

PEIDE HUANG

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EDUCATION

Carnegie Mellon University

September 2020 - September 2024

Ph.D. in Mechanical Engineering (SafeAI Lab)

M.S. in Machine Learning

Pittsburgh, PA, US

Stanford University

September 2018 - April 2020

M.S. in Mechanical Engineering (Robotics Track), GPA: 3.9/4.0

Stanford, CA, US

Nanyang Technological University, Singapore

September 2014 - May 2018

B.E. in Aerospace Engineering with Highest Distinction, GPA: 4.9/5.0

Singapore

CURRENT RESEARCH

Peide's research goal is to develop and understand the co-evolution strategy of the learning environments and the learning agents, with the objective of ensuring trustworthy deployment in the physical world. His work demonstrates that safety, robustness, and efficiency can be achieved through strategic training and comprehensive evaluation. He also leverages curriculum learning, game theory, and foundation models to tackle real-world challenges in robotics and autonomous driving.

Keywords: *reinforcement learning, robotics, large foundation models*

SELECTED PUBLICATIONS

* indicates equal contribution.

1. **CaDRE: Controllable and Diverse Generation of Safety-Critical Driving Scenarios using Real-World Trajectories**
Peide Huang, Wenhao Ding, Jonathan Francis, Bingqing Chen, Ding Zhao.
Preprint
2. **Gradient Shaping for Multi-Constraint Safe Reinforcement Learning**
Yihang Yao, Zuxin Liu, Zhepeng Cen, **Peide Huang**, Tingnan Zhang, Wenhao Yu, Ding Zhao.
6th Annual Learning for Dynamics & Control Conference (L4DC 2024)
3. **Creative Robot Tool Use with Large Language Models**
Mengdi Xu*, **Peide Huang***, Wenhao Yu*, Shiqi Liu, Xilun Zhang, Yaru Niu, Tingnan Zhang, Fei Xia, Jie Tan, Ding Zhao.
Preprint
4. **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
7th Conference on Robot Learning (CoRL 2023)
5. **Continual Vision-based Reinforcement Learning with Group Symmetries**
Shiqi Liu*, Mengdi Xu*, **Peide Huang**, Yongkang Liu, Kentaro Oguchi, Ding Zhao
7th Conference on Robot Learning (CoRL 2023) (Oral, 6.6%)
6. **Curriculum Reinforcement Learning using Optimal Transport via Gradual Domain Adaptation**
Peide Huang, Mengdi Xu, Jiacheng Zhu, Laixi Shi, Fei Fang, Ding Zhao.
The 36th Conference on Neural Information Processing Systems (NeurIPS 2022)
7. **Robust Reinforcement Learning as a Stackelberg Game via Adaptively-Regularized Adversarial Training**

Peide Huang, Mengdi Xu, Fei Fang, Ding Zhao.

The 31st International Joint Conference on Artificial Intelligence (IJCAI 2022).

8. **Scalable Safety-Critical Policy Evaluation with Accelerated Rare Event Sampling**
Mengdi Xu, **Peide Huang**, Fengpei Li, Jiacheng Zhu, Xuwei Qi, Kentaro Oguchi, Zhiyuan Huang, Henry Lam, and Ding Zhao.
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022).
9. **Group Distributionally Robust Reinforcement Learning with Hierarchical Latent Variables**
Mengdi Xu, **Peide Huang**, Yaru Niu, Visak Kumar, Jielin Qiu, Chao Fang, Kuan-Hui Lee, Xuwei Qi, Henry Lam, Bo Li, Ding Zhao.
The 26th International Conference on Artificial Intelligence and Statistics (AISTATS 2023)
10. **Cardiac Disease Diagnosis on Imbalanced Electrocardiography Data Through Optimal Transport Augmentation**
Jielin Qiu, Jiacheng Zhu, Mengdi Xu, **Peide Huang**, Michael Rosenberg, Douglas Weber, Emerson Liu, Ding Zhao
2023 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2023)
11. **Latent Goal Allocation for Multi-Agent Goal-Conditioned Self-Supervised Imitation Learning**
Peide Huang^{*}, Rui Chen^{*}, and Laixi Shi^{*}.
NeurIPS 2021 Bayesian Deep Learning Workshop.
12. **Trustworthy Reinforcement Learning Against Intrinsic Vulnerabilities: Robustness, Safety, and Generalizability**
Peide Huang^{*}, Mengdi Xu^{*}, Zuxin Liu^{*}, Wenhao Ding, Zhepeng Cen, Bo Li, Ding Zhao.
Preprint
13. **Multimodal Representation Learning of Cardiovascular Magnetic Resonance Imaging**
Jielin Qiu^{*}, **Peide Huang**^{*}, Makiya Nakashima, Jaehyun Lee, Jiacheng Zhu, Wilson Tang, Pohao Chen, Christopher Nguyen, Byung-Hak Kim, Debbie Kwon, Douglas Weber, Ding Zhao, David Chen.
Preprint

AWARDS AND HONORS

- CMU Machine Learning Department Fellowship 2023-2024
- NeurIPS 2022 Scholar Award
- NeurIPS 2022 Top Reviewer (8% of all reviewers)
- ICLR 2021 Travel Award
- NTU 2016 President Research Scholar with Distinction

INTERNSHIP EXPERIENCE

Apple, AIML

Machine Learning Research Intern

May 2024 - August 2024

California, US

- Develop large foundation models for decision-making and robotics.

Bosch Center for Artificial Intelligence

Machine Learning Research Intern

May 2023 - August 2023

Pennsylvania, US

- Proposed a novel sim-to-real approach that aligns the robot simulator with the real world by discovering the causal relationship between the simulator parameters and the sim-to-real gap.
- Proposed a safety-critical scenario generation method for autonomous vehicle evaluation.

Flexiv Robotics Ltd.*System Engineer Intern*

June 2019 - September 2019

California, US

- Established a new experimental software and hardware framework to expedite the prototyping and testing procedure of products in development. Developed a multi-threaded inter-process communication software library to achieve more robust and faster communication between middle-ware modules.
- Coordinated with senior engineers and managers to ensure smooth integration of the new framework into the R&D department. Constructed a standard operating procedure for the experimental setup.

Agency for Science, Technology and Research, Singapore*Research Assistant*

January 2017 - June 2017

Singapore

- Designed and developed a variable footprint, Omni-directional mobile robotic platform that can change the morphology for increased stability or compactness in response to the task requirements.
- Communicated with the supervisor and managed the project timeline, budgeting, and deliverables.

SERVICES

Conference Reviewer

NeurIPS, ICML, ICLR, AISTATS, ICASSP, CVPR

Journal Reviewer

TPAMI, IJCV

TEACHING AND LEADERSHIP EXPERIENCE

CMU Modern Control Theory, Fall 2021

Head of teaching assistants

CMU Linear Control Systems, Fall 2020

Head of teaching assistants

NTU Introduction to Computing, Spring 2016

Peer tutor

NTU Robotics Club

Co-founder and Vice President