

Wenhao Ding

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Education

Carnegie Mellon University, Pittsburgh, USA <i>Ph.D. Mechanical Engineering</i>	<i>Aug 2019 - May 2024 (Expected)</i>
Carnegie Mellon University, Pittsburgh, USA <i>M.S. Machine Learning</i>	<i>Jan 2021 - Dec 2022</i>
Tsinghua University, Beijing, China <i>B.Eng. Electronic Engineering</i>	<i>Aug 2014 - July 2018</i>

Research Interests

My research lies in closing the loop of agent and environment from the data perspective. I believe that building safe, robust, and generalizable autonomy relies on both powerful algorithms and suitable environments for training and validating the algorithms. To achieve this goal, I work on the following directions:

- Increase data coverage:** Generate critical scenarios for scaling up training and validation.
Increase data efficiency: Discover underlying causality for learning interpretable representation.

Research Experience

NVIDIA Research, Santa Clara, USA <i>Research Scientist Intern, Autonomous Vehicle Group</i>	<i>July 2023 - Now</i>
Amazon Lab126, Sunnyvale, USA <i>Applied Scientist Intern</i>	<i>May 2022 - Aug 2022</i>
Bosch Center for Artificial Intelligence, Pittsburgh, USA <i>Machine Learning Research Intern</i>	<i>May 2021 - Aug 2021</i>
Chinese University of HongKong, HongKong, China <i>Research Assistant</i>	<i>July 2017 - Sep 2017</i>

Publication

Conference and Journal Paper

- [NeurIPS'23] Seeing is not Believing: Robust Reinforcement Learning against Spurious Correlation
**Wenhao Ding, *Laixi Shi, Yuejie Chi, Ding Zhao*
- [ICML'23] Bayesian Reparameterization of Reward-Conditioned Reinforcement Learning with Energy-based Models
**Wenhao Ding, *Tong Che, Ding Zhao, Marco Pavone*
- [ICRA'23] Learning to View: Decision Transformers for Active Object Detection
Wenhao Ding, Nathalie Majcherczyk, Mohit Deshpande, Xuwei Qi, Ding Zhao, Rajasimman Madhivanan, Arnie Sen
- [T-ITS'23] A Survey on Safety-critical Scenario Generation for Autonomous Driving – A Methodological Perspective
Wenhao Ding, Chejian Xu, Haohong Lin, Bo Li, Ding Zhao

5. [CoRL'23] What Went Wrong? Closing the Sim-to-Real Gap via Differentiable Causal Discovery
*Peide Huang, Xilun Zhang, Ziang Cao, Shiqi Liu, Mengdi Xu, **Wenhao Ding**, Jonathan Francis, Bingqing Chen, Ding Zhao*
6. [NeurIPS'22] Generalizing Goal-Conditioned Reinforcement Learning with Variational Causal Reasoning
Wenhao Ding, Haohong Lin, Bo Li, Ding Zhao
7. [NeurIPS'22] SafeBench: A Benchmarking Platform for Safety Evaluation of Autonomous Vehicles
Chejian Xu, **Wenhao Ding, Weijie Lyu, Zuxin Liu, Shuai Wang, Yihan He, Hanjiang Hu, Ding Zhao, Bo Li*
8. [CoRL'22] CausalAF: Causal Autoregressive Flow for Goal-Directed Safety-Critical Scenes Generation
Wenhao Ding, Haohong Lin, Bo Li, Ding Zhao
9. [RA-L'21] Multimodal Safety-Critical Scenarios Generation for Decision-Making Algorithms Evaluation
Wenhao Ding, Baiming Chen, Bo Li, Kim Ji Eun, Ding Zhao
10. [ICRA'21] Context-Aware Safe Reinforcement Learning for Non-Stationary Environments
*Baiming Chen, Zuxin Liu, Jiacheng Zhu, Mengdi Xu, **Wenhao Ding**, Liang Li, Ding Zhao*
11. [AISTATS'21] Deep Probabilistic Accelerated Evaluation: A Certifiable Rare-Event Simulation Methodology for Black-Box Autonomy
Mansur Arief, Zhiyuan Huang*, Guru Kumar, Yuanlu Bai, **Wenhao Ding**, Henry Lam, Ding Zhao*
12. [NeurIPS'20] Task-Agnostic Online Reinforcement Learning with an Infinite Mixture of Gaussian Processes
*Mengdi Xu, **Wenhao Ding**, Jiacheng Zhu, Zuxin Liu, Baiming Chen, Ding Zhao*
13. [IROS'20] Learning to Collide: An Adaptive Safety-Critical Scenarios Generating Method
Wenhao Ding, Baiming Chen, Minjun Xu and Ding Zhao
14. [ICRA'20] CMTS: Conditional Multiple Trajectory Synthesizer for Generating Safety-critical Driving Scenarios
Wenhao Ding, Mengdi Xu and Ding Zhao
15. [ICRA'19] A New Multi-vehicle Trajectory Generator to Simulate Vehicle-to-Vehicle Encounters
Wenhao Ding, Wenshuo Wang and Ding Zhao
16. [T-ASLP'19] Adaptive Multi-scale Detection of Acoustic Events
Wenhao Ding and Liang He
17. [DCASE'19] Prior Knowledge-based Regularization for Sound Event Localization and Detection
Wenhao Ding*, Jingyang Zhang* and Liang He
18. [Interspeech'19] Multi-Scale Time-Frequency Attention for Acoustic Event Detection
*Jingyang Zhang, **Wenhao Ding**, Jintao Kang and Liang He*
19. [Interspeech'18] MTGAN: Speaker Verification through Multitasking Triplet Generative Adversarial Networks
Wenhao Ding and Liang He
20. [ROBIO'18] Hierarchical Reinforcement Learning Framework towards Multi-agent Navigation
Wenhao Ding, Shuaijun Li and Huihuan Qian
21. [ROBIO'18] Vehicle Pose and Shape Estimation through Multiple Monocular Vision
Wenhao Ding, Shuaijun Li, Guilin Zhang, Xiangyu Lei and Huihuan Qian

Workshop Paper and Preprint

22. Semantically Controllable Scene Generation with Guidance of Explicit Knowledge
Wenhao Ding, Bo Li, Kim Ji Eun, Ding Zhao

Environment Generation for Generalizable Robots (EGG) Workshop at **RSS** 2023
Knowledge and Logical Reasoning in the Era of Data-driven Learning Workshop at **ICML** 2023

23. Safety-aware Causal Representation for Trustworthy Reinforcement Learning in Autonomous Driving
*Haohong Lin, *Wenhao Ding, Zuxin Liu, Yaru Niu, Jiacheng Zhu, Yuming Niu, Ding Zhao*
Preprint arXiv:2311.10747
24. Your Room is not Private: Gradient Inversion Attack for Deep Q-Learning
*Miao Li, *Wenhao Ding, Ding Zhao*
Preprint arXiv:2306.09273
25. Certifiable Deep Importance Sampling for Rare-Event Simulation of Black-Box Systems
Mansur Arief, Yuanlu Bai, Wenhao Ding, Shengyi He, Zhiyuan Huang, Henry Lam, Ding Zhao
Preprint arXiv:2111.02204
26. Trustworthy Reinforcement Learning Against Intrinsic Vulnerabilities: Robustness, Safety, and Generalizability
**Mengdi Xu, *Zuxin Liu, *Peide Huang, Wenhao Ding, Zhepeng Cen, Bo Li, Ding Zhao*
Preprint arXiv:2209.08025

Honors & Awards

2023 - NeurIPS Scholar Award
2022 - Qualcomm Innovation Fellowship Winner, North America
2022 - CMU K&L Gates Presidential Fellowship, College of Engineering Nominee
2022 - NeurIPS Scholar Award
2019 - CMU Graduate Student Assembly/Provost Conference Funds
2018 - Tsinghua University Outstanding Bachelor Thesis Award (5%)
2017 - 34th Tsinghua University Academic Challenge Cup (*Second prize*)
2016 - Fellowship of Spark Talents Program (*50 recipients in Tsinghua per year*)

Academic Services

Conference Reviewer: ICML 22-23, ICLR 22-24, NeurIPS 21-23 (top reviewer), AISTATS 23-24, ECCV 22, CVPR 22-24, ICCV 21-23, ICRA 20-24, IROS 20-23, ICME 20-23

Journal Reviewer: TMLR, IEEE RA-L, IEEE Access, IEEE T-ITS, IEEE TII, IEEE MM

Organizer: CVPR 2023 Secure and Safe Autonomous Driving Workshop and Challenge
ICRA 2022 SeasonDepth Challenge

Program Committee: NeurIPS 2022 ML4AD Workshop
NeurIPS 2022 TSRML Workshop
IJCAI 2022 AI4AD Workshop and Challenge

Students Mentored

Miao Li, <i>Ph.D. student in CMU</i>	<i>Aug 2022 - Now</i>
Haohong Lin, <i>Ph.D. student in CMU</i>	<i>Aug 2021 - Now</i>
Shuai Wang, <i>Master's student in CMU</i>	<i>Aug 2021 - May 2023</i>
Guilin Zhang, <i>Master's student in CMU, now in Google</i>	<i>Aug 2021 - May 2022</i>
Yihan He, <i>Master's student in CMU, now in DeepRoute</i>	<i>Aug 2021 - May 2022</i>
Jiayi Xia, <i>Master's student in CMU, now in Zoox</i>	<i>Oct 2021 - May 2022</i>
Minjun Xu, <i>Master's student in CMU, now in Akuna Capital</i>	<i>Oct 2020 - May 2021</i>

Invited Talks

Critical Scenario Generation for Trustworthy Autonomy <i>ZhiDongXi MOOCs (online)</i>	<i>June 8 2023</i>
Critical Scenario Generation for Trustworthy Autonomy <i>Department of Electronic Engineering, Tsinghua, China, host by Prof. Liang He (online)</i>	<i>Apr 12 2023</i>
Critical Scenario Generation for Trustworthy Autonomy <i>AISOC Lab, CMU, USA, host by Prof. Fei Fang</i>	<i>Mar 21 2023</i>
Generalizing Goal-Conditioned Reinforcement Learning with Variational Causal Reasoning <i>AI Timer, China (online)</i>	<i>Feb 16 2023</i>
Safety-critical Scenarios Generation with Causal Discovery <i>Wayve, UK (online)</i>	<i>Oct 26 2022</i>
Safety-Critical Driving Scenario Generation – and What Lessons We Have Learned <i>University of Pennsylvania, USA (online), host by Prof. Rahul Mangharam</i>	<i>Feb 28 2022</i>
Safety-critical Scenarios Generation for Autonomous Vehicles <i>Stanford University, USA (online), host by Prof. Mykel Kochenderfer</i>	<i>Jan 31 2022</i>