Yanbing Wang, Ph.D.

Assistant Professor, Arizona State University
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Employment

Arizona State University, Tempe, AZ — Jan 2025 -
Assistant Professor, School of Sustainable Engineering and the Built Environment

Argonne National Laboratory, Lemont, IL — Jan - Dec 2024
Post-doctoral Researcher, Vehicle & Mobility Systems Department

Vanderbilt University, Nashville, TN (Advisor: Dr. Dan Work)
Research Engineer, Institute for Software Integrated Systems — Oct - Dec 2023
Graduate Research Assistant, Institute for Software Integrated Systems — June 2018 - Sept 2023

Mitsubishi Electric Research Laboratories, Cambridge, MA — Jan - Mar 2023
Research Intern, Control for Autonomy Group (Advisor: Dr. Marcel Menner)

Toyota InfoTech Labs, Mountain View, CA — Jan - Apr 2021
Research Intern (Advisor: Dr. Ziran Wang)

University of Illinois at Urbana-Champaign, Champaign, IL
Undergraduate Researcher, Illinois Geometry Lab (Advisor: Dr. Richard Sowers) — Aug 2016 - May 2018
Instructor, NetMath — May 2016 - May 2017

Education

Ph.D. in Civil & Environmental Engineering — Sept 2023
Vanderbilt University
Advisor: Dr. Dan Work, Professor of Civil and Environmental Engineering, Professor of Computer Science
Dissertation: *Reconstruction of mixed traffic systems at micro and macro scales*

B.S. in Civil & Environmental Engineering — May 2018
University of Illinois at Urbana-Champaign
Minor in Architecture

Publications

Journal Articles

1. J. W. Lee, H. Wang, ... **Y. Wang**, ... A. M. Bayen, "Traffic control via connected and automated vehicles: An open-road field experiment with 100 CAVs", *IEEE Control Systems Magazine (IEEE CSM)*, 2024, To appear.
2. Y. Zhang, M. Quinones-Grueiro, Z. Zhang, **Y. Wang**, W. Barbour, G. Biswas, and D. Work, "MARVEL: Bringing multi-agent reinforcement-learning based variable speed limit controllers closer to deployment", *IEEE Access*, 2024. Preprint: download.
3. **Y. Wang**, D. Gloudemans, J. Ji, Z. N. Teoh, L. Liu, G. Zachár, W. Barbour, and D. B. Work, "Automatic vehicle trajectory data reconstruction at scale", *Transportation Research Part C: Emerging Technologies*, vol. 160, p. 104 520, 2024. **Manuscript:** download. Preprint: download.

4. D. Gloudemans, **Y. Wang**, J. Ji, G. Zachár, W. Barbour, E. Hall, M. Cebelak, L. Smith, and D. Work, "I-24 MOTION: An instrument for freeway traffic science", *Transportation Research Part C: Emerging Technologies*, vol. 155, p. 104 311, Sep. 2023. **Manuscript:** download. Preprint: download.
5. P. Choobchian, G. Roscoe, T. Dick, B. Zou, D. Work, K. Zhang, **Y. Wang**, and Y. Hung, "Leveraging connected vehicle platooning technology to improve the efficiency and effectiveness of train fleeting under moving blocks", *Transportation Research Part C: Emerging Technologies*, vol. 148, p. 104 026, Jan. 2023. **Manuscript:** download. Preprint: download.
6. **Y. Wang**, Z. Wang, K. Han, P. Tiwari, and D. B. Work, "Gaussian process-based personalized adaptive cruise control", *IEEE Transactions on Intelligent Transportation Systems*, vol. 23, no. 11, pp. 21 178–21 189, 2022. DOI: 10.1109/TITS.2022.3174042. **Manuscript:** download. Preprint: download.
7. Y. Hu, A. Qu, **Y. Wang**, and D. B. Work, "Streaming data preprocessing via online tensor recovery for large environmental sensor networks", *ACM Transactions on Knowledge Discovery from Data (TKDD)*, vol. 16, no. 6, pp. 1–24, 2022. **Manuscript:** download. Preprint: download.
8. **Y. Wang** and D. B. Work, "Estimation for heterogeneous traffic using enhanced particle filters", *Transportmetrica A: Transport Science*, vol. 18, no. 3, pp. 568–593, Jan. 2022. **Manuscript:** download. Preprint: download.
9. **Y. Wang**, M. L. Delle Monache, and D. B. Work, "Identifiability of car-following dynamics", *Physica D: Nonlinear Phenomena*, no. 0167-2789, p. 133 090, 2021. **Manuscript:** download. Preprint: download.
10. **Y. Wang**, G. Gunter, M. Nice, M. L. Delle Monache, and D. B. Work, "Online parameter estimation methods for adaptive cruise control systems", *IEEE Transactions on Intelligent Vehicles*, vol. 6, no. 2, pp. 288–298, 2020. **Manuscript:** download. Preprint: download.

Conference Proceedings

1. **Y. Wang**, F. de Souza, J. Han, and D. Karbowski, "Is it necessary to calibrate all parameters for each driver?", in *the 4th Modeling, Estimation, and Control Conference (MECC 2024)*, 2024.
2. J. Ji, **Y. Wang**, D. Gloudemans, G. Zachár, W. Barbour, and D. B. Work, "Virtual trajectories for I-24 MOTION: Data and tools", in *IEEE Forum for Innovative Sustainable Transportation Systems (FISTS)*, 2024. **Manuscript:** download. Preprint: download.
3. **Y. Wang**, K. Berntorp, and M. Menner, "Physics-informed road monitoring and suspension control using crowdsourced vehicle data", in *European Control Conference (ECC)*, 2024. Preprint: download.
4. D. Gloudemans, **Y. Wang**, G. Gumm, W. Barbour, and D. B. Work, "The interstate-24 3d dataset: A new benchmark for 3d multi-camera vehicle tracking", in *British Machine Vision Conference (BMVC)*, 2023. **Manuscript:** download. Preprint: download.
5. Y. Hu, Y. Zhang, **Y. Wang**, and D. B. Work, "Detecting socially abnormal highway driving behaviors via recurrent graph attention networks", in *The Web Conference 2023, Austin, Texas, USA*, ACM, 2023, pp. 1–6. **Manuscript:** download.
6. **Y. Wang**, J. Ji, W. Barbour, and D. B. Work, "Online min cost circulation for multi-object-tracking on fragments", in *2023 IEEE International Intelligent Transportation Systems Conference (ITSC)*, 2023. **Manuscript:** download. Preprint: download.
7. J. Ji, **Y. Wang**, W. Barbour, and D. B. Work, "Platoon trajectory reconstruction with conflict resolution using semidefinite relaxation", in *2023 IEEE International Intelligent Transportation Systems Conference (ITSC)*, 2023. **Manuscript:** download.
8. D. Gloudemans, G. Zachár, **Y. Wang**, J. Ji, M. Nice, M. Bunting, W. Barbour, J. Sprinkle, B. Piccoli, M. L. D. Monache, *et al.*, "So you think you can track?", in *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, 2023. Preprint: download.

9. **Y. Wang**, Z. Wang, K. Han, P. Tiwari, and D. B. Work, "Personalized adaptive cruise control via gaussian process regression", in *2021 IEEE International Intelligent Transportation Systems Conference (ITSC)*, 2021, pp. 1496–1502. **Manuscript:** download. Preprint: download.
10. **Y. Wang**, G. Gunter, and D. B. Work, "Online parameter estimation of adaptive cruise control models with delays and lags", in *2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC)*, 2020, pp. 1–6. **Manuscript:** download. Preprint: download.
11. A. Qu, Y. Wang, Y. Hu, **Y. Wang**, and H. Baroud, "A data-integration analysis on road emissions and traffic patterns", in *Driving Scientific and Engineering Discoveries Through the Convergence of HPC, Big Data and AI: 17th Smoky Mountains Computational Sciences and Engineering Conference, SMC 2020, Oak Ridge, TN, USA, August 26-28, 2020. (Best student paper award)*, Springer, 2020, pp. 503–517. **Manuscript:** download. Preprint: download.
12. **Y. Wang** and D. B. Work, "Heterogeneous traffic estimation with particle filtering", in *2019 IEEE Intelligent Transportation Systems Conference (ITSC)*, 2019, pp. 2551–2556. **Manuscript:** download. Preprint: download.
13. G. Gunter, **Y. Wang**, D. Gloudemans, R. Stern, D. B. Work, M. L. D. Monache, R. Bhadani, M. Bunting, R. Lysecky, J. Sprinkle, *et al.*, "Wip abstract: String stability of commercial adaptive cruise control vehicles", in *Proceedings of the 10th ACM/IEEE International Conference on Cyber-Physical Systems*, 2019, pp. 328–329. **Manuscript:** download. Preprint: download.
14. Y. Hu **Y. Wang**, C. Jiao, R. Sankaran, C. Catlett, and D. Work, "Automatic data cleaning via tensor factorization for large urban environmental sensor networks", in *NeurIPS Workshop on Tackling Climate Change with Machine Learning*, 2019. Preprint: download.

Under Review

1. M. L. Delle Monache, S. McQuade, H. N. Z. Matin, D. Gloudemans, **Y. Wang**, G. Gunter, A. M. Bayen, J. W. Lee, B. Piccoli, B. Seibold, J. Sprinkle, and D. B. Work, "Modeling, monitoring and controlling of road traffic using vehicles to sense and act", 2025, *Under review.*
2. **Y. Wang**, F. de Souza, and D. Karbowski, "Uncover inter-driver heterogeneity through centroid-guided calibration", 2024, *Under review.*
3. J. Ji, D. Gloudemans, **Y. Wang**, G. Zachár, W. Barbour, J. Sprinkle, B. Piccoli, and D. B. Work, "Scalable analysis of stop-and-go waves", 2024, *Under review.* Preprint: download.

Patents

1. R. Gupta, **Y. Wang**, Z. Wang, K. Han, and P. Tiwari, *Hybrid deterministic override of probabilistic advanced driving assistance systems (ADAS)*, US Patent No. 20230048774, Feb. 2023.
2. R. Gupta, Z. Wang, **Y. Wang**, K. Han, and P. Tiwari, *Systems and methods for protecting a vehicle at an intersection*, US Patent No. 20230065859, Mar. 2023.
3. **Y. Wang**, Z. Wang, K. Han, R. Gupta, and P. Tiwari, *Systems and methods for personalizing adaptive cruise control in a vehicle*, US Patent No. 20230047354, Feb. 2023.
4. R. Gupta, Z. Wang, **Y. Wang**, K. Han, and P. Tiwari, *Detection, classification, and prediction of bacteria colony growth in a vehicle passenger cabin*, US Patent No. 20230008646, Jan. 2023.
5. R. Gupta, **Y. Wang**, Z. Wang, K. Han, and P. Tiwari, *Student-t process personalized adaptive cruise control*, US Patent No. 20230035228, Feb. 2023.
6. R. Gupta, Z. Wang, **Y. Wang**, K. Han, and P. Tiwari, *Vehicular topple risk notification*, US Patent No. 20230029036, Jan. 2023.

Honors and Awards

Cyber-Physical Systems (CPS) Rising Star, University of Virginia Link Lab 2023

Dwight D. Eisenhower Transportation Fellowship, USDOT 2018, 2019, 2020, 2021, 2022
Five-time award recipient

Sidney P. Colowick Graduate Scholar, Vanderbilt University 2021
One of the three graduate scholars named across the entire campus

Harold Stirling Vanderbilt (HSV) Award, Vanderbilt University 2021

Best Paper Award 2020
A. Qu, Y. Wang, Y. Hu, **Y. Wang**, and H. Baroud, "A data-integration analysis on road emissions and traffic patterns", in *Driving Scientific and Engineering Discoveries Through the Convergence of HPC, Big Data and AI: 17th Smoky Mountains Computational Sciences and Engineering Conference*, Oak Ridge TN, USA.

Fred S. Bailey Undergraduate Scholarship for Cause-Driven Leaders, University YMCA 2017

Duane Edward and Phyllis Ann Erickson Memorial Scholarship, University of Illinois 2017

Samuel C. Roberts Award, University of Illinois 2016

Edmund J. James Scholar, University of Illinois 2014, 2015, 2016, 2017, 2018

Dean's List, University of Illinois 2014, 2015, 2016, 2017, 2018

Talks

1. "Calibrating Microsimulation Models with Macroscopic Data", *TRB Annual Meeting*, Washington, D.C., 2025
2. "Uncover Inter-Driver Heterogeneity using Identiability-Guided Calibration", *the 4th Modeling, Estimation, and Control Conference (MECC)*, Chicago, IL, 2024
3. "Transportation Cyber-Physical Systems: Sensing and Digital Twins", *CME Seminar at University of Illinois Chicago*, 2024
4. "Transportation Cyber-Physical Systems: New Instruments for Traffic Science", *SSEBE Seminar at Arizona State University*, 2024
5. "Transportation Cyber-Physical Systems: Sensing for Intelligence", *CEE Seminar at University of Pittsburgh*, 2024
6. "Automatic Trajectory Data Reconstruction: Application to I-24 MOTION", *TRB Annual Meeting*, Washington, D.C., 2023
7. "The Future of Advanced Driving Assistance Systems (ADAS)", Guest speaker for *Massachusetts General Hospital, Professional Development Workshops*, Boston, MA, 2022
8. "Automatic Trajectory Data Reconstruction", *IPAM Mathematical Challenges and Opportunities for Autonomous Vehicles Workshop*, UCLA, Lake Arrowhead Reunion Conference, 2022
9. "Personalized Adaptive Cruise Control via Gaussian Process", *1st CIRCLES Workshop on Traffic and Autonomy*, 2021
10. "Personalized Adaptive Cruise Control via Gaussian Process", *IEEE Conference on Intelligent Transportation Systems*, 2021
11. "Interstate-24 MOTION: Enabling Smart Mobility with High-Fidelity Trajectory Extractions", *The 32nd IEEE Intelligent Vehicle Symposium Workshop: Cooperative Driving in Mixed Traffic*, 2021
12. "Identifiability of Car-Following Dynamics", *TRB Annual Meeting*, Washington, D.C., 2021
13. "Parameter Identifiability of Car-Following Models", *IPAM Mathematical Challenges and Opportunities for Autonomous Vehicles Workshop*, UCLA, 2020

14. "Online Parameter Estimation for Adaptive Cruise Control Systems", *TRB Annual Meeting*, Washington, D.C., 2020
15. "Online Parameter Estimation of Adaptive Cruise Control Models with Delays and Lags", *IEEE 23rd International Conference on Intelligent Transportation Systems*, 2020
16. "Tensor Factorization for Preprocessing Urban Sensor Networks", *CCAI NeurIPS*, 2019
17. "Heterogeneous Traffic Estimation with Particle Filtering", *IEEE Conference on Intelligent Transportation Systems*, Auckland, NZ, 2019
18. "Video as a Sensor", *the 13th Coordinated Science Laboratory Student Conference*, Urbana, IL, 2018

Teaching Experiences

Graduate Courses

Traffic Flow Theory (ASU CEE 598) Spring 2025
The course covers the definition, taxonomy, and macroscopic and microscopic models of highway traffic flow theories as well as intelligent transportation systems. Students participate in mini-projects throughout the semester to apply concepts in real-world traffic data analysis.

Guest Lectures

Autonomous Vehicles and Traffic (Vanderbilt University CE 5999) Fall 2023
Guest lecture on "Personalized Driving Assistance using Machine Learning"

Vanderbilt Summer Academy Summer 2022
Guest lecture on "Intelligent Solutions for Traffic Improvements"

Online Courses

Differential Equations (UIUC NetMath MATH 441) Fall 2017
Basic course in ordinary differential equations. Topics include existence and uniqueness of solutions and the general theory of linear differential equations.

Leadership & Mentoring

Mentored at Arizona State University

Yuanhao Shen, Remote Intern, M.S. at Columbia University 2024 - 2025
Topic: Vehicle trajectory tracking with extended Siamese Neural Networks (eSNN)

Mentored at Argonne National Laboratory

Zhaobin Mo, Research Intern, Ph.D. Candidate at Columbia University 2024
Topic: Detecting the precursor of traffic breakdown using spatial-temporal Graph Neural Network

Mentored at Vanderbilt University REU Program

Jane Sun, Undergraduate Student in Computer Science and Psychology 2022 - 2023
Topic: Traffic data visualization

Lisa Liu, Undergraduate Student in Electrical Engineering 2021 - 2022
Topic: Database design and visualization

Zi Nean Teoh, Undergraduate Student in Computer Science and Math 2021 - 2022
Topic: Database design and visualization

David Gao, Undergraduate Student in Computer Science 2021 - 2022
Topic: System log monitoring using Elastic

Arthur Sung, Undergraduate Student in Computer Science 2021 - 2022

Topic: Outlier detection with vehicle trajectory data

Ao Qu, Undergraduate Student in Computer Science 2019 - 2020
Topic: Traffic pattern analysis with heterogeneous data sources

Canwen Jiao, Undergraduate Student in Computer Science 2019
Topic: Data analysis for large urban environmental sensor networks

Co-founder and Team Lead for Engineers in Action (EIA) Bridge Chapter at UIUC

Organized fundraising events for travel and construction materials 2016 - 2018

Led design and construction of two cable suspended footbridges in Patzula, Joyabaj, Guatemala and Bajo Maiz, Panama

Professional Services

Journal Paper Reviewer

Transportation Research Part B: Methodological

Transportation Research Part C: Emerging Technologies

IEEE Transactions on Intelligent Transportation Systems

Data Science for Transportation Journal

IEEE Sensors Journal

Conference Paper Reviewer

International Conference on Learning Representations (ICLR)

British Machine Vision Conference (BMVC)

International Symposium on Transportation and Traffic Theory (ISTTT)

IEEE Conference on Decision and Control (CDC)

The European Control Conference (ECC)

IEEE Intelligent Vehicle Symposium (IEEE-IV)

Proposal Reviewer

National Science Foundation (NSF) Cyber-Physical Systems (CPS) Panel

Workshop Organizer

IPAM Long Program: Mathematical Challenges and Opportunities for Autonomous Vehicles, Research Seminar Sept - Dec 2020

American Control Conference (ACC) NSF-CIS Workshop on Control for Networked Transportation Systems (CNTS) July 2019

Media Coverage

"Ph.D.s in ITS," *IEEE Intelligent Transportation Systems Magazine*, Feb 2025. Link

"Ph.D.s in Control," *IEEE Control Systems Magazine Magazine*, Apr 2025. To appear.