Speeds for Increasing Battery Electric Vehicle Usability" . 2020-2022.

**Huawei**, Bellevue, Washington, US |*AI Engineer* 2019.1-2019.6

- **Lead Researcher,** "Partial Observable Imitation Network for Traffic Signal Control" .

**DiDi**, Beijing, CN |*Algorithm Engineer* 2018.8-2018.10

- **Lead Researcher,** "Short-term Traffic State Predictin with Latent Structure" .

## HONORS & AWARDS

- Best Paper Award, VEHICULAR 2021, The Tenth International Conference on Advances in Vehicular Systems, Technologies, and Applications, held in Nice, France during July 18 –22, 2021
- Second Prize, Transportation Forecasting Competition, Organized by: ABJ70, IEEE ITSS & Didi, 2019.
- Concord Engineering Term Graduate Student Support Fund, 2018.
- Outstanding Reviewer, Transportation Research Part C. 2018.
- Graduate Student Conference Travel Awards, University of Washington, 2017, 2019.
- Graduate Travel Grant, Rensselaer Polytechnic Institute, 2016.
- Outstanding Award, Graduate Student Research Conference in Louisiana State University, 2014.
- Graduate Student Association Travel Awards, Louisiana State University, 2013.

## PUBLICATIONS

**Refereed Journal Publications**

26. **Li, W.**, Pan, M. M., Wang, C. R., & Chen, P. (2025). Impacts and emerging research opportunities in Vehicle-Grid Integration for transportation: A review. *Transportation Research Part D: Transport and Environment,* 145, 104802.

25. **Li, W.**, Wang, B., Sun, R., Ai, L., Lin, Z. (2025). Energy-efficient multimodal mobility networks in transportation digital twins: Strategies and optimization. *Energy*, 318, 134587.

24. Wang, H., Wang, Y., **Li, W.**, Subramaniyan, A. B., & Zhang, G. (2025). Learning error distribution kernel-enhanced neural network methodology for multi-intersection signal control optimization. *Computer-Aided Civil and Infrastructure Engineering*. https://doi.org/10.1111/mice.13522.

23. Shi, H., Wu, K., **Li, W.**, Ran, B., Zhou, Y. (2025). A Predictive Deep Reinforcement Learning Based Connected Automated Vehicle Anticipatory Longitudinal Control in a Mixed Traffic Lane Change Condition. *IEEE Internet of Things Journal*. 12, 14.

22. Pan, M., **Li, W.**, Wang, C. R. (2024). From roads to roofs: How urban and rural mobility influence building energy consumption. *Energy Research & Social Science*, 118, 103800.

21. **Li, W.**, Rios Torres, J., Wang, B, Khattah, Z. (2024). Experimental Assessment of Communication Delay's Impact on Connected Automated Vehicles Speed Volatility and Energy Consumption. *Communications in Transportation Research*, 4, 100136.

20. Khattah, Z., **Li, W.**. Karnowski, T. (2024). The role of driver head pose dynamics and instantaneous driving in safety critical events: Application of computer vision in naturalistic driving. *Accident Analysis & Prevision*, 200, 107545.

19. Wang, B., **Li, W.***, & Khattak, H. (2024). Advancing Cybersecurity through Anomaly Detection in CAV Trajectories Using LSTM Autoencoder and Gaussian Mixture Model. *Electronics*, 13(7), 1251.

18. **Li, W.**, Lin, Z., Ou, S. S., & Wang, B. (2023). Deployment priority of public charging speeds for increasing battery electric vehicle usability. *Transportation Research Part D: Transport and Environment*, 124, 103943.

17. Xu. H., Yuan, J., Berres, A., Shao, Y., Wang, C., **Li, W.**, Laclair, T., Sanyal, J., Wang, H. (2004). A Mobile Edge Computing Framework for Traffic Optimization at Urban Intersections Through Cyber-Physical Integration. *IEEE Transactions on Intelligent Vehicles*, 9(1), 1131-1145.

16. Subramaniyan, A. B., Wang, C., Shao, Y., **Li, W.**, Wang, H., Zhang, G., & Ma, T. (2022). Hybrid Recurrent Neural Network Modeling for Traffic Delay Prediction at Signalized Intersections Along an Urban Arterial. *IEEE Transactions on Intelligent Transportation Systems*, 24(1), 1384-1394.

15. **Li, W.**, Wang, B., Khattak, Z. H., & Deng, X. (2022). Network-Level Traffic Signal Cooperation: A Higher-Order Conflict Graph Approach. *IEEE Transactions on Intelligent Transportation Systems*, 24(1), 990-999.

14. **Li, W.**, Wang, B., Liu, Z, & Qi, G. (2022). POINT: Partial Observable Imitation Network for Traffic Signal Control. *Sustainable Cities and Society*, 76(2022), 103461.

13. Wang, H., Zhu, M., Hong, W., Wang, C., **Li, W.**, Tao, G., & Wang Y. (2022). Network-wide Traffic Signal Control Using Bilinear System Modeling and Adaptive Optimization. *IEEE transaction on Intelligent Transportation Engineering*, 24(1), 79-91.

12. Wang, H., Shao, Y, Wang, H., **Li, W.**, Subramaniyan, A., Zhang, G., Ma, T., Ringler, J., Chow, D. (2021). Hybrid Neural Network Learning for Multiple Intersections along Signalized Arterials: A Microscopic Simulation vs. Real System Effect. International *Journal on Advances in Networks and Services*, 14, no 1 & 2.

11. Khattak, Z., Fontaine, M., **Li, W.**, Khattak, A. (2021). Investigating the Relation Between Instantaneous Driving Decisions and Safety Critical Events Using Naturalistic Driving Data. *Accident Analysis & Prevision*, 156 (2021): 106086.

10. **Li, W.** & Ban, X. (2020). Connected Vehicles Based Traffic Signal Coordination. *Engineering*. 6(12), 1463-1472.

9. **Li, W.**, Wang, J., Fan, R., Zhang, Y., Guo, Q., Siddique, C., & Ban, X. J. (2020). Short-term traffic state prediction from latent structures: Accuracy vs. efficiency. *Transportation Research Part C: Emerging Technologies*, 111, 72-90.

8. **Li, W.**, Ban, X. J., Zheng, J., Liu, H. X., Gong, C., & Li, Y. (2020). Real-Time Movement-Based Traffic Volume Prediction at Signalized Intersections. *Journal of Transportation Engineering, Part A: Systems*, 146(8), 04020081.

7. Ou, S., **Li, W.**, Li, J., Lin, Z., He, X., Bouchard, J., & Przesmitzki, S. (2020). Relationships between Vehicle Pricing and Features: Data Driven Analysis of the Chinese Vehicle Market. *Energies*, 13(12), 3088.

6. Ke, R., **Li, W.**, Cui, Z., & Wang, Y. (2020). Two-Stream Multi-Channel Convolutional Neural Network for Multi-Lane Traffic Speed Prediction Considering Traffic Volume Impact. *Transportation Research Record*, 2674(4), 459-470.

5. **Li, W.** & Ban, X. (2018). Connected Vehicles Based Traffic Signal Timing Optimization. *IEEE Transactions on Intelligent Transportation Systems*, 20(12), 4354-4366.

4. Xu, B., Ban, X. J., Bian, Y., **Li, W.**, Wang, J., Li, S. E., & Li, K. (2018). Cooperative method of traffic signal optimization and speed control of connected vehicles at isolated intersections. *IEEE Transactions on Intelligent Transportation Systems*, 20(4), 1390-1403.

3. **Li, W.**, Cheng, D., Bian, R., Ishak, S., & Osman, O. A. (2017). Accounting for travel time reliability, trip purpose and departure time choice in an agent-based dynamic toll pricing approach. *IET Intelligent Transport Systems*. 12(1), 58-65.

2. Zhao, J., **Li, W.**, Wang, J., & Ban, X. (2016). Dynamic Traffic Signal Timing Optimization Strategy Incorporating Various Vehicle Fuel Consumption Characteristics. *IEEE Transactions on Vehicular Technology*, 65(6), 3874-3887.

1. Cheng, D., **Li, W.**, & Ishak, S. (2014). Accounting for Travel Time Reliability and Trip Purpose in an Agent-Based Dynamic Feedback-Control Toll Pricing Approach: A Case Study on the I-95 Managed Lanes Corridor. *Transportation Research Record*. 2470(1), 131-141.

**Conference Proceedings**

11. Kumar, P., **Li, W.**, & Ozpineci, B. (2025). Enhancing EV Motor Design Through Knowledge-Based AI and Hierarchical Fuzzy Logic Model. In 2025 IEEE Power & Energy Society General Meeting. Austin TX, USA. July 27-34.

10. Bose, R. K., Kumar, P., Busch, I., **Li, W.**, & Rogers, M. O. (2025). Electrifying Airport GSE: Monte Carlo Grid Impacts. In 2025 IEEE/AIAA Transportation Electrification Conference and Electric Aircraft Technologies Symposium. Anaheim, CA, USA. June 18-20, 2025

9. Pan, M., **Li, W.**, Wang, C. (2025). Spatial impacts of electric vehicle charging on power grid stability: A downtown Atlanta case study. ASCE International Conference on Transportation Development. Glendale, AZ, USA.

8. Pan, M., **Li, W.**, Wang, C. (2024). Modeling Electric Vehicle Charging Load Using Origin-Destination Data. ASCE International Conference on Transportation Development. Atlanta, GA, USA.

7. **Li, W.**, Wang, R., Shao, Y., Wang, H., Zhang, G., Ma, T., Ringler, J., Chow, D. (2021). Hybrid Neural Network Modeling for Multiple Intersections along an Arterial in Honolulu. The Tenth International Conference on Advances in Vehicular Systems, Technologies, and Applications. Nice, France. June 22, 2021. **(Best Paper Award)**.

6. **Li, W.**, Ban, X., (2018). Traffic Signal Timing Optimization under Connected Vehicles environment. In Proceedings of the 97th Annual Meeting of Transportation Research Board, Washington, DC.

5. **Li, W.**, Ban, X., (2017). Traffic signal timing optimization in connected vehicles environment. In Proceedings of the IEEE Intelligent Vehicle Symposium, June 11-14, Redondo Beach, CA.

4. **Li, W.**, Ban, X. (2017). Big data analysis based decision-making tool for applying adaptive traffic control systems. In Proceedings of the 96th Annual Meeting of Transportation Research Board, Washington, DC.

3. **Li, W.**, Ban, X. J., & Wang, J. (2016). Traffic signal timing optimization incorporating individual vehicle fuel consumption characteristics under connected vehicles environment. In IEEE Connected Vehicles and Expo (ICCVE).

2. Sun, Z., **Li, W.**, & Ban, X. (2018). Adaptive Traffic Signal Control System (ACS-Lite) on Heavily Congested Arterial Traffic: Experiences and Lessons Learned. COTA International Conference of Transportation Professionals, CICTP.

1. Cheng, D., **Li, W.**, & Ishak, S. (2014). Accounting for Travel Time Reliability and Trip Purpose in an Agent-Based Dynamic Feedback-Control Toll Pricing Approach: A Case Study on the I-95 Managed Lanes Corridor. In Proceedings of the 93rd Annual Meeting of Transportation Research Board, Washington, DC.

**Conference Presentations**

15. **Li, W.**(2025). Assessing Spatiotemporal Variations in EV Charging Access and Implications for Infrastructure Equity. ASCE International Conference on Transportation Development. Glendale, AZ, USA.

14. **Li, W.** (2025). Nationwide Impact of Air Taxis on Energy Consumption and Road Traffic Dynamics. ASCE International Conference on Transportation Development. Glendale, AZ, USA.

13. **Li, W.** (2025). A Technical Review of the Impact and Emerging Research Opportunities in Vehicle-Grid Integration (VGI) for Transportation. 104th Transportation Research Board Annual Meeting. Washington DC, USA.

12. **Li, W.** (2024). Distributed Reinforcement Learning with GNN Integration for Netowrk-Level Traffic Signal Control. ASCE International Conference on Transportation Development. Atlanta, GA, USA.

11. **Li, W.** (2024). Distributed Reinforcement Learning with GNN Integration for Netowrk-Level Traffic Signal Control. ASCE International Conference on Transportation Development. Atlanta, GA, USA.

10. **Li, W.** (2024). Field Testing and Evaluation of a Predictive Bilinear Signal Control on a Signalized Corridor. ASCE International Conference on Transportation Development. Atlanta, GA, USA.

9. **Li, W.** (2024). An Agent-Based Model for U.S. Medium and Heavy-Duty Vehicle Market. 103rd Transportation Research Board Annual Meeting. Washington DC, USA.

8. **Li, W.** (2024). Energy-Efficient Multimodal Mobility Networks in Transportation Digital Twins: Strategies and Optimization. 103rd Transportation Research Board Annual Meeting. Washington DC, USA.

7. **Li, W.** (2023). Network-Wide Hybrid Traffic Signal Control for Connected and Autonomous Vehicles – Case Studies in Chattanooga, TN. ASCE International Conference on Transportation Development, Austin, TX, USA.

6. **Li, W.** (2022). Deployment Priority of Public Charging Speeds for Increasing Battery Electric Vehicle Usability –Insights from Revealed Travel Patterns. 101st Transportation Research Board Annual Meeting, Washington, DC, USA.

5. **Li, W.** (2021). Network-level Traffic Signal Cooperation Using High-order Conflict Graph. 100th Transportation Research Board Annual Meeting, Washington, DC, USA.

4. **Li, W.** (2020). Adaptive Traffic Signal Control based on Partial Knowledge of Traffic States. In Proceedings of ASCE International Conference on Transportation & Development. Seattle, WA, USA.

3. **Li, W.** (2020). Short-term Traffic State Prediction: Accuracy vs. Efficiency. 99th Transportation Research Board Annual Meeting, Washington, DC, USA.

2. **Li, W.** (2019). A Deep Learning Approach for Lane based Traffic Volume Prediction at Signalized Intersection. 98th Transportation Research Board Annual Meeting, Washington, DC, USA.

1. **Li, W.** (2019). Connected Vehicles Based Traffic Signal Coordination. 98th Transportation Research Board Annual Meeting, Washington, DC, USA.

**Book Chapters**

1. Xu, H., Yuan, J., Zhou, A., Xu, G., **Li, W.**, Ban, X., Ye, X. GenAI-powered Multi-Agent Paradigm for Smart Urban Mobility: Opportunities and Challenges for Integrating Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG) with Intelligent Transportation Systems. In *Urban Human Mobility*, Edited by Huang et al., London: Taylor & Francis, 2025. Preprint available at: `https://arxiv.org/abs/2409.00494`.

**Patent**

3. Wang, H., Zhang, G., Wang, C., Shao, Y., **Li, W.**, Athiban, A., & Yuan, J. (2025). Artificial Intelligence Closed Loop Control for Traffic Signals of Multiple Intersections. U.S. Patent Application No. 18/819,850. https://patents.google.com/patent/US20250078655A1/en.

2. Yuan, J., **Li, W.**, Wang, C., LaClair, T., XU, H., Berres, A. S., ... & Sanyal, J. (2025). Energy-efficient vehicle and/or traffic light control. U.S. Patent Application No. 18/920,355. https://patents.google.com/patent/US20250128708A1/en.

1. Haowen, X. U., Yuan, J., Wang, C., LaClair, T., Berres, A. S., **Li, W.**, ... & Sanyal, J. (2025). Eco-Pilot-Energy-Efficient Vehicle Speed Advisory Through Vehicle-to-Infrastructure Communications. U.S. Patent Application 18/920,302. https://patents.google.com/patent/US20250131819A1/en.

**Technical Reports**

4. Laclair,T., Wang, R., Yuan, J., Wang. H., **Li, W.** (2021). Milestone Report: Speed Control Algorithm for "Green Wave" Approach. ORNL/TM-2021/2146.

3. Ban, X., Wojtowicz, J., **Li, W.** (2016). Decision-Making Tool for Applying Adaptive Traffic Signal Control System. Final Report to NYSERDA and NYSDOT.

2. Ban, X., **Li, W.** (2018). Connected Vehicle Based Traffic Signal Optimization. C2SMART USDOT Tier 1 University Transportation Center.

1. Wilmot, C., **Li, W.**, Glascock, S., &Graham, G. (2015). Improving Freight Crash Incident Management. Technical FHWA/LA 14/542.

## FUNDED RESEARCH

**Total funding: $2.6M**

3. Co-PI, US Department of Energy (DOE) project "Charging Tennessee: Advancing Public Vehicle Fleet Electrification", $1M, 2025-2027.

2. Co-PI, US Department of Energy (DOE) project "Demonstrating Rapidly Deployable Artificial Intelligence (AI) Based Adaptive Signal Timing Optimization to Urban Areas", $1.5M, 2024-2027.

1. PI, US DOE project "Rural Reimagined: Building an EV Ecosystem and Green Economy for Transforming Lives in Economically Distressed Appalachia", $100k, 2022-2025.

## TEACHING EXPERIENCE

**Co-Instructor, University of Washington**

CEE 593 Transportation System Analysis –Programming with SUMO, Spring 2019.

**Guest Lecturer University of Washington**

CET 585 Analytical Methods in Transportation II –Linear and Nonlinear Programming in Python, Fall 2018.

**Co-Instructor, Rensselaer Polytechnic Institute**

CIVL 6270 Traffic Simulation and Control –Traffic simulation in VISSIM, Spring 2015.

## ACADEMIC SERVICE

**Committee Member**

- TRB Standing Committee on Fleet and Equipment – AKJ16
- American Society of Civil Engineers (ASCE) Transportation and Development Institute (T&DI) Data Sensing and Analytics Committee
- ASCE T&DI Artificial Intelligence Committee

**Handling Editor**

- Transportation Research Record: Journal of the Transportation Research Board

**Guest Editor**

- Renewable and Sustainable Energy Reviews
- Frontiers in Future Transportation

**Reviewer for the following journals**

- Transportation Research Part C
- Transportation Research Part D
- IEEE Transaction on Intelligent Transportation System
- IEEE Transaction on Industrial Informatics
- IEEE Transaction on Neural Networks
- IEEE Transaction on Vehicular Technologies
- Journal of Intelligent Transportation System
- Journal of Transportation Research Record
- Knowledge and Information Systems
- Sustainable Cities and Society

**Reviewer of following conference and workshops**

- International Workshop on Computational Transportation Science
- Transportation Research Board Annual Conference
- COTA International Conference of Transportation Professionals
- The 8th International Symposium on Dynamic Traffic Assignment
- ASCE International Conference on Transportation & Development
- Annual Meeting of Transportation Research Board