Wenhao Ding

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Education

Carnegie Mellon University, Pittsburgh, USA *Aug 2019 - May 2024 (Expected)*
Ph.D. Mechanical Engineering

Carnegie Mellon University, Pittsburgh, USA *Jan 2021 - Dec 2022*
M.S. Machine Leaning

Tsinghua University, Beijing, China *Aug 2014 - July 2018*
B.Eng. Electronic Engineering

Research Interests

My research lies in closing the loop of intelligent robot learning and effective data collection. 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 these directions:

Deep Generative Models: Generate critical data for scaling up robot training and validation.

Causal Structure Discovery: Discover underlying causality for making interpretable decisions.

Imitation / Reinforcement Learning: Improve generalization and robustness of autonomous agents.

Research Experience

NVIDIA Research, Santa Clara, USA *July 2023 - Now*
Research Scientist Intern, Autonomous Vehicle Group

Amazon Lab126, Sunnyvale, USA *May 2022 - Aug 2022*
Applied Scientist Intern

Bosch Center for Artificial Intelligence, Pittsburgh, USA *May 2021 - Aug 2021*
Machine Learning Research Intern

Chinese University of HongKong, HongKong, China *July 2017 - Sep 2017*
Research Assitant

Publication

Conference and Journal Paper

1. [NeurIPS'23] Seeing is not Believing: Robust Reinforcement Learning against Spurious Correlation
   ***Wenhao Ding**, *Laixi Shi, Yuejie Chi, Ding Zhao*

2. [ICML'23] Bayesian Reparameterization of Reward-Conditioned Reinforcement Learning with Energy-based Models
   ***Wenhao Ding**, *Tong Che, Ding Zhao, Marco Pavone*

3. [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*

4. [ICRA'23] Learning to View: Decision Transformers for Active Object Detection
   ***Wenhao Ding**, Nathalie Majcherczyk, Mohit Deshpande, Xuewei Qi, Ding Zhao, Rajasimman Madhivanan, Arnie Sen*

5. [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*
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**, Baimimng 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, *Ph.D. student in CMU*	*Aug 2022 - Now*
Haohong Lin, *Ph.D. student in CMU*	*Aug 2021 - Now*
Shuai Wang, *Master's student in CMU*	*Aug 2021 - May 2023*
Guilin Zhang, *Master's student in CMU, now in Google*	*Aug 2021 - May 2022*
Yihan He, *Master's student in CMU, now in DeepRoute*	*Aug 2021 - May 2022*
Jiayi Xia, *Master's student in CMU, now in Zoox*	*Oct 2021 - May 2022*
Minjun Xu, *Master's student in CMU, now in Akuna Capital*	*Oct 2020 - May 2021*

Manoj Bhat, *Master's student in CMU, now in Amazon* *Oct 2020 - May 2021*

Invited Talks

Critical Scenario Generation for Trustworthy Autonomy *June 8 2023*
ZhiDongXi MOOCs (online)

Critical Scenario Generation for Trustworthy Autonomy *Apr 12 2023*
Department of Electronic Engineeing, Tsinghua, China, host by Prof. Liang He (online)

Critical Scenario Generation for Trustworthy Autonomy *Mar 21 2023*
AISOC Lab, CMU, USA, host by Prof. Fei Fang

Generalizing Goal-Conditioned Reinforcement Learning with Variational Causal Reasoning *Feb 16 2023*
AI Timer, China (online)

Safety-critical Scenarios Generation with Causal Discovery *Oct 26 2022*
Wayve, UK (online)

Safety-Critical Driving Scenario Generation – and What Lessons We Have Learned *Feb 28 2022*
University of Pennsylvania, USA (online), host by Prof. Rahul Mangharam

Safety-critical Scenarios Generation for Autonomous Vehicles *Jan 31 2022*
Stanford University, USA (online), host by Prof. Mykel Kochenderfer