Yongqi Dong

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Junior Research Group Leader @ RWTH Aachen University
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EDUCATIONAL BACKGROUND

PhD in Transportation, Department of Transport & Planning, **Delft University of Technology** (**TU Delft)** Dec.2019-May.2025
Thesis: *Safe, Efficient, and Socially Compliant Automated Driving: Sensing, Anomaly Detection, Planning and Control*
Advisors: Prof.dr.ir. Bart van Arem and Dr.ir. Haneen Farah

Visiting PhD Researcher, Department of Mechanical Engineering, **University of California, Berkeley** May.2023- Oct.2023
Topic: *Socially Compliant Automated Driving via Deep Reinforcement Learning and Model-based Social-aware MPC*

Master of Control Science and Engineering, Department of Automation, **Tsinghua University** Sep.2014-Jul.2017
Minor: Master Project for Improving Ability in *Big Data*
Thesis: *Data-Driven Analysis on Group Behaviors of Taxi Drivers and Ridesourcing Drivers*
Nominated for Tsinghua University Outstanding Master Thesis Dissertation
Advisors: Prof. Li Li and Prof. Zuo Zhang

Bachelor of Telecommunication Engineering Sep.2010-Jul.2014
School of Electronic and Information Engineering, **Beijing Jiaotong University**
GPA: 91.5/100 | Rank: 1/202 | Postgraduate Recommendation to Tsinghua University without Examination
Thesis: *Design of vehicle-mounted data acquisition & communication unit for the WMN-based locomotive remote control*
Outstanding Undergraduate Thesis

PUBLICATIONS

*(Google Scholar ID: L2kD-DwAAAAJ. The superscript # indicates equal contribution, * indicates corresponding authors.)*

Key Journal Publications:

1. **Dong, Y.**, Patil, S., van Arem, B., & Farah, H. (2023). A Hybrid Spatial-temporal Deep Learning Architecture for Lane Detection. *Computer-Aided Civil and Infrastructure Engineering*, 38(1), 67-86. https://doi.org/10.1111/mice.12829 **[Top Q1**, ***IF*:8.5, *SJR*:2.972, *CiteScore*: 17.6**]**
2. **Dong, Y.**, Wang, Sh., Li, L., Zhang, Z. (2018). An Empirical Study on Travel Patterns of Internet Based Ride-Sharing, *Transportation Research Part C: Emerging Technologies* 86: 1-22. https://doi.org/10.1016/j.trc.2017.10.022 **[Highly cited**; **Top Q1**, ***IF*:7.6, *SJR*:2.86, *CiteScore*: 15.8]**
3. Li, R.[#], & **Dong, Y.**[#,*](2023). Robust Lane Detection Through Self Pre-Training With Masked Sequential Autoencoders and Fine-Tuning With Customized PolyLoss. *IEEE Transactions on Intelligent Transportation Systems*, vol. 24, no. 12, pp. 14121-14132, doi: https://doi.org/10.1109/TITS.2023.3305015. (Joint first author and corresponding author) **[Top Q1**, ***IF*:7.9, *SJR*:2.58, *CiteScore*: 14.8**]**
4. **Dong, Y.**[#,*], Zhang, L.[#], Farah, H., Zgonnikov, A., & van Arem, B. (2023). Data-driven Semi-supervised Machine Learning with Safety Indicators for Abnormal Driving Behavior Detection, (**accepted** by *Transportation Research Record: Journal of the Transportation Research Board*; **accepted** by and presented at *TRBAM2024* and *the 35th annual meeting of International Co-operation on Theories and Concepts in Traffic Safety (ICTCT 2023)*), Preprint
5. Farah, H., Postigo, I., Reddy, N., **Dong, Y.**, Rydergren, C., Raju, N., & Olstam, J. (2022). Modelling Automated Driving in Microscopic Traffic Simulations for Traffic Performance Evaluations: Aspects to Consider and State of the Practice. *IEEE Transactions on Intelligent Transportation Systems*, 2022, https://doi.org/10.1109/TITS.2022.3200176
6. Berge, B., de Winter, J., Dodou, D., Pooyan Afghari, A., Papadimitriou, E., Reddy, N., **Dong, Y.**, Raju, N., & Farah,

H., (2024). Understanding cyclists' perception of driverless vehicles through eye-tracking and interviews (**Accepted by** *Transportation Research Part F: Traffic Psychology and Behaviour*, **accepted** and **presented** at *ICTCT 2023*), Preprint **[Top Q1**, ***IF*:3.5, *SJR*:1.262, *CiteScore*: 7.6]**

Key Conference Proceeding Publications & Presentations:

- 1. Zhang, L.[#], **Dong, Y.** [#,*], Farah, H., & van Arem, B. (2023). Social-aware Planning and Control for Automated Vehicles based on Driving Risk Field and Model Predictive Contouring Control: Driving through Roundabouts as a Case Study. 2023 IEEE International Conference on Systems, Man, and Cybernetics (SMC), Honolulu, Oahu, HI, USA, 2023, pp. 3297-3304. http://dx.doi.org/10.1109/SMC53992.2023.10394462. (Co-first author and corresponding author, accepted and presented at *TRB's 2023 Automated Road Transportation Symposium*), Demo video
- 2. **Dong, Y.**[#,*], Lu, X.[#], Li, R., Song, W., van Arem, B., & Farah, H. (2023). Intelligent Anomaly Detection for Lane Rendering Using Transformer with Self-Supervised Pre-Training and Customized Fine-Tuning (**Accepted** and presented at TRB2024 and ***under second-round review*** by *Transportation Research Record: Journal of the Transportation Research Board*, **minor revision**), Preprint
- 3. **Dong, Y.**, Detema, T., Wassenaar, V., van de Weg, J., Kopar, T., & Suleman, H. (2023). Comprehensive Comparison of Deep Reinforcement Learning for Automated Driving on Various Driving Maneuvers with Simulation. *2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC)*, Bilbao, Spain, 2023, pp. 6165-6170, http://dx.doi.org/10.1109/ITSC57777.2023.10422159
- 4. **Dong, Y.**[#,*], Patil, S.[#], Farah, H, & Hellendoorn, J. (2023). Sequential Neural Network Model with Spatial-Temporal Attention Mechanism for Robust Lane Detection Using Multi Continuous Image Frames (**Presented** at *the Transportation Research Board (TRB) 102nd annual meeting TRB 2023*). TRBAM-23-04409 poster
- 5. Yuan, H., Li, P., van Arem, B., Kang, L., Farah, H., & **Dong, Y.**[*] (2023). Safe, Efficient, Comfort, and Energy-saving Automated Driving through Roundabout Based on Deep Reinforcement Learning. *2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC)*, Bilbao, Spain, 2023, pp. 6074-6079, http://dx.doi.org/10.1109/ITSC57777.2023.10422488 (Corresponding author and PI)
- 6. Xue, C.[#], **Dong, Y.**[#], Liu, J.[*] , Liao, Y., & Li, L. (2023). Design of the Reverse Logistics System for Medical Waste Recycling Part I: System Architecture and Disposal Site Selection Algorithm. *2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC)*, Bilbao, Spain, 2023, pp. 1741-1746, http://dx.doi.org/10.1109/ITSC57777.2023.10422624 (Co-first author)
- 7. Xue, C.[#], **Dong, Y.**[#], Liu, J.[*] , Liao, Y., & Li, L. (2023). Design of the Reverse Logistics System for Medical Waste Recycling Part II: Route Optimization with Case Study under COVID-19 Pandemic. *2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC)*, Bilbao, Spain, 2023, pp. 4011-4017. http://dx.doi.org/10.1109/ITSC57777.2023.10422236 (Co-first author)
- 8. **Dong, Y.**[*], Chen, K., Peng, Y., & Ma, Z. (2022). Comparative Study on Supervised versus Semi-supervised Machine Learning for Anomaly Detection of In-vehicle CAN Network. *2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC)*, 2022, pp. 2914-2919, https://doi.org/10.1109/ITSC55140.2022.9922235

Other Journal and Conference Publications:

- 1. Lingam, S. N., De Winter, J., **Dong, Y.**, Tsapi, A., Van Arem, B., & Farah, H. (2024). eHMI on the Vehicle or on the Infrastructure? A Driving Simulator Study. *European Journal of Transport and Infrastructure Research*, 24(2), 1–24. https://doi.org/10.59490/ejtir.2024.24.2.7273 *[Journal]*
- 2. **Dong, Y.**, Liu, C., Wang, Y., & Fu, Zh. (2024). Towards Understanding Worldwide Cross-cultural Differences in Implicit Driving Cues: Review, Comparative Analysis, and Research Roadmap. Accepted by and presented at *the 2024 IEEE 27th International Conference on Intelligent Transportation Systems (ITSC)*, Preprint *[Conference]*
- 3. Huang, Y.[#], **Dong, Y.**[#,*], Tang, Y., & Li, L. (2024). Leverage Multi-source Traffic Demand Data Fusion with Transformer Model for Urban Parking Prediction. **Accepted** by *the 28th International Conference Of Hong Kong*

Society For Transportation Studies (HKSTS 2024) and *the Conference in Emerging Technologies in Transportation Systems (TRC-30)* for presentation, Preprint *[Conference]*

- 4. **Dong, Y.**[#,*], Chen, K.[#], & Ma, Z. (2023). Comparative Study on Semi-Supervised Learning Applied for Anomaly Detection in Hydraulic Condition Monitoring System. *2023 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, Honolulu, Oahu, HI, USA, 2023, pp. 1702-1708, http://dx.doi.org/10.1109/SMC53992.2023.10394193 *[Conference]*
- 5. Raju, N., Schakel, W., Reddy, N., **Dong, Y.**, Farah, H. (2022). Car-Following Properties of a Commercial Adaptive Cruise Control System- A Pilot Field Test. *Transportation Research Record: Journal of the Transportation Research Board*, https://doi.org/10.1177/03611981221077085 *[Journal]*
- 7. **Dong, Y.**, Yang, Z., Yue, Y., Pei, X., & Zhang, Z. (2018). Revealing Travel Patterns of Sharing-bikes in a Spatial-temporal Manner Using Non-negative Matrix Factorization Method. In *CICTP 2018: Intelligence, Connectivity, and Mobility* (pp. 1665-1674). Reston, VA: American Society of Civil Engineers. https://doi.org/10.1061/9780784481523.165 *[Conference]*
- 7. Yue, Y., Pei, X., Yang, Z., **Dong, Y**., & Yao, D. (2018). A Trip Building and Chaining Methodology Using Traffic Surveillance Data. In *CICTP 2018: Intelligence, Connectivity, and Mobility* (pp. 2254-2262). Reston, VA: American Society of Civil Engineers. https://doi.org/10.1061/9780784481523.224 *[Conference]*
- 8. **Dong, Y.**, Zhang, Z., Fu, R., Xie, N. (2016). Revealing New York Taxi Drivers' Operation Patterns Focusing on the Revenue Aspect. (2016) In *12th World Congress* on *Intelligent Control and Automation (WCICA)*, (pp. 1052-1057). IEEE. https://doi.org/10.1109/WCICA.2016.7578771 *[Conference]*
- 9. **Dong, Y.**, Ruan, H., Cai, T., Peng, J, and Wang ,W. (2013). Using LED to Demonstrate the Composition of Simple Harmonic Motions and Five Polarization States of Light. *Physics Experimentation* 11:45-48 *[Journal]*

Under Review and Working Papers:

- 1. **Dong, Y.**, van Arem, B., & Farah, H. (2025). Safe and Socially-compliant Automated Driving through Integrating Multi-Agent Reinforcement Learning with SVO and MPCC (In preparation, to be submitted to *the Proceedings of the National Academy of Sciences, PNAS*)
- 2. **Dong, Y.**, Farah, H., & van Arem, B. (2024). Towards Developing Socially-Compliant Automated Vehicles: State of the Art, Experts Expectations, and a Conceptual Framework (**Accepted** by the 104th TRB Annual Meeting (TRB 2025) for poster presentation, and **presented** at *the 4th Symposium on Management of Future Motorway and Urban Traffic Systems (MFTS)*; ***Under Review*** by *Transportation Research Part E: Logistics and Transportation Review*), Preprint
- 3. Wu, C., Ji, J., Lu, R., Madadi, B., **Dong, Y.**, Varotto, S., Belkessa, L., Saunier, N., MacFarlane, G., Wang, L., Ghosh, B. (2024). Measuring Availability Features for Reproducibility in Transportation Research, to be submitted to *Transportation Research Part C*: *Emerging Technologies*, ***Under Review*** by *Transportation Research Symposium*
- 4. Patil, S.[#], **Dong, Y.**[#,*], Farah, H, & Hellendoorn, J. Sequential Neural Network Model with Spatial-Temporal Attention Mechanism for Robust Lane Detection Using Multi Continuous Image Frames (Joint first author and corresponding author, Journal of *Transportation Research Part C*: *Emerging Technologies*, ***Under Review***), Preprint
- 5. Zhang, Y., **Dong, Y.**[*] (2023). Optimization of coordinated flow restriction and skip-stopping schemes for urban rail stations considering platform carrying capacity (**Presented** at *the Transportation Research Board (TRB) 102nd annual meeting TRB 2023*, ***Under Review*** by *Transportation Research Record: Journal of the Transportation Research Board*). TRBAM-23-04413 poster, Preprint
- 6. Liu, W., Zhang, X., **Dong, Y.**, Xu, L. (2023). A Unified Model Predictive Control Method of Automated Vehicles for Lane Changing and Lane Keeping Maneuvers (***Under review*** by *Journal of Intelligent Transportation Systems*, *Minor*)
- 7. **Dong, Y.**[#,*], Reyna, C.F. [#], Klunder, G., Liao, F., & Rasouli, S. (2025) A Benchmarking Framework for Traffic Microsimulation Platforms: Case Study on Dutch Motorways with Dynamic Speed Limits. (Joint first author and corresponding author, *to be submitted* to *Transportation Research Part C: Emerging Technologies*)
- 8. Zhang, Y., **Dong, Y.**[*]., Evans, C., Rinaldi, M., Shyrokau, B., & Farah, H. (2025) Coordinated Planning and Control for

Connected and Automated Vehicles' On-ramp Merging in Mixed Traffic Through Value Decomposition-based Multiagent Deep Reinforcement Learning. (Corresponding author, *to be submitted* to *Transportation Research Part C: Emerging Technologies*)

- 9. Wu, G., **Dong, Y.*** Sequential Multimodal Deep Learning for Anomaly Detection in Weakly-Labeled Videos (Corresponding author, in preparation for Journal of *IEEE Transactions on Robotics*)
- 10. The Age of Smart Integrated Transportation: Practice of in the Digital Transformation of Transportation Industry [M]. *Publishing House of Electronics Industry*. [Involved as **reviewer** and **expert editor** for Preface, Chapters 1 & 13]

Open resource repository:

- Datasets, Simulation Platforms, and Relevant Publications on Emerging Mixed Traffic of AVs and HDVs

PATENTS & SOFTWARE COPYRIGHTS

✧ ***European and Dutch Patent:***

- **Dong, Y**. , Li, R. Automated lane detection (IDF OCT-22-060, **granted** on May 25, 2024, Patent number 2033551)
- Socially compliant Planning and Control for Automated Vehicles using Model-backend Deep Reinforcement Learning with Driving Risk Field and Model Predictive Contouring Control (OCT-23-056, N2035943, Submitted & **filed**)

✧ ***Chinese Invention Patent:***

- Intelligent Demonstration Instrument of Simple Harmonic Oscillation Composition and Five Polarization States of Light, Application ID: 201310123700.5, Date: 2013.08.07, Patent Number **CN103236211B**, **Publication** Date: 2016.07.06

✧ ***Software copyright:***

- Spatial-Temporal Attention Integrated Sequential Neural Network Model for Vision-based Robust Lane Detection Using Multi Continuous Image Frames (i-DEPOT 142731, **approved & registered**)
- Vision-Based Lane Detection System With Self-supervised Pre-training Through Masked Sequential Auto-encoders (Computer Software Copyright Registration in China, 2024SR1350911, **approved & registered**)

ACADEMIC SERVICES

Technical Committee (Chair) | Automated Mobility in Mixed Traffic | IEEE ITSS May.2024-Present

Establishing the interdisciplinary community: "Automated Mobility in Mixed Traffic"

IEEE ITSS New Initiatives Project Principal Investigator (PI) | IEEE ITSS Mar.2024-Present

Project: *Promoting interdisciplinary research towards the deployment of automated vehicles in mixed traffic*

Workshop Organizer (Primary coordinator) | 27th IEEE ITSC 2024, Edmonton, Canada Sep.24, 2024

Workshop title: Automated Mobility in Emerging Mixed Traffic

Workshop Organizer (Second coordinator) | 26th IEEE ITSC 2023, Bilbao, Bizkaia, Spain Sep. 24, 2023

Workshop title: Data-driven and Empirical Research for Emerging Mixed Traffic of Automated Vehicles and Human-driven Vehicles

Workshop Organizer (Primary coordinator) | IEEE IV 2023, Anchorage, USA Jun.4, 2023

Workshop title: Development of Socially-compliant Driving Behaviour for Automated Vehicles to Enhance Safety and Efficiency in Mixed Traffic

IEEE TCoS Seeding Project Leader (PI) | 2023 IEEE TAB Committee on Standards (TCoS) seed funding

Project title: *Enhancing the deployment of socially-compliant automated vehicles in mixed traffic* (website)

Ad-hoc Journal Reviewer Services

- International Journal of Computer Vision (**IF: 19.5**; Top AI journal)
- IEEE Transactions on Intelligent Transportation Systems
- IEEE Open Journal of Intelligent Transportation Systems
- Transportation Letters: the International Journal of Transportation Research

- Journal of Intelligent Transportation Systems: Technology, Planning, and Operations
- Journal of Transportation Research Record: Journal of the Transportation Research Board
- International Journal of Human-Computer Interaction
- Journal of Advanced Transportation
- Scientific Reports
- Applied Ergonomics
- European Transport Research Review
- ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering

Ad-hoc Conference Reviewer Services

- IEEE Intelligent Vehicles Symposium (IV) | Associate editor
- IEEE Intelligent Transportation Systems Conference (ITSC)
- Transportation Research Board (TRB) Annual Meeting
- World Congress on Intelligent Control and Automation (WCICA)
- COTA International Conference of Transportation Professionals (CICTP)
- The International Symposium on Transport Network Resilience (INSTR)

THESIS SUPERVISION

Yuteng Zhang | Master of Science in Transport, Infrastructure & Logistics Jan.2024-Nov.2024

Thesis title: Coordinated Planning and Control for Connected and Automated Vehicles' On-ramp Merging in Mixed Traffic Through Value Decomposition-based Multiagent Deep Reinforcement Learning

Cesar Flores Reyna | Master of Science in Sustainable Mobility Transitions, EIT, TU/e Jan.2024-Nov.2024

Thesis title: Investigating a Benchmarking Framework for the Large-Scale Micro Simulator (LSMS) Platform in Freeways under Dynamic Speed Limits

Mathijs den Otter | Master of Science in Civil Engineering–Transport and Planning Sep.2022-Dec.2023

Thesis title: Impact of Improved Lane Marking Properties on the Performance of Lane Keeping Assistance Systems in Varying Circumstances

Lanxin Zhang | Master of Science in Civil Engineering–Transport and Planning Oct.2022-Jun.2023

Thesis title: Semi-supervised Machine Learning for Abnormal Driving Behaviour Detection

Henan Yuan | Bachelor in Traffic and Transportation, BJTU&TUDelft TTE Oct.2022-Jun.2023

Thesis title: Deep Reinforcement Learning for Driving through Roundabouts

Shiva Nischal Lingam | Master of Science in Civil Engineering–Transport and Planning Jan.2021-Nov.2021

Thesis title: Effects of External Human Machine Interfaces on Automated Vehicles' Communicative Interactions With Human Drivers (Cum Laude) | Won 2nd Cuperusprijs prieze of KIVI

Sandeep Patil | Master of Science in Mechanical Engineering (Vehicular Engineering) Oct.2020-Aug.2021

Thesis title: Lane Detection using SpatioTemporal Attention

Eline van der Kooij | Master of Science in Transport, Infrastructure & Logistics Jul.2020-May.2021

Thesis title: Visibility of Lane Markings for Machine Vision

Sanny Toonen | Bachelor of Science in Civil Engineering–Transport and Planning Jul.2020-May.2021

Thesis title: Lane Recognition for Automated Vehicles

TEACHING ACTIVITIES

Project supervisor, Instructor | EEMCS, TU Delft Nov.2022-Feb.2024

Courses: Interdisciplinary Advanced AI Project (IFEEMCS520200); Capstone Applied AI Project (T13150TU)
Fundamentals of Artificial Intelligence Programme (IFEEMCS520100)

Teaching Assistant, Instructor | TU Delft and BJTU joint bachelor program Mar.2022 & Mar.2023

Course: Advanced Lecture "Trends in Transportation" 2022 & 2023

Lecturer | DakeOffer online Platform Mar.2020-Jun.2020 & Nov.2020-Jan.2021

Course: Introduction to Big Data and Artificial Intelligence: Fundamental and Practice

Teaching Assistant | Transport and Planning, TU Delft Apr.2020-Aug.2020 & Apr.2021-Aug.2021

Course: CIE5805 – Intelligent Vehicles for Safe and Efficient Traffic

Teaching Assistant | Department of Automation, Tsinghua University Sep.2016-Jan.2017

Course: Data Ethics

Teaching and Lab Assistant | Electrical and Electronic Lab Center, Tsinghua University Mar.2015-Jul.2016

Courses: Advanced Labs in Electronic Technology, Fundamentals of Electronics Power Technology

RSI Tutor | Center for Excellence in Education, USA Jul.2017-Aug.2017

Research writing and presentation tutor for the 2017 Research Science Institute Program at Tsinghua University

Undergraduate Counselor (Class 2012) **|** School of EIE, Beijing Jiaotong University Jul.2012- Jul.2014

TALKS & PRESENTATIONS

Promoting Diversity and Leadership in ITS | IEEE WiE/YP Workshop & Forum, Cairo, Egypt Nov.21.2023

Presentation topic: Resource Repository: Datasets, Simulation Platforms, and Relevant Publications for Emerging Mixed Traffic of Automated Vehicles and Human-driven Vehicles

Automated Round Transportation | TRB ARTS 2023, San Francisco, USA Jul.12.2023

Presentation topic: Social-aware Planning and Control for Automated Vehicles Based on Driving Risk Field and Model Predictive Contouring Control: Driving through Roundabouts as a Case Study

AI Applications in Transportation Planning | TRB 2023, Washington D.C., USA Jan.11.2023

Presentation topics: (1) Robust Lane Detection through Self Pre-training with Masked Sequential Autoencoders and Fine-tuning with Customized PolyLoss

(2) Sequential Neural Network Model with Spatial-Temporal Attention Mechanism for Robust Lane Detection Using Multi Continuous Image Frames

Research into Urban Rail Transit Operations and Design | TRB 2023, Washington D.C., USA Jan.11.2023

Presentation topic: Optimization of coordinated flow restriction and skip-stopping schemes for urban rail stations considering platform carrying capacity

Connected and Automated Vehicles | MFTS 2022, Dresden, Germany Dec.01.2022

Presentation topic: Towards Developing Socially-Compliant Automated Vehicles: State of the Practice, Experts Expectations, and a Conceptual Framework

Automated mobility | IEEE ITSS Young Professionals Fellowship Symposium, Chania, Greece Nov.25.2022

Presentation topic: Multi-goal proactive traffic management for mixed traffic of automated vehicles (AVs) and human-driven vehicles (HDVs) using explainable physics-informed Artificial Intelligence

AI, Security, Privacy and Safety Systems in ITS Applications| ITSC2022, Macow, China Oct.08.2022

Presentation topic: Comparative Study on Supervised *vs* Semi-supervised ML for Anomaly Detection of CAN Network

Research on AI and Advancing Computing Applications | TRB 2022, Washington D.C., USA Jan.12.2022

Presentation topic: A Hybrid Spatial-temporal Sequence-to-one Neural Network Model for Lane Detection

Challenges of Automated Vehicles and Traffic | University of Győr, Hungary May.28.2021

Talk topic: Deep learning for automated vehicles' operational design domain: problems, challenges, and case studies

SAMEN User Committee Annual Meeting | Dutch Research Council (NWO), Delft, Netherlands Jan.28.2021

Talk topic: Data-driven research for automated vehicles' operational design domain: a case study on perception

Intelligence, Connectivity, and Mobility | COTA CICTP 2018, Tsinghua University, China Jul.07.2018

Presentation topic: Revealing travel patterns of sharing-bikes in a spatial-temporal manner using the NFM method

World Congress on Intelligent Control and Automation | IEEE WCICA 2016, Guilin, China Jun.12.2016

Presentation topic: Revealing New York Taxi Drivers' Operation Patterns Focusing on the Revenue Aspect

HONORS & AWARDS

- **Chinese CSC Award for Outstanding Self-financed Students Abroad (6,000 $)**
- **TU Delft-Transport Institute Interdisciplinary Research Award (10,500 €)**
- **2023 IEEE TAB Committee on Standards (TCoS) seed funding (6,000 $)**
- **2024 IEEE ITSS New Initiatives Proposal Funding (5,000 $)**
- **IEEE ITSS Young Professionals Fellowship (Twice)**
- **Erasmus + mobility Grants (Three times)**
- **Outstanding College Graduates of Beijing (Top 1‰)**
- **National Scholarship (Top 1%)**
- First Class Tsinghua University RONG Scholarship
- Second-Class Merit Scholarship for Masters Tsinghua University
- Merit Student (Four times)
- First-Class Academic Fellowship (Top 1%, Twice)
- Second Prize in the 2012 & 2013 Undergraduate Electronic Design Contest in Beijing
- Bronze award in “Challenge Cup” Entrepreneurship Design Contest in Beijing
- First Prize in Freescale Cup University Students Intelligent Car Race (Rank 2nd)
- Second Prize in the Physical Experiment Competition in Beijing
- 2019 Microsoft Discover AI Challenge: *Sustainable Life* | Data-Driven All-in-one Shared Mobility | Top (10%)

RESEARCH EXPERIENCE

AI & Automated Mobility group | Institute of Highway Engineering **| RWTH Aachen University** Jun.2024-Present

- **AI-Enhanced Hierarchical Multi-objects Driving Risk Field Model Integrating Physics-Based and Human Perception-Based Approaches with Drivers’ Distraction**
  (PI, *Individual DFG*)
- **Explainable Mathematics-Enhanced AI Model for Multi-Modal Urban Traffic Prediction and Simulation** (Co-PI, *DFG Research Unit Proposal*)
- **Realistic Modelling of Cycling Behaviour and Interaction with Other Road Users in Mixed Traffic**
  (PI, *DFG Package Proposal*)
- **Parameter-Efficient Fine-Tuning of Pretrained Multimodal Large Vision Model (LVM) for Privacy-preserving Traffic Anomaly Detection with Thermal Imaging**

Traffic and Transportation Safety Lab | Department of Transport and Planning **| TU Delft** Dec.2019-Jun.2024

- **Data-driven and AI-based research for expanding Automated Vehicles’ Operational Design Domain in mixed traffic (part of SAMEN project)**
  - Developed a hybrid sequence-to-one model for lane detection in extremely hard driving scenes
  - Incorporated spatial-temporal attention for automated vehicles’ perception
  - Designed reliable data-driven algorithms for anomalies and abnormal behaviors prediction
  - Implemented Deep Reinforcement Learning (DRL) models for safe, reliable, and socially compliant automated driving under challenging manoeuvres involving both longitudinal and lateral control
  - Gaze behaviour of road users when interacting with an automated vehicle at an intersection: *Understanding*

cyclists' perception of driverless vehicles through eye-tracking and interviews

Mechanical Systems Control (MSC) Lab | Department of Mechanical Engineering **| UC Berkeley** May.2023-Oct.2023

Advisor: Prof. Masayoshi Tomizuka

- **Socially Compliant Automated Driving through DRL and Model-based Social-aware MPC**
  - Reviewed State-of-the-art Socially Compliant Automated Driving Methods in Literature
  - Developed Model-enhance Multi-agent Deep Reinforcement Learning with Social-aware MPC

Waterloo Artificial Intelligence Institute | Faculty of Engineering **| University of Waterloo** May.2018-Sep.2019

- **Applied Machine Learning, Artificial Intelligence, and Big Data Research**
  - 2018 Railroad Problem Solving Contest: Use CNN-LSTM-Dense Concatenated model to forecast train delays
  - A Deep Learning Framework for Traffic Forecasting: Exploring GCN joint with LSTM to predict traffic flow
  - Data-driven anomaly detection (unsupervised): Auto-Encoder, Hierarchical Extreme Learning Machines
  - Kaggle competition: Employ LSTM, LightGBM, XGBoost models to predict stock movements with news data
  - Deep reinforcement learning in traffic control: DQN, A3C, and PPO methods
  - Real-time Road Surface Condition (RSC) Monitoring: Adopt CNN to RSC image classification

Singapore-MIT Alliance for Research and Technology (SMART) Aug.2016-Sep.2016

Future Urban Mobility (FM) IRG | Project: *SimMobility* | Topic: Taxi Roaming

Advisors: Prof. Moshe BEN-AKIVA, Postdoctoral Associate Bat-hen NAHMIAS-BIRAN

- **Constructing a model tackling the taxi roaming (taxi service) problem, to be embedded into the *SimMobility* platform**
  - Proposed one advisable solution of cruising along hotspots through a cell-based logit-opportunity model improved by a data-driven method
  - Participated in building the architecture of the final model embedded in *SimMobility*

Intelligent Transportation Laboratory, Tsinghua National Laboratory for Information Science and Technology (TNList) | Advisors: Prof. Zuo Zhang and Prof. Li Li (*IEEE Fellow*) Sep.2014-May.2018

Transportation Research based on machine learning and data-driven methods

- **Revealing New York taxi drivers' operation patterns focusing on revenue**
  - Developed a method for classifying drivers into 3 groups based on their revenue: top, ordinary, low earner
  - Excavated the population operation patterns of different taxi driver groups through big data analytics
- **Influence of on-demand ridesourcing *vs.* traditional taxi based on machine learning and big data analytics**
  - Uncovered the differences between taxi service and ridesourcing using big data analysis and clustering
  - Applied non-negative matrix factorization (NMF) to obtain basis patterns of Taxi, Hitch and Express service
- **Influence of on-demand ridesourcing on vehicle emissions with big data analytics and PHEM model**
- **Fundamental research on intelligent parking guidance and recommendations based on machine learning**
  - Forecast models of travel time to parking lots (*Random Forest*); Guidance & optimization models for parking
  - Personalized recommendation research on parking (Collaborative Filtering and Content-based algorithm)
- **Study on key technology in Intelligent Vehicle Infrastructure Cooperative Systems (**IVICS**) (*863* Program)**
  - Contributed to the design report of basic technical framework and the overall demonstration of IVICS

The Freescale Cup College Students Intelligent Car Race: Intelligent car that can follow specific trajectories based on image processing, pattern recognition, and PID controller Jun.2012-Jun.2013

- **Hardware Aspect:** Designed the signal acquisition circuit and the core control circuit based on MC9S12XS256
- **Software Aspect:** Developed specific control strategies/algorithms for intelligent cars to follow given trajectories
- **Actuator:** Customized specific steering linkage, applied and tuned PID algorithms to control diversion and speed

WORKING EXPERIENCE

Junior Research Group Leader | AI & Automated Mobility Group | **RWTH Aachen University** Jun.2024-Present

- **Research** proposal initialization, preparation, and writing: German Research Foundation (DFG) and mFUND
- **Co-PI**: main responder and drafter for **three** DFG research proposals
- **Lead** the group and supervise the PhD/MSc students
- **Teaching** support for *Road Planning II* and *Machine Learning in Civil Engineering* (master's level)

PhD Researcher | **TTS Lab** | Department of Transport & Planning | **TU Delft** Dec.2019-Jun.2024

- Carried out PhD research work under the NWO funded SAMEN project
- Provided teaching assistance and evaluation support for various courses and supervised seven MSc students
- Published scientific papers and patents, presented research works in conferences and organized workshops

Visiting PhD Researcher | **MSC Lab** | Department of Mechanical Engineering | **UC Berkeley** May.2023-Oct.2023

- Carried out literature review and research work related to Socially Compliant Automated Driving

Research Assistant | Waterloo Artificial Intelligence Institute | **University of Waterloo** May.2018-Sep.2019

- Carried out research works related to applied Machine Learning, Artificial Intelligence, and Big Data in Transportation

Research Assistant | Transport Big Data Analytics | **ITS Lab, TNList@Tsinghua University** Aug.2017- May.2018

- Cross-domain data fusion for full-time trip chain reconstruction and anomaly detection;
- City Computing: Applying NMF methods to evaluate indicators describing urban function, land use, mobility, etc.
- Revealing collective travel patterns of *Shared Mobility* in a spatial-temporal manner

Carryout service data analysis Project Manager | Beijing Gooagoo Technical Service Co., Ltd. Jul.2016-Aug.2016

- Integral process of Big Data Analytics: Crawled carryout service data using Python crawler; executed data storage, data analysis, and data processing in a relational database (MySQL); visualization, clustering, and web application

Commentator | China International Congress on Intelligent & Connected Vehicles (CICV) Oct.2015-Oct.2015

- Introduced the i-VICS systems to audiences; received executives from automobile manufacturers BMW, Volvo, VW

LEADERSHIP & VOLUNTEER EXPERIENCE

Webmaster | Traffic and Transportation Safety (TTS) Lab Website, TU Delft Mar.2020-June.2024

- Responsible and volunteering for the TTS Lab website development and maintenance

Project Leader | Asian Youth Center: Leadership Development Training Program for Masters Jul.2015-Aug.2016

- Responsible for activities and competitions between overseas and Chinese students in the Asian Youth Center project
- ***Volunteer Leader*** in the 5th Joint School Symposium for the Asian Youth Center Project

iTalk Group Leader | International Department, Tsinghua University Postgraduate Association Oct.2014-Oct .2015

- Committed to speech in English given by students or alumni stars, held a special performance for overseas students

Volunteer | National Doctor Forum on Traffic and Transportation Engineering, Beijing Jiaotong University Jun.2011

SKILLS & MISCELLANEOUS

- Programming: Python (Tensorflow, PyTorch, Keras), Matlab, R, C/C++, Java, VHDL | Database: MySQL
- Deep Learning, Deep Reinforcement Learning, TRAIL Research School Diploma
- Hardware circuit design: Altium Designer | Software development on Linux and Windows
- Big data analytics and visualization methods | Cross-domain Data Fusion | Data-driven anomaly/fraud detection
- Languages: Chinese (Native); English (Professional); **Dutch** (Elementary)
- Hobbies: **Tai Chi, Kung Fu**, **Meditation,** Yoga, Chess, Reading, Mountain Hiking