Tairan He

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Education

Carnegie Mellon University — *Pittsburgh, USA*
PH.D. IN ROBOTICS — *Aug. 2023 - Present*

Shanghai Jiao Tong University — *Shanghai, China*
B.ENG. IN COMPUTER SCIENCE — *Aug. 2018 - Jun. 2023*

Research Interests

My research lies at the intersection of **robotics**, **learning**, and **control**. I am focused on enabling robots to perform useful tasks with **adaptability**, **agility**, **generalizability**, and **safety**, utilizing learning-based methods that scales with data and computation. I am passionate about humanoid robots, pushing them toward achieving human-level capabilities.

Honors and Awards (Selected)

2024 **RI Presidential Fellowship**, CMU RI Departmental PhD Fellowships.
2024 **Outstanding Student Paper Award Finalist - Top 3**, Robotics: Science and Systems.
2021 **Microsoft Star of Tomorrow**, top-performing interns at Microsoft.
2020 **Shanghai Jiao Tong University Excellent Scholarship**, top 10% students in SJTU.
2019 **Zhiyuan Honorary Scholarship**, top 5% students in SJTU.

Publications (*equal contribution)

PREPRINTS

[P1] HOVER: Versatile Neural Whole-Body Controller for Humanoid Robots.
Tairan He*, Wenli Xiao*, Toru Lin, Zhengyi Luo, Zhenjia Xu, Zhenyu Jiang, Jan Kautz, Changliu Liu, Guanya Shi, Xiaolong Wang, Linxi "Jim" Fan†, Yuke Zhu†
Under review, 2024 [Paper]

CONFERENCE PROCEEDINGS

[C14] OmniH2O: Universal and Dexterous Human-to-Humanoid Whole-Body Teleoperation and Learning.
Tairan He*, Zhengyi Luo*, Xialin He*, Wenli Xiao, Chong Zhang, Kris Kitani, Weinan Zhang, Changliu Liu, Guanya Shi.
CoRL, 2024 [Paper]

[C13] WoCoCo: Learning Whole-Body Humanoid Control with Sequential Contacts.
Chong Zhang*, Wenli Xiao*, Tairan He, Guanya Shi.
CoRL (Oral), 2024 [Paper]

[C12] Learning Human-to-Humanoid Real-Time Whole-Body Teleoperation.
Tairan He*, Zhengyi Luo*, Wenli Xiao, Chong Zhang, Kris Kitani, Changliu Liu, Guanya Shi
IROS, 2024 (Oral) [Paper]

[C11] Progressive Adaptive Chance-Constrained Safeguards for Reinforcement Learning.
Zhaorun Chen, Binhao Chen, Tairan He, Liang Gong, Chengliang Liu.
IROS, 2024 [Paper]

[C10] Agile But Safe: Learning Collision-Free High-Speed Legged Locomotion.
Tairan He*, Chong Zhang*, Wenli Xiao, Guanqi He, Changliu Liu, Guanya Shi.
RSS, 2024 (Outstanding Student Paper Award Finalist - Top 3) [Paper]

[C9] Safe Deep Policy Adaptation.
Wenli Xiao*, Tairan He*, John Dolan, Guanya Shi.
ICRA, 2024 [Paper]

[C8] State-wise Safe Reinforcement Learning: A Survey.
Weiye Zhao, Tairan He, Rui Chen, Tianhao Wei, Changliu Liu.
IJCAI (Survey Track), 2023. [Paper]

[C7] Probabilistic Safeguard for Reinforcement Learning Using Safety Index Guided Gaussian Process Models.
Weiye Zhao*, Tairan He*, Changliu Liu.
L4DC, 2023. [Paper]

[C6] Visual Imitation Learning with Patch Rewards.
Minghuan Liu, Tairan He, Weinan Zhang, Shuicheng Yan, Zhongwen Xu.
ICLR, 2023. [Paper]

[C5] Safety Index Synthesis via Sum-of-Squares Programming.
Weiye Zhao*, Tairan He, Tianhao Wei, Simin Liu, Changliu Liu.
ACC, 2023. [Paper]

[C4] AutoCost: Evolving Intrinsic Cost for Zero-violation Reinforcement Learning.
Tairan He, Weiye Zhao, Changliu Liu.
AAAI, 2023. [Paper]

[C3] Reinforcement Learning with Automated Auxiliary Loss Search.
Tairan He, Yuge Zhang, Kan Ren, Minghuan Liu, Che Wang, Weinan Zhang, Yuqing Yang, Dongsheng Li.
NeurIPS, 2022. [Paper]

[C2] Model-free Safe Control for Zero-Violation Reinforcement Learning.
Weiye Zhao, Tairan He, Changliu Liu.
CoRL, 2021. [Paper]

[C1] Energy-Based Imitation Learning.
Minghuan Liu, Tairan He, Minkai Xu, Weinan Zhang.
AAMAS, 2021 (Oral) [Paper]

Research Experience

NVIDIA Research — *Santa Clara, USA*
Research Intern at GEAR Lab, advised by Jim Fan and Yuke Zhu — *Jun. 2024 - Present*
- **Research Topics**: humanoid whole-body control, dexterous bimanual manipulation.

Carnegie Mellon University — *Pittsburgh, USA*
PhD Student, advised by Prof. Guanya Shi and Prof. Changliu Liu — *Aug. 2023 - Present*
- **Research Topics**: reinforcement learning, humanoid teleoperation, agile legged robots.

Carnegie Mellon University — *Pittsburgh, USA*
Research Assistant at Intelligent Control Lab, advised by Prof. Changliu Liu — *Jan. 2022 - Jan. 2023*
- **Research Topics**: safe reinforcement learning, safe control, control theory.

Microsoft Research — *Shanghai, China*
Research Intern, advised by Kan Ren and Yuge Zhang — *Mar. 2021 - Dec. 2021*
- **Research Topics**: auto ML, reinforcement learning.

Shanghai Jiao Tong University — *Shanghai, China*
Research Assistant at APEX Lab, advised by Prof. Weinan Zhang — *Jul. 2019 - Jan. 2023*
- **Research Topics**: reinforcement learning, imitation learning.

Academic Services

Reviewer	ICML, ICLR, NeurIPS, CoRL, Humanoids, CDC, L4DC, AAAI 2021-Present
Teaching Assistant	CMU 16-831 Introduction to Robot Learning [Link] 2024
Co-Orgnizer	CMU Learning and Control Seminar [Link] 2024

Skills

Programming	Python, C/C++, LaTeX, JAVA, Node.js, Wolfram Language, SQL, Linux, MATLAB, PHP
Frameworks	PyTorch, Tensorflow, NumPy, Flask, MySQL, Git, Anaconda, OpenCV, ROS.
Platforms	Kinova, Rosbot. Unitree Go1, Unitree H1, Fourier GR-1

Project Portfolio (Selected)

SJTU Anonymous Forum — *Shanghai, China*
Founder & Developer. [Android Code] / [iOS Code] / [Farewell Video] — *Feb. 2020 - Apr. 2021*
- Develoed a care-free forum platform for SJTU students to share and talk using anonymous identities.
- More than **10000+** users used this app in the SJTU campus.

Invited Talks

[T2] Learning Humanoid Generalist Agility by Unifying Cognitive and Physical Intelligence.
UCL MLLM Seminar, *OpenDriveLab*, *Tsinghua IIIS*, *SJTU Navigation Seminar*, *Guest Lecture at USC CS699*, 2024

[T1] Bridging Safety, Agility and Generalization for Learning-Based Robotic Control.
TechBeat, 2024 [Link]

Press Coverage (Selected)

[M7] "Swift and Secure: CMU Researchers Develop Collision-Free, High-Speed Robots"
by Mallory Lindahl, CMU Robotics News, 2024 [Link]

[M6] "Human to Humanoid: Your Weekly Selection of Awesome Robot Videos"
by Evan Ackerman, IEEE Spectrum, 2024 [Link]

[M5] "System Enables Human-to-Humanoid Robot Operation"
by Scarlett Evans, IoT World Today, 2024 [Link]

[M4] "Human-to-humanoid Robot Full-body Teleoperation Unlocked in Real-time"
by Jijo Malayil, Interesting Engineering, 2024 [Link]

[M3] "A scalable reinforcement learning–based framework to facilitate the teleoperation of humanoid robots"
by Ingrid Fadelli, Tech Xplore, 2024 [Link]

[M2] "CMU's Agile Robot Dog is Half the Size of Spot, Can Avoid Obstacles at High-Speed"
by Jackson Chung, TechEBlog, 2024 [Link]

[M1] "Video Friday: Agile but Safe: Your Weekly Selection of Awesome Robot Videos"
by Evan Ackerman, IEEE Spectrum, 2024 [Link]