

# Hao (Frank) Yang

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## RESEARCH INTEREST

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1. Connected and Smart Infrastructure System
2. Advanced & Cooperative Cyber-physical Perception
3. Physical-informed Machine Learning and Transportation Data Science
4. Equity and Safety Improvement for Urban Systems

## EDUCATION

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### University of Washington

Seattle, WA, USA

*Ph.D. in Civil and Environmental Engineering (Transportation)*

03/2020 – 04/2023 (expected)

- Advisor: Professor Yin Hai Wang
- Dissertation: Towards Equal and Cooperative Traffic Tasks by Learning Multimodality Data Representations with Edge Artificial Intelligence

### University of Washington

Seattle, WA, USA

*Master of Science in Transportation Engineering*

09/2017 – 03/2020

- Advisor: Professor Yin Hai Wang
- Thesis: Novel Traffic Sensing Using Multi-camera Car Tracking and Re-Identification

### Beijing University of Post and Telecommunications (BUPT)

Beijing, China

*Bachelor of Engineering in Electrical Engineering (Telecommunications)*

09/2013 – 07/2017

- National Scholarship Awardee (top 1%).

### University of London – Queen Mary (Joint Program with BUPT)

London, UK

*Bachelor of Engineering in Electrical & Computer Engineering*

09/2013 – 07/2017

## AWARDS & HONORS

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21. **Best Paper Award Nominee**, TRB Standing Committee on Information Systems and Technology (AED30), for paper titled “Cooperative and Comprehensive Multi-task Surveillance Sensing and Interaction System Empowered by Edge Artificial Intelligence”, final award to be announced in Jan 2023.
20. **Outstanding Paper Award**, IEEE Digital Twins and Parallel Intelligence conference (IEEE DTPI 2022), for paper titled “Real-Time Traffic and Road Surveillance with Parallel Edge Intelligence (JRFID-0141-07-2022).” Nov 2022
19. **Michael Kyte Outstanding Student of the Year Award**, US Department of Transportation University Transportation Center (UTC) for Federal Region 10, Oct 2022.
18. **High-Value Research Award of American Association of State Highway and Transportation Officials (AASHTO)** for project “Real-Time Truck Parking Information Integration, Visualization and Prediction”, Aug 2022.
17. Runner-up, ASCE University of Washington Presentation Competition, Jun 2022.
16. Winner, Second MetroLab Student Cup organized by MetroLab Network, for project “Real-time Road Surface Conditions and Visibility Monitoring System for Traffic Safety”, Jun 2022.

15. Runner-up, Transportation Forecasting Competition 2022 (TRANSFOR 22), organized by TRB AED50 Artificial Intelligence and Advanced Computing Applications Committee, Jan 2022.
14. Winner, Multi-camera Vehicle Tracking Competition, AI City Challenge, in Conference on Computer Vision and Pattern Recognition (CVPR), Jun 2019
13. Runner-up, Multi-camera Vehicle Re-identification Competition, AI City Challenge, in Conference on Computer Vision and Pattern Recognition (CVPR), Jun 2019
12. Winner, Multi-camera Vehicle Tracking Competition, AI City Challenge, in Conference on Computer Vision and Pattern Recognition (CVPR), Jun 2018
11. Outstanding Award (6/1500), Third Di-Tech Smart Traffic Signal AI Algorithm Competition organized by Didi Chuxing Technology Co., Mar 2018.
10. Graduate Student Travel Award, Pacific Northwest Transportation Consortium (PacTrans) Region 10 University Transportation Center, 2018, 2019, 2020, 2022.
9. National Scholarship (top 1%), 2014, 2016.
8. Winner (1/6736), National College Students E-commerce "Innovation, Creativity and Entrepreneurship" Competition, 2016
7. Hengtong Optic-Electric Scholarship, 2015.
6. Meritorious Mention, Mathematical and Interdisciplinary Contest In Modeling (MCM/ICM), 2015.
5. Winner in Northern China; Runner-up in Nationwide Final, China Next-Generation Network Technology Innovation Competition: The Dynamic parking Lot Price Optimization Assignment based on Ipv6 and IoT, 2015.
4. Outstanding Student of Beijing, 2015.
3. Outstanding Student Leader of Beijing, 2014.
2. Outstanding Student of Beijing University of Posts and Telecommunications (BUPT), 2014.
1. Winner, "Ideal Cup" University Students Joint Speech Competition, 2013, 2014.

## REFEREED PUBLICATIONS

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### Refereed Journal Publications

- J16. **H. Yang**, J. Cai, C. Liu, R. Ke, and Y. Wang\*. "Cooperative Multi-camera Vehicle Tracking and Traffic Surveillance with Collaborative Edge Artificial Intelligence and Deep Learning." Accepted to Transportation Research Part C: Emerging Technologies on Dec 2022, in press.
- J15. **H. Yang**, Y. Ling, C. Kopca, S. Ricord and Y. Wang\*<sup>1</sup>, "Cooperative Traffic Signal Assistance System for Non-motorized Users and Disabilities Empowered by Computer Vision and Edge Artificial Intelligence." in Transportation Research Part C: Emerging Technologies, Volume 145 (2022), 103896, <https://doi.org/10.1016/j.trc.2022.103896>
- J14. **H. Yang**, J. Cai, M. Zhu, C. Liu and Y. Wang\*, 2022. "Traffic-Informed Multi-Camera Sensing (TIMS) System Based on Vehicle Re-Identification." in IEEE Transactions on Intelligent Transportation Systems, <https://doi.org/10.1109/TITS.2022.3154368>
- J13. **H. Yang**, R. Ke, Z. Cui\*, Y. Wang\*. and K. Murthy, 2022. "Toward a real-time Smart Parking Data Management and Prediction (SPDMP) System by Attributes Representation Learning." International Journal of Intelligent Systems (JCR Q1 in Artificial Intelligence, IF 8.993), 37(8), pp.4437-4470. <https://doi.org/10.1002/int.22725>

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<sup>1</sup>\*the corresponding author

- J12. **H. Yang** et al., "Truck Parking Pattern Aggregation and Availability Prediction by Deep Learning." in IEEE Transactions on Intelligent Transportation Systems, vol. 23, no. 8, pp. 12778-12789, Aug. 2022, <https://doi.org/10.1109/TITS.2021.3117290>
- J11. **H. Yang**, C. Liu, M. Zhu, X. Ban and Y. Wang\*, "How Fast You Will Drive? Predicting Speed of Customized Paths By Deep Neural Network." in IEEE Transactions on Intelligent Transportation Systems, vol. 23, no. 3, pp. 2045-2055, March 2022, <https://doi.org/10.1109/TITS.2020.3031026>
- J10. C. Liu, **H. Yang**, R. Ke and Y. Wang\*, 2022, "Toward a Dynamic Reversible Lane Management Strategy by Empowering Learning-Based Predictive Assignment Scheme." in IEEE Transactions on Intelligent Transportation Systems, <https://doi.org/10.1109/TITS.2022.3202487>
- J9. M. Zhu, **H. F. Yang**, C. Liu, Z. Pu and Y. Wang\*, "Real-time crash identification using connected electric vehicle operation data." Accident Analysis & Prevention, 173(2022), p.106708. <https://doi.org/10.1016/j.aap.2022.106708>
- J8. D. Liu\*, **H. F. Yang**, X. Mao, V. Antonoglou, and E.I. Kaisar, 2022. "New Mobility-Assist E-Grocery Delivery Network: a Load-Dependent Two-Echelon Vehicle Routing Problem With Mixed Vehicles." Transportation Research Record, p.03611981221099277.
- J7. Y. Zhuang, Z. Pu, **H. Yang**, and Y. Wang\*, 2022, "Edge-Artificial Intelligence-Powered Parking Surveillance With Quantized Neural Networks." in IEEE Intelligent Transportation Systems Magazine, doi: 10.1109/IMITS.2022.3182358.
- J6. X. Fu, X. Lv, **H.F. Yang**, X. Wang & J. Wang, 2022. "Multi-lane's control performance differentiation on traffic efficiency under the lane-level dynamic coordination strategy", Journal of Intelligent Transportation Systems, DOI: 10.1080/15472450.2022.2157213
- J5. R. Ke, C. Liu, **H. Yang**, W. Sun and Y. Wang, 2022, "Real-Time Traffic and Road Surveillance with Parallel Edge Intelligence," in IEEE Journal of Radio Frequency Identification, doi: 10.1109/JRFID.2022.3211262.
- J4. X. Fu\*, H. Meng, X. Wang, **H. Yang** and J. Wang, 2022. "A hybrid neural network for driving behavior risk prediction based on distracted driving behavior data." PLoS ONE 17(1): e0263030. <https://doi.org/10.1371/journal.pone.0263030>.
- J3. X. Zhou, R. Ke\*, **H. Yang**, C. Liu, 2021. "When Intelligent Transportation Systems Sensing Meets Edge Computing: Vision and Challenges." Applied Sciences. 11(20):9680. <https://doi.org/10.3390/app11209680>
- J2. X. Fu, **H. Yang\***, C. Liu, J. Wang and Y. Wang\*, 2019. "A hybrid neural network for large-scale expressway network OD prediction based on toll data." PloS one, 14(5), p.e0217241.
- J1. H. Yao, **H. Yang**, A. Zhang, C. Fang\*, and Y. Guo, 2017. "WLAN interference self-optimization using SOM neural networks." Concurrency and Computation: Practice and Experience, 29(3), p.e3913.

### Under Review Journal Submissions

- J16. **H\*. Yang**, W. Zheng, J. Cai, P. Wang, X. Jiang, S. Du, Y. Wang\* and Z. Wang. "Spatial-temporal Physical Priori Transformer: A Universal Framework for City-wide Traffic Learning and Forecasting." Submitted to IEEE Transactions on Pattern Analysis and Machine Intelligence on Sep 2022, under review.
- J15. **H. Yang**, X. Jiang, Y. Zhuang, M. Tsai., and Y. Wang\*. "Enhancing-Minority Vehicle Classification System Empowered by Micro-Pulse LiDAR and Edge Artificial Intelligence." Submitted to IEEE Transactions on Intelligent Transportation Systems on Nov 2021, accept with minor revision on Oct 2022.
- J14. **H. Yang**, J. Cai, C. Liu, and J. Huang and Y. Wang\*. "Mitigating the Bias of Deep Neural Network for Traffic Perception Empowered by Learning Few-Shot Representations." Submitted to IEEE Transactions on Intelligent Transportation Systems on Aug 2022, under review.
- J13. **H. Yang**, J.cai, C. Liu and Y. Wang\*, "Privacy-preserving Non-motorized Users and Disabilities Detection and Tracking by Learning Few-shot Representations." Submitted to IEEE Internet of Things Journal, Sep. 2022, under review.

- J12. C. Liu, **H. Yang**, M. Zhu, F. Wang, T. Vaa and Y. Wang\*, "Real-time Multi-task Environmental Perception System for Traffic Safety Challenges Empowered by Edge Artificial Intelligence." Submitted to Transportation Research Part C: Emerging Technologies on Oct. 2022, under review.
- J11. C. Liu, **H. Yang**, Z. Cui, R. Ke and Y. Wang\*, "3D Structural Information Sensing System (3D-SISS) based on Single Monocular Surveillance Camera for Fully-automatic Traffic Scene Perception." Submitted to IEEE Transactions on Intelligent Transportation Systems, Jul. 2022, under review.
- J10. C. Liu, **H. Yang**, R. Ke and Y. Wang\*, "Edge-based Automatic Real-time Road Surface Condition Monitoring system (RSCMS) based on Single Monocular Surveillance Camera." IEEE Transactions on Intelligent Transportation Systems on Aug 2022, under review.
- J9. C. Liu, **H. Yang**, R. Ke, W. Sun, J. Wang and Y. Wang\*, "Cooperative and Comprehensive Multi-task Surveillance Sensing and Interaction System Empowered by Edge Artificial Intelligence." Submitted to Transportation Research Record, Sep. 2022, under review.
- J8. Y. Zhuang, Z.\* Pu, **H. Yang**, and Y. Wang\*. "Multi-Task Crowd Monitoring Using Deep Learning: Crowd Counting, Localization and Motion Detection." Submitted to IEEE Transactions on Intelligent Transportation Systems on Dec 2021, under review.
- J7. M. Tsai, Z. Cui, **H. Yang**, and Y. Wang\*. "Traffic-Twitter Transformer: A Nature Language Processing-joined Framework For Network-wide Traffic Forecasting." Submitted to IEEE Transactions on Intelligent Transportation Systems on Dec 2021, under review.
- J6. J. Wang, M. Cui, **H. Yang**, S. Fu, X. Liu, and X.\* Fu. "Trip purpose inference and spatio-temporal characterization based on anonymized trip data - an empirical study from dockless shared bicycle dataset in Xi'an, China." Submitted to Travel Behavior and Society on Jun. 2022, under review.
- J5. X. Fu\*, Y. Yue, **H. Yang**, X. Zhao, G. Jiao, and J. Wang, "Reliability-oriented route generation algorithm for multimodal transport—A perspective from supply chain's reliability enhancement." Submitted to Travel Behavior and Society on July. 2022, under review.
- J4. X. Fu\*, H. Meng, **H. Yang**, and J. Wang, "A Hybrid Deep Learning Method for Distracted Driving Risk Prediction Based on Spatio-temporal Driving Behavior Data." Submitted to Accident Analysis and Prevention on Sep. 2022, under review.
- J3. M. Zhu, S. Du., X. Wang., **H. Yang**, Z. Pu, and Y. Wang\*. "TransFollower: Long-Sequence Car-Following Trajectory Prediction through Transformer." Submitted to Transportation Research Part C: Emerging Technologies on Apr. 2021, under review.
- J2. R. Ke, Z. Cui, Y. Chen, M. Zhu, **H. Yang**. and Y. Wang\*. "Edge Computing for Real-Time Near-Crash Detection for Smart Transportation Applications." Submitted to IEEE Vehicular Technology Magazine on Sep. 2022, under review.
- J1. Y. Wang, J. Lutin, R. Ke, Z. Cui, S. Yin, Y. Zhuang and **H. Yang**. "Transit Safety System Evaluation and Hotspot Identification Empowered by Edge Computing Transit Event Logging System." Submitted to Transportation Research Record, July. 2022, under review.

### Refereed Conference Proceedings

- C34. **H. Yang**, W. Zheng, J. Cai, P. Wang, X. Jiang, S. Du, Y. Wang\* and Z. Wang., "Integrating the Traffic Science with Deep Learning for City-wide Network Congestion Prediction (TRBAM-23-04536)." Accepted, Proceedings of the 102<sup>nd</sup> Annual Meeting of Transportation Research Board, Jan. 2023. Washington D.C. USA.
- C33. **H. Yang**, C. Liu, M. Zhu, Y. Wang\*, "Cooperative Perception and Interaction Smart Node for Non-motorized Users and Disabilities Empowered by Edge Ensemble Learning (TRBAM-23-04541)." Accepted, Proceedings of the 102<sup>nd</sup> Annual Meeting of Transportation Research Board, Jan. 2023. Washington D.C. USA.
- C32. **H. Yang**, C. Liu, R. Ke, M. Zhu, and Y. Wang\*, "RISTS: Real-time IoT System for Traffic Sensing by Edge Computing and Multi-camera Vehicle Re-identification (TRBAM-22-04404)." **Lectern Session**, Advances in Edge Computing for Intelligent Real-Time Traffic Sensing and Detection, Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.

- C31. **H. Yang**, M. Tsai, C. Liu, and Y. Wang\*, "Equity-aware Cost-effective Vehicle Classification System by Compact Pulse LiDAR and Edge Artificial Intelligence (TRBAM-22-04640)." **Lectern Session**, Advances in Edge Computing for Intelligent Real-Time Traffic Sensing and Detection. Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C30. **H. Yang**, Y. Ling, Y. Zhuang, and Y. Wang\*. "Connected, Equal and Automated Signal Phase and Timing (SPaT) Infrastructure System for Non-motorized Users and Disabilities by Edge Artificial Intelligence (TRBAM-22-04633)." Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C29. **H. Yang**, Z. Cui, S. Yin, K. Murthy, and Y. Wang\*, 2022, Towards A Real-Time Smart Parking Information Management and Prediction System by Representation Learning (TRBAM-22-04430), Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C28. **H. Yang**, C. Liu, Y. Zhuang, W. Sun, and Y. Wang\*. "Truck Parking Pattern Aggregation and Real-time Availability Prediction by Multi-task Learning (TRBAM-21-04040)" Proceedings of the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2021. Washington D.C. USA.
- C27. **H. Yang**, M. Zhu, R. Ke, C. Liu, and Y. Wang\*. "Novel Network-Scale Traffic Sensing Approach Using Multi-camera Object Tracking and Re-Identification (TRBAM-21-04114)." Proceedings of the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2021. Washington D.C. USA.
- C26. **H. Yang**, C. Liu, R. Ke, M. Zhu, and Y. Wang\*, " Privacy-preserving Non-motorized Users and Disabilities Detection and Tracking by Learning Few-shot Representations (TRBAM-21-02145)." Proceedings of the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2021. Washington D.C. USA.
- C25. **H. Yang**, M. Zhu, C. Liu, and Y. Wang\*, 2020, August. " A Novel Framework for City-scale Road Network Congestion Prediction and Cascading Analysis based on Multi-Target Multi-Camera Tracking (MTMCT)." Proceedings of the 2020 ASCE International Conference on Transportation and Development (ICTD), May 2020. Seattle, USA.
- C24. **H. Yang**, C. Liu, M. Zhu, W. Sun, and Y. Wang\*. "Hybrid data-fusion model for short-term road hazardous segments identification based on the acceleration and deceleration information." Proceedings of the 2020 ASCE International Conference on Transportation and Development (ICTD), May 2020. Seattle, USA.
- C23. **H. Yang**, C. Liu Gottsacker, X. Ban, C. Zhang, and Y. Wang\*, 2019. "Cell-speed prediction neural network (CPNN): A deep learning approach for trip-based speed prediction (TRBAM-19-02492)." Proceedings of the 98<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2019. Washington D.C. USA.
- C22. C. Liu, **H. Yang**, R. Ke, W. Sun, J. Wang and Y. Wang\*, "Cooperative and Comprehensive Multi-task Surveillance Sensing and Interaction System Empowered by Edge Artificial Intelligence." **Accepted and Best Paper Award Nominee of TRB Standing Committee on Information Systems and Technology (AED30)**, Proceedings of the 102<sup>nd</sup> Annual Meeting of Transportation Research Board, Jan. 2023. Washington D.C. USA.
- C21. C. Liu, **H. Yang**, R. Ke and Y. Wang\*. "Edge-based Automatic Real-time Road Surface Condition Monitoring system (RSCMS) based on Single Monocular Surveillance Camera." Accepted, Proceedings of the 102<sup>nd</sup> Annual Meeting of Transportation Research Board, Jan. 2023. Washington D.C. USA.
- C20. M. Zhu, **H. Yang**, C. Liu and Y. Wang\*. "Multi-Agent Deep Reinforcement Learning for Network-Wide Traffic Signal Control." Accepted, Proceedings of the 102<sup>nd</sup> Annual Meeting of Transportation Research Board, Jan. 2023. Washington D.C. USA.
- C19. Y. Zhuang, Z. Pu, **H. Yang** and Y. Wang\*. "Few-Shot Learning for Novel Object Detection in Autonomous Driving" Accepted, Proceedings of the 102<sup>nd</sup> Annual Meeting of Transportation Research Board, Jan. 2023. Washington D.C. USA.
- C18. Y. Wang, J. Lutin, R. Ke, Z. Cui, S. Yin, Y. Zhuang and **H. Yang**. "Transit Safety System Evaluation and Hotspot Identification Empowered by Edge Computing Transit Event Logging System." Accepted, Proceedings of the 102<sup>nd</sup> Annual Meeting of Transportation Research Board, Jan. 2023. Washington D.C. USA.
- C17. R. Ke, C. Liu, **H. Yang**, W. Sun and Y. Wang, "Real-Time Traffic and Road Surveillance with Parallel Edge Intelligence," The 2nd IEEE International Conference on Digital Twins and Parallel Intelligence (IEEE DTPI), Oct. 2022, Boston, MA, USA.

- C16. R. Ke, C. Liu, Z. Pu, **H. Yang**, Y. Zhuang, and Y. Wang\*. "Multi-Task System for Real-Time Surveillance of Road and Traffic with Edge Artificial Intelligence (TRBAM-22-00979)", **Lectern Session**, Advances in Edge Computing for Intelligent Real-Time Traffic Sensing and Detection, Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C15. W. Zheng, Q. Guo, **H. Yang**, P. Wang, and Z. Wang. "Delayed Propagation Transformer: A Universal Computation Engine towards Practical Control in Cyber-Physical Systems." Proceedings of Advances in Neural Information Processing Systems (NIPS), 34, (acceptance rate: 25.5%)
- C14. M. Tsai, **H. Yang**, Y. Wang\*. "Traffic-Twitter Transformer: A Nature Language Processing-joined framework for network-wide traffic forecasting from tweet semantics (TRBAM-22-01470)." Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C13. M. Tsai, Z. Cui, C. Liu, **H. Yang** and Y. Wang\*. "An Incremental Learning-Based Framework for Non-Stationary Traffic Representations Clustering and Forecasting." Proceedings of the 25<sup>th</sup> IEEE International Conference on Intelligent Transportation Systems (ITSC 2022), Oct. 2022. Macau, China.
- C12. C. Liu, **H. Yang**, Z. Cui, W. Sun, and Y. Wang\*. "3D structural information sensing system (3D-SISS) based on Car Key Points Detection with Single Monocular Surveillance Camera (TRBAM-22-04562)." Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C11. M. Zhu, **H. Yang**, C. Liu, Z. Pu, and Y. Wang\*. "Real-Time Crash Identification using Connected Electric Vehicle Operation Data (TRBAM-22-04497)." Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C10. Y. Zhuang, Z. Pu, **H. Yang**, Y. Wang\*. "An Efficient Deep Learning Framework for Crowd Counting, Localization, and Motion Detection (TRBAM-22-04204)." Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C9. Z. Cui, M. Tsai, M. Zhu, **H. Yang**, C. Liu, and Y. Wang\*. "Traffic Performance Score 2.0: Measure Urban Mobility and Online Predict Near-term Traffic like Weather Forecast (TRBAM-22-04705)." Proceedings of the 101<sup>st</sup> Annual Meeting of Transportation Research Board, Jan. 2022. Washington D.C. USA.
- C8. X. Jiang, **H. Yang** and Y. Wang\*. "Making Sense of Electrical Vehicle Discussions Using Sentiment Analysis on Closely Related News and User Comments." Proceedings of 2022 International Conference on Transportation and Development (ICTD), American Society of Civil Engineers (ASCE)
- C7. C. Liu, **H. Yang**, H. Chen, and Y. Wang\*. "Bi-level Optimization Algorithm for Dynamic Reversible Lane Control based on Short-term Traffic Flow Prediction (TRBAM-21-03352)." Proceedings of the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2021. Washington D.C. USA.
- C6. Y. Zhuang, Z. Pu, **H. Yang**, and Y. Wang\*. "Quantized Convolutional Neural Network for Edge-based Parking Surveillance (TRBAM-21-02134)." Proceedings of the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2021. Washington D.C. USA.
- C5. Z. Pu, Z. Cui, S. Wang, **H. Yang**, and Y. Wang\*. "Multi-Modal Traffic Speed Monitoring: A Real-Time System Based on Passive Wi-Fi and Bluetooth Sensing Technology (TRBAM-21-04435)." Proceedings of the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2021. Washington D.C. USA.
- C4. C. Liu, **H. Yang**, P. Xu, X. Fu, and Y. Wang\*. "Advanced Multidimensional Sequence Alignment Method for Activity-Based Travel Pattern Similarity Identification (TRBAM-20-03210)." Proceedings of the 99<sup>th</sup> Annual Meeting of Transportation Research Board, Jan. 2020. Washington D.C. USA.
- C3. C. Liu, **H. Yang**, N. Dong, and Y. Wang. "Advanced Multidimensional Sequence Alignment Method (AMSAM) for Activity-based Travel Pattern Similarity Identification." Proceedings of 2020 ASCE International Conference on Transportation and Development (ICTD). Seattle, Washington, May 26-29, 2020.
- C2. T.W. Huang, J. Cai, **H. Yang**, H.M. Hsu, and J.N. Hwang, 2019, June. "Multi-View Vehicle Re-Identification using Temporal Attention Model and Metadata Re-ranking." Proceedings of Conference on Computer Vision and Pattern Recognition (CVPR) Workshops (Vol. 2), IEEE.

- C1. Y. Dou, **H. Yang** and X. Deng, 2016, August. "A Survey of Collaborative Filtering Algorithms for Social Recommender Systems." Proceedings of 12th International Conference on Semantics, Knowledge and Grids (SKG) (pp. 40-46). IEEE. Jun. 2016. Beijing, China

## INVITED ACADEMIC TALKS AND SEMINARS

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16. "Traffic-oriented Multi-camera Cooperative Perception System by Edge Artificial Intelligence and Vehicle Re-identification", in mid-year committee meeting of Highway Traffic Monitoring (ACP70) standing committee, Online, Aug 2022.
15. "Truck Parking Pattern Aggregation and Real-time Availability Prediction by Deep Learning", High Value Research (HVR) Session, American Association of State Highway and Transportation Officials (AASHTO) RAC Annual Meeting, Boston, Jul 2022.
14. "Washington State Signal Phase and Timing (SPaT) for Non-motorized Users", Session of Monitoring Intersection Operations and Utilizing Data, 2022 National Travel Monitoring Expo and Conference (NaTMEC). Online, Jun 2022.
13. "Real-time IoT System for Traffic Sensing by Edge Computing and Multi-camera Vehicle Re-identification", Podium Presentation of AI & Big Data Track, Sensing and Data Analytics, ASCE International Conference on Transportation and Development (ICTD), Seattle, WA, USA, May 2022.
12. "Traffic Sign Detection and Recognition for Autonomous Driving in Virtual Simulation Environment", Podium Presentation of AI & Big Data Track, Sensing and Data Analytics, ASCE International Conference on Transportation and Development (ICTD), Seattle, WA, USA, May 2022.
11. "Transfollower: Long Sequence Car-Following Trajectory Prediction through Transformer", Podium Presentation of AI & Big Data Track, AI in Transportation I, ASCE International Conference on Transportation and Development (ICTD), Seattle, WA, USA, May 2022.
10. "Towards Equal Traffic Signal Services for Non-motorized Users and Disabilities in Connected Vehicle Environment by Edge Computing", ASCE International Conference on Transportation and Development (ICTD), Seattle, WA, USA, May 2022.
9. "Equality-aware Cost-effective Vehicle Classification System by Compact Pulse LiDAR and Edge Artificial Intelligence", Lectern Session, Advances in Edge Computing for Intelligent Real-Time Traffic Sensing and Detection, the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Washington D.C., USA, Jan 2022.
8. "Multi-Task System for Real-Time Surveillance of Road and Traffic with Edge Artificial Intelligence", Lectern Session, Advances in Edge Computing for Intelligent Real-Time Traffic Sensing and Detection, the 100<sup>th</sup> Annual Meeting of Transportation Research Board, Washington D.C., USA, Jan 2022.
7. "Advanced Sensing Technology based on IoT for Next Generation Smart Transportation System", the Robotics Institute, Carnegie Mellon University (CMU), Pittsburgh, PA, USA, Jan 2022.
6. "Development of a Truck Parking Information Management System", Session of Facing Challenges to Freight and Port Operations in Washington, ITS Washington Conference, Olympia, WA, USA, Nov 2021.
5. "Development of a Truck Parking Information Management System Using Artificial Intelligence in Washington State", Webinar for Washington State Department of Transportation (WSDOT), Olympia, WA, USA, Oct 2021.
4. "A Cost-Effective Solution for Truck Parking Based on Artificial Intelligence", 2021 Western States Rural Transportation Technology Implementers Forum, Yreka, CA, USA, Sep 2021.
3. "Multi-Camera Multi-Target (MTMC) Vehicle Tracking and Re-identification Framework for Network-scale Traffic Sensing", University Transportation Center (UTC) Demonstrations, USDOT exhibit, Consumer Electronics Show (CES), Las Vegas, NV, USA, Jan 2020.
2. "Multi-View Vehicle Re-Identification using Temporal Attention Model and Metadata Re-ranking", Conference on Computer Vision and Pattern Recognition (CVPR) AI City Workshop, Long Beach, CA, USA, Jun 2019.
1. "Data Driven Solution for Network-Scale Traffic Signal Optimization", Third Di-Tech Competition organized by Didi Chuxing Technology Co., Beijing, China, Mar 2018.

## PROPOSAL WRITING

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9. **Under review.** Finished the initial draft for the Exploratory Advanced Research (EAR) Program proposal of Federal Highway Administration (FHWA), titled "Real-time Adaptive Privacy-preserving Assistance and Risk Analysis System for Vulnerable Road User (VRU) with Federated Learning and Edge Computing", \$800,000.
8. **Under review.** Contributed to a tier-one UTC proposal lead by Professor Asad J. Khattak at University of Tennessee, Center for Advancing Transportation Leadership and Safety (ATLAS Center), UW portion \$375,000.
7. **Under review.** Contributed to a tier-one UTC proposal lead by Professor Heng Wei at University of Cincinnati, Center for Sustainable and Climate-Friendly Connected Streets (SCCS), UW portion \$220,000.
6. **Under review.** Contributed to a tier-one UTC proposal lead by Professor Guohui Zhang at University of Hawaii at Manoa, Center for porT-ORiented Coastal Highway Eco-Systems (C-TORCHES), UW portion \$280,000.
5. **Under review.** Contributed to a regional UTC proposal lead by Professor Yin Hai Wang at University of Washington, Pacific Northwest Transportation Consortium (PacTrans).
4. **Accepted.** Finished the initial draft for UW team to the WSDOT Truck Parking Information and Management System (TPIMS) funded by Federal Motor Carrier Safety Administration (FMCSA), \$232,000. Dec 2021 – Sep 2025.
3. **Accepted.** Contributed to the proposal titled "Extending the SR-522 SPaT Challenge to Active Transportation Users", Washington State Department of Transportation, \$249,464. Oct 2018 – Sept 2021.
2. **Accepted.** Finished the initial draft titled "Real-Time Truck Parking Information Integration, Visualization and Prediction." for Washington State Department of Transportation (WSDOT), \$150,000, Sep 2019 -Mar 2021.
1. **Accepted.** Finished the initial draft titled "Enhancing Safety and Accessibility for Active Users at Signalized Intersections under the Signal Phasing and Timing (SPaT) Challenge", \$80,000, Mar 2021 – Mar 2022.

## TECHNICAL REPORTS

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5. Y. Wang, **H. Yang**, W. Sun, and Y. Zhuang. "Real-Time Truck Parking Information Integration, Visualization, and Prediction." Final Report for WSDOT, Dec 2021.
4. Y. Wang, W. Sun, **H. Yang**, C. Gottsacker, S. Ricord, and S. Yin. "Developing a Data-Driven Safety Assessment Framework for RITI Communities in Washington State." Final Report for CSET, Sep 2019.
3. Y. Wang, **H. Yang**, R. Ke, and Z. Zeng. "Data-Driven Analytical Framework and Algorithms for Traffic Emission Inventory." Research Report for Sichuan Energy Internet Research Institute, Jun 2019.
2. Y. Wang, H. Wang, Z. Li, **H. Yang**, K. Henrickson, J. Ash, C. Chen, and S. Dong. "Freeway Traffic Safety and Efficiency Enhancement through Adaptive Roadway Lighting and Control Enabled by Connected Infrastructure Networks." Final Research Report for WSDOT and PacTrans, Dec 2018.
1. Y. Wang, Y. Zhuang, R., C. Liu, Z. Pu, and **H. Yang**. "A Multi-Sensor Solution for Sound Transit Parking Space Detection." Final Research Report for Sound Transit, Dec 2018.

## PROFESSIONAL SERVICES & LEADERSHIP

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### Subcommittee Chair

Student Subcommittee, ASCE Transportation & Development Institute (T&DI) AI Committee, since 2022.

### Associate Editor

IEEE International Intelligent Transportation Systems Conference (ITSC), since 2021.

### Committee Member

Young Member, TRB Standing Committee on Information Systems and Technology (AED30), since 2022.

Young Member, TRB Standing Committee on Freight Transportation Data (AED70), since 2021.

Member, TRB Standing Committee on Trucking Industry Research (AT060), since 2021.

Student Member, ASCE Transportation & Development Institute (T&DI) Artificial Intelligence Committee, since 2020

### Conference Session Chair



National Science Foundation (NSF) AI in Transportation Workshop, the Frontiers of AI-empowered Methods and Solutions to Urban Transportation Challenges, Poster Session, Dec 2022, Gainesville, Florida

#### **Academic Society Membership**

Institute of Transportation Engineers (ITE)  
Institute of Electrical and Electronics Engineers (IEEE)  
American Society of Civil Engineers (ASCE)  
Chinese Overseas Transportation Association (COTA)

## **REFeree FOR JOURNALS AND CONFERENCES**

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### **Peer Review Journals**

Neurocomputing, since 2020  
Transportation Research Part C: Emerging Technologies, since 2018  
IEEE Transactions on Vehicular Technology, since 2020  
IEEE Transactions on Intelligent Transportation Systems, since 2017  
IEEE Transactions on Transportation Electrification, since 2022  
IEEE Transactions on Neural Networks and Learning Systems, since 2021  
IEEE Transactions on Circuits and Systems for Video Technology, since 2021  
IEEE Intelligent Transportation Systems Magazine, since 2017  
IEEE Transactions on Knowledge and Data Engineering, since 2021  
IEEE Internet of Things Journal, since 2022  
International Journal of Intelligent Systems, since 2021  
Journal of Advanced Transportation, since 2019  
IET Intelligent Transport Systems, since 2020  
Accident Analysis & Prevention, since 2020  
Transportation Research Record, since 2020  
Journal of Intelligent Transportation Systems, since 2018  
ASCE Journal of Transportation Engineering, Part A: Systems, since 2019  
Transportmetrica B-Transport Dynamics, since 2020  
Scientific Reports, since 2021  
PLoS ONE, since 2018

### **Conferences**

Conference on Computer Vision and Pattern Recognition (CVPR), since 2017  
Association for the Advancement of Artificial Intelligence (AAAI), since 2021  
IEEE International Conference on Computer Vision (ICCV), 2020  
Conference on Neural Information Processing Systems (NeurIPS), since 2021  
Special Interest Group on Knowledge Discovery and Data Mining (SIGKDD), since 2021  
IEEE International Intelligent Transportation Systems Conference, 2019-2020  
Transportation Research Board (TRB) Annual Meeting, Paper Reviewer for:  
    ACP15 Standing Committee on Intelligent Transportation Systems, 2019-2021  
    ACP15 Standing Committee on Freeway Operations, since 2020  
    ACP25 Standing Committee on Traffic Signal Systems, since 2020  
    ACP70 Standing Committee on Highway Traffic Monitoring, since 2021  
    AED30 Standing Committee on Information Systems and Technology, since 2019  
    AED50 Standing Committee on Artificial Intelligence and Advanced Computing Application, since 2017  
    AED70 Standing Committee on Freight Transportation Data, since 2021  
    AED80 Standing Committee on Visualization in Transportation, 2017-2018  
    AT060 Standing Committee on Trucking Industry Research, since 2021  
ASCE International Conference on Transportation & Development (ICTD), since 2020  
International Conference on Transportation Information and Safety, 2021  
COTA International Conference of Transportation Professionals, since 2019  
IEEE International Smart Cities Conference, since 2021

## TEACHING EXPERIENCE

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### **CET 327 Traffic Engineering**

*Teaching Assistant & Instructor of the Practice Session*

- Practice sessions (4 hours per week) design, organization and instruction.
- Homework grading and tutoring, simulation tutorials, and final exams preparation.

Winter Quarter, 2022  
*University of Washington*

### **CET 590 Traffic Systems Operations**

*Teaching Assistant*

- Homework grading and tutoring, simulation tutorials, and final exams preparation.

Fall Quarter, 2021  
*University of Washington*

### **CET590 Traffic Systems Operations**

*Guest Lecture*

- Topic: The Past and Future of Traffic Detection Systems - Eyes of Traffic Operators

Fall Quarter, 2021  
*University of Washington*

### **CSE 590 Ubiquitous Computing Seminar**

*Guest Lecture*

- Topic: Multi-camera System for Intelligent Transportation Systems, Opportunities and Challenges.

Spring Quarter, 2020  
*University of Washington*

## RESEARCH EXPERIENCE

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### **University of Washington**

*Research Assistant, Smart Transportation Application & Research Lab (STAR Lab)*

07/2017 – Present  
*Seattle, WA*

### **MIT-Cambridge-Tsinghua Center for Future Transport Research**

*Research Assistant*

01/2016 – 03/2017  
*Beijing & Boston, China & USA*

### **Key Lab of Universal Wireless Communication, Ministry of Education**

*Undergraduate Research Assistance, IoT System Center*

Jun. 2015 – Dec. 2015  
*Beijing, China*

### **Microsoft (China) Co., Ltd**

*Research Intern, Assistant Director, Smart City Group*

Jun. 2014 – Nov. 2014  
*Beijing, China*

## SKILLS

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- **Programming:** Python, C++, HTML/CSS, Java, R
- **Deep learning frameworks:** Pytorch, TensorFlow
- **Languages:** English, Mandarin