Ding Zhao | Curriculum Vitae

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Education

University of Michigan **Ann Arbor**
Ph.D. in Mechanical Engineering *2011–2016*
Dissertation Title: "Accelerated Evaluation of Automated Vehicles"

Jilin University **Changchun, China**
Bachelor of Science in Automotive Engineering *2006–2010*
Summa Cum Laude. Thesis Title: "Design of a Four-wheel Steering and Driven By-Wire Vehicle"

Research Interests

Research Interests
Autonomous vehicles, intelligent/connected transportation, traffic safety, human machine interaction, rare events analysis, dynamics and control, machine learning, and big data analysis.

Projects

University of Michigan, Mechanical Engineering | Robotic Institute **Ann Arbor**
Assistant Research Scientist *2017-present*
Projects that I lead and co-lead are listed below. My funding mainly comes from automotive industry and federal government.

Funding Agency	Dates	Role	Project title	Budget
SFMotor	2017/1-2017/12	PI	Platform Construction and Basic Function Developments for Autonomous Vehicle	$150,000
SAIC	2017/6-2017/12	Co-PI	Methodology on Connected and Automated Vehicles Testing and Evaluation based on Accelerated Evaluation Theory	$118,316
DoE	2017/3-2020/3	Project Manager	Integrated power and thermal management for connected and automated vehicles through real-time adaptation and optimization	$1,600,000
Toyota Research Institute	2017/3-2019/2	Co-PI	Development of a "primary other test vehicle" for the testing and evaluation of high-level automated vehicles	$723,748
UM-MTC	2016/5-2017/12	PI	Development of evaluation approaches and the certificate system for automated vehicles based on the accelerated evaluation	$200,000
UM-MTC	2016/5-2017/12	Co-PI	Towards centimeter accurate localization using low cost GPS: algorithms for data fusing within V2X networks	$200,000
Denso	2015/9-2017/9	PI	Development of evaluation approaches and the certificate system for automated vehicles based on the accelerated evaluation	$170,000
Ford	2016/5-2018/9	Senior Member	Accelerated Evaluation of Automated Vehicles	$200,000
				$3,362,064

Publication

Peer-Reviewed Journals (In Review)

* Corresponding authors.

[J16] Macheng Shen, Jing Sun, **Ding Zhao***, "The Impact of Road Configuration in V2V-based Cooperative Localization: Mathematical Analysis and Real-world Evaluation," *IEEE Transactions on Intelligent Transportation Systems*, 2017.

[J15] Wenshuo Wang, **Ding Zhao***, "Evaluation of Lane Departure Correction Systems Using a Stochastic Driver Model," *IEEE Transactions on Intelligent Vehicle*, 2017.

[J14] Zhiyuan Huang, Henry Lam, David J. LeBlanc, **Ding Zhao***, "Accelerated Evaluation of Automated Vehicles using Piecewise Mixture Models," *IEEE Transactions on Intelligent Transportation Systems*, 2017.

[J13] Wenshuo Wang, **Ding Zhao**, Junqiang Xi*, J. Karl Hedrick, "Learning-Based Personalized Driver Model Using Bounded Generalized Gaussian Mixture Method," *IEEE Transactions on Cybernetics*, 2017.

[J12] Macheng Shen, **Ding Zhao***, Jing Sun, Huei Peng, "Improving Localization Accuracy in Connected Vehicle Networks Using Rao-Blackwellized Particle Filters: Theory, Simulations, and Experiments," *IEEE Transactions on Intelligent Transportation Systems*, 2017.

[J11] Shaobing Xu, Shengbo Eben Li*, Huei Peng, **Ding Zhao**, Bo Cheng, "A Non-Predictive Control for Vehicle Fuel-Oriented Cruising based on Equivalent Conversion between Kinetic-energy and Fuel," *Transportation Research Part B: Methodological*, 2017.

[J10] Wenshuo Wang, **Ding Zhao**, Junqiang Xi*, Wei Han, "A Learning-Based Approach for Lane Departure Warning Systems with a Personalized Driver Model," *IEEE Transactions on Industrial Electronics*, 2017.

[J9] Wenshuo Wang, **Ding Zhao**, Junqiang Xi*, J. Karl Hedrick, "Learning and Inferring a Driver's Brake Action in Car-Following Scenarios," *IEEE Transactions on Systems, Man and Cybernetics*, 2017.

Peer-Reviewed Journals (Accepted)

[J8] Wenshuo Wang, Chang Liu, **Ding Zhao***, "How Much Data is Enough? - A Statistical Approach with Case Study on Longitudinal Driving Behavior," *IEEE Transactions on Intelligent Vehicle*, 2017.

[J7] **Ding Zhao***, Xianan Huang, Huei Peng, Henry Lam, David J. LeBlanc, "Accelerated Evaluation of Automated Vehicles in Car-Following Maneuvers," *IEEE Transactions on Intelligent Transportation Systems*, 2017.

[J6] Xianan Huang*, **Ding Zhao**, Huei Peng, "Empirical Study on the Effective Range of DSRC using Naturalistic Driving Data," *IEEE Transactions on Intelligent Transportation Systems*, 2017.

[J5] **Ding Zhao***, Henry Lam, Huei Peng, David J. LeBlanc, Shan Bao, Kazutoshi Nobukawa, Christopher S. Pan, "Accelerated Evaluation of Automated Vehicles Safety in Lane-Change Scenarios Based on Importance Sampling Techniques," *IEEE Transactions on Intelligent Transportation Systems*, vol. 18, no. 3, pp. 595-607, March 2017.

[J4] Weichao Zhuang*, Xiaowu Zhang, **Ding Zhao**, Huei Peng, Lianmou Wang, "Optimal Design of Three-planetary-gear Power-split Hybrid Powertrains," *International Journal of Automotive Technology*, vol. 17, no. 2, pp. 299-309, Apr. 2016.

[J3] Kazutoshi Nobukawa*, Shan Bao, David J. LeBlanc, **Ding Zhao**, Huei Peng, Christopher S. Pan, "Gap Acceptance During Lane Changes by Large-Truck Drivers - An Image-Based Analysis," *IEEE Transactions on Intelligent Transportation Systems*, vol. 17, no. 3, Mar. 2016.

[J2] **Ding Zhao***, Wenfeng Cui, Haiyang Sun, "The Design and Analysis of Integrated-wheel Drive and Electric Steering Vehicle Traveling mechanism," *Science Technology and Engineering*, vol. 10, no. 19, pp. 4687-4692, 2010.

[J1] Jing Li*, **Ding Zhao**, Lin Zhu, Jun-Jie Liu, "Matching of Velocity Threshold for Vehicle Driving Fuel Economy Control Strategy," *Journal of Jilin University (Engineering and Technology Edition)*, vol. 40, no. 02, pp. 0320-0323, 2010.

Conferences Proceedings (In Review)

[C17] Zhiyuan Huang, Henry Lam, **Ding Zhao***, "Learning the Performances of Intelligent Vehicles with Gaussian Mixture and Monotonicity Information," *Proceedings of the IEEE 20th International Intelligent Transportation Systems Conference (**ITSC**)*, Yokohama, Japan, October 16-19, 2017.

Conferences Proceedings (Accepted)

[C16] Zhiyuan Huang, Henry Lam, **Ding Zhao***, "Towards Affordable On-track Testing for Autonomous Vehicle - A Kriging-based Statistical Approach," *Proceedings of the IEEE 20th International Intelligent Transportation Systems Conference (**ITSC**)*, Yokohama, Japan, October 16-19, 2017.

[C15] Macheng Shen, Jin Sun, **Ding Zhao***, "Optimization of Vehicle Connections in V2V-based Cooperative Localization," *Proceedings of the IEEE 20th International Intelligent Transportation Systems Conference (**ITSC**)*, Yokohama, Japan, October 16-19, 2017.

[C14] **Ding Zhao***, Yaohui Guo, Yunhan Jack Jia, "TrafficNet: An Open Naturalistic Driving Scenario Library," *Proceedings of the IEEE 20th International Intelligent Transportation Systems Conference (**ITSC**)*, Yokohama, Japan, October 16-19, 2017.

[C13] Zhiyuan Huang*, Henry Lam, **Ding Zhao**, "Sequential Experimentation to Evaluate Automated Vehicles," *Winter Simulation Conference (**WSC**)*, Las Vegas, U.S.A., December 3-6, 2017.

[C12] Baiming Chen, **Ding Zhao***, Huei Peng, "Evaluation of Automated Vehicles Encountering Pedestrians at Unsignalized Crossings," *IEEE Intelligent Vehicle Symposium (**IV**)*, Redondo Beach, U.S.A., June 11-14, 2017.

[C11] Xinpeng Wang, **Ding Zhao***, Huei Peng, David J. LeBlanc, "Analysis and Modeling of Unprotected Intersection Left-Turn Conflicts based on Naturalistic Driving Data," *IEEE Intelligent Vehicle Symposium (**IV**)*, Redondo Beach, U.S.A., June 11-14, 2017.

[C10] **Ding Zhao***, Wenshuo Wang, David J. LeBlanc, "Evaluation of Semi-autonomous Lane Departure Assistant System with Naturalistic Driving Data," *IEEE Intelligent Vehicle Symposium (**IV**)*, Redondo Beach, U.S.A., June 11-14, 2017.

[C9] Yunhan Jack Jia, **Ding Zhao***, Qi Alfred Chen, Z. Morley Mao, "Towards Secure and Safe Appified Automated Vehicles," *IEEE Intelligent Vehicle Symposium (**IV**)*, Redondo Beach, U.S.A., June 11-14, 2017.

[C8] Macheng Shen, **Ding Zhao***, Jing Sun, "Effect of Road Configurations on GNSS-based Cooperative Localization Using Map Matching," *IEEE 85th Vehicular Technology Conference (**VTC**)*, Sydney, Australia, June 4-7, 2017.

[C7] Zhiyuan Huang, **Ding Zhao***, Henry Lam, David J. LeBlanc, Huei Peng, 'Evaluation of Automated Vehicles in the Frontal Cut-in Scenario - an Enhanced Approach using Piecewise Mixture Model," *IEEE International Conference on Robotics and Automation (**ICRA**)*, Singapore, May 29-June 3, 2017.

[C6] Wenshuo Wang, **Ding Zhao**, Junqiang Xi*, David J. LeBlanc, J. Karl Hedrick, "Development and Evaluation of Two Learning-Based Personalized Driver Models for Car-Following Behaviors," *American Control Conference (**ACC**)*, Seattle, U.S.A., May 24-26, 2017.

[C5] Macheng Shen, **Ding Zhao***, Jing Sun, "Enhancement of Low-cost GNSS Localization in Connected Vehicle Networks using Rao-Blackwellized Particle Filters," *Proceedings of the IEEE 19th International Intelligent Transportation Systems Conference (**ITSC**)*, Rio de Janeiro, Brazil, Nov 1-4, 2016.

[C4] **Ding Zhao***, Huei Peng, Henry Lam, Shan Bao, Kazutoshi Nobukawa, David J. LeBlanc, Christopher S. Pan, "Accelerated Evaluation of Automated Vehicles in Lane Change Scenarios," in *Proceedings of the ASME 2015 Dynamic Systems and Control Conference (**DSCC**)*, Columbus, U.S.A., Oct 28-30, 2015.

[C3] **Ding Zhao***, Huei Peng, Shan Bao, Kazutoshi Nobukawa, David J. LeBlanc, Christopher S. Pan, "Accelerated Evaluation of Automated Vehicles using Extracted Naturalistic Driving Data," *Proceedings of the 24th Symposium of the International Association for Vehicle System Dynamics (**IAVSD**)*, Graz, Austria, August 17-21, 2015.

[C2] **Ding Zhao***, Huei Peng, Kazutoshi Nobukawa, Shan Bao, David J. LeBlanc, Christopher S. Pan, "Analysis of Mandatory and Discretionary Lane Change Behaviors for Heavy Trucks," in *the 14th International Symposium on Advanced Vehicle Control (**AVEC**)*, Tokyo, Japan, September 22-26, 2014.

[C1] **Ding Zhao***, Haiyang Sun, and Wenfeng Cui, "Research on the Platform Design and Control System for the Wheel-side Steering-driving Coordination Vehicle," in *the 2010 IEEE International Conference on Mechatronics and Automation (**ICMA**)*, Xi'an, China, August 4-7, 2010.

Granted Patent

[P6] CN 101973307 B, Main pin zero bias wire-controlled independent driven and steering automobile running mechanism and electric vehicle.

[P5] CN 201842130 U, Electromobile and drive-by-wire independent driving and steering automobile traveling mechanism with zero-offset master pin.

[P4] CN 101648573 B, Automobile traveling mechanism with wheel hub comprehensively drive and turning.

[P3] CN 201494493 U, Vehicle walking mechanism with wheel edge combination driving and steering.

[P2] CN 201198869 Y, Bidirectional bearing.

[P1] CN201187538 Y, Sliding clutch.

Invited Talks

Uber
"Accelerated Evaluation of Self-driving Vehicles," Pittsburgh, PA, USA, 2017

General Motor
"Towards Zero Crash - The Modern Testing of AVs," Webex, 2017

Mcity
"White Paper on Accelerated Evaluation," Ann Arbor, MI, USA, 2017

China Academy of Telecommunication Research
"Development of Test Scenarios for Connected and Automated Vehicles - Our Work at Mcity," Beijing, China, 2017

Tongji University
"Learning the Limitations of Intelligent Agents - a New Accelerated Evaluation Approach," Shanghai, China, 2017

Shanghai Automotive Industry Corporation
"Accelerated Evaluation, Big Naturalistic Driving Data, and How They Work Together for AV Testing," Shanghai, China, 2017

University of Michigan Transportation Institute
"OpenCAV: an Open Collebrative Platform for Connected and Autonomous Vehicle Research," Ann Arbor, Michigan, 2017

Lawrence Berkeley National Laboratory
"Building Trust in Connected and Automated Vehicles," Berkeley, California, 2017

Tsinghua University
"Is an Automated Vehicle Safe? - Evaluation methods of Automated Vehicles," Beijing, China, 2016

Baidu
"Testing Highly Intelligent Vehicles," Beijing, China 2016

Yutong Bus
"Test and Evaluation of Automated Vehicles," Zhengzhou, China, 2016

University of California, Berkeley
"Accelerated Evaluation based on Importance Sampling Theory," Berkeley, California, 2016

Appointments and Experience

Robotic Institute, University of Michigan **Ann Arbor**
Assistant Research Scientist *2017–present*

Department of Mechanical Engineering, University of Michigan **Ann Arbor**
Assistant Research Scientist *2017–present*

University of Michigan Transportation Research Institute **Ann Arbor**
Research Fellow *2016–2017*
Projects:
- "Crash Avoidance SystemsâĂŞSafety Evaluationof an Important Class of Electronic Control Systems", funded by Toyota.

Department of Mechanical Engineering, University of Michigan **Ann Arbor**
Graduate Student Research Assistant *2011–2016*
Projects:
- "Computationally efficient and robust design codes for power-split hybrid powertrains", 2014-2015, funded by MTRAC.
- "Evaluation of commercial vehicle active safety systems and their effect on truck driver behaviors", 2012-2015, funded by CDC/NIOSH.
- "A portable brake control and diagnosis system for stopping distance reduction and braking efficiency assessment", 2011-2013, funded by Ford.

Internship at Ford Motor Company **Dearborn**
Design Engineer *2013.5–2013.12*
Developed an automated diagnosis and evaluation toolbox and verified it via simulation, bench tests, and on-track tests.

Jilin University **Changchun, China**
Research Assistant *2006–2010*
Projects:
- "Analysis of dynamics for the next generation electric vehicle", 2009-2011, funded by the Ministry of Education of the People's Republic of China.
- "Study on the fuel consumption of a new type of clutch", 2007-2009, funded by the Ministry of Education of the People's Republic of China.
- 8^{th} place in China, captain, Formula SAE competition, 2011.
- 3^{rd} place in China, member, 2008 championship of the Honda Energy-Saving Sports Tournament.
- 3^{rd} place in China, member, 2007 championship of the Honda Energy-Saving Sports Tournament.

Awards

2015: Best poster awards, 2nd place in UMTRI Transportation Safety Research Symposium

2011: Fellowship Award, Mechanical Engineering, University of Michigan, Ann Arbor1

2010: Summa Cum Laude (0.034 %), highest honor among 40,000 undergraduate students in Jilin University

2010: Honor Student of Changchun City, Changchun city Government, China

2010: The Red Flag Scholarship, First Automobile Works Group Corporation

2010: National Scholarship, the Ministry of Education of the P.R. of China

2009: National Scholarship, the Ministry of Education of the P.R. of China

2009: Academic Star, Jilin University

Academic Service

Invited Session Organizer

Serve as the organizer in ASME Committee on Automotive and Transportation Systems and the IEEE Committee on Automotive Controls of the Control Systems Society

- 2016 Dynamic Systems and Control Conference
- 2017 American Control Conference

Reviewer

- IEEE Vehicular Technology Magazine
- Transportation Research Part C
- Simulation Modelling Practice and Theory
- IEEE Intelligent Transportation Systems
- IEEE Intelligent Transportation Systems Conference
- Traffic Injury Prevention
- SAE international Conference
- IEEE Transactions on Human-Machine Systems
- Mechatronics