

Yifan Sun

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EDUCATION

Carnegie Mellon University

Pittsburgh, PA

Ph.D. in Robotics; Advisor: Prof. Changliu Liu

Sept. 2024–Present

Research interests: safe planning, learning, and control; humanoid safety and whole-body control; dexterous manipulation; safe human–robot interaction.

Carnegie Mellon University

Pittsburgh, PA

M.S. in Mechanical Engineering–Research; GPA: 3.98/4.0

Sept. 2021–May 2023

Selected coursework: planning and decision-making in robotics, deep reinforcement learning for robot decision-making, robot localization and mapping, machine learning, and engineering optimization.

Xi'an Jiaotong University

Xi'an, China

B.S. in Mechanical Engineering; GPA: 3.87/4.3

Sept. 2016–June 2020

Selected coursework: computer systems, microcomputer principles and interfaces, and intelligent control.

RESEARCH STATEMENT

My research develops intelligent decision-making and motion-control methods that enable complex robotic systems—especially humanoids—to operate safely in dynamic, contact-rich environments. I study scalable safety analysis, safe learning and control, and dexterous whole-body interaction, with applications to human–robot collaboration and industrial automation.

PUBLICATIONS

CONFERENCE PAPERS

C1. Learning Safe-Stopability Monitors for Humanoid Robots

Y. Sun, Y. Pan, S. Li, C. Ding, T. Cui, L. Wang, and C. Liu

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2026.

C2. SPARK: Safe Protective and Assistive Robot Kit

Y. Sun, R. Chen, K. S. Yun, Y. Fang, S. Jung, F. Li, B. Li, W. Zhao, and C. Liu

14th IFAC Symposium on Robotics (ROBOTICS), 2025.

C3. Continual Learning and Lifting of Koopman Dynamics for Linear Control of Legged Robots

F. Li, A. Abuduweili, Y. Sun, R. Chen, W. Zhao, and C. Liu

7th Annual Learning for Dynamics & Control Conference (L4DC), PMLR 283:136–148, 2025.

C4. Learn With Imagination: Safe Set Guided State-wise Constrained Policy Optimization

Y. Sun*, F. Li*, W. Zhao*, R. Chen, T. Wei, and C. Liu

Learning for Dynamics & Control Conference (L4DC), 2025.

C5. Absolute Policy Optimization: Enhancing Lower Probability Bound of Performance with High Confidence

W. Zhao*, F. Li*, Y. Sun, R. Chen, T. Wei, and C. Liu

International Conference on Machine Learning (ICML), 2024.

C6. Hybrid Task Constrained Incremental Planner for Robot Manipulators in Confined Environments

Y. Sun, W. Zhao, and C. Liu

American Control Conference (ACC), 2024.

C7. A Lightweight and Transferable Design for Robust LEGO Manipulation

R. Liu, Y. Sun, and C. Liu

International Symposium on Flexible Automation (ISFA), 2024.

C8. Jerk-bounded Position Controller with Real-Time Task Modification for Interactive Industrial Robots

R. Liu, R. Chen, Y. Sun, Y. Zhao, and C. Liu

IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2022.

JOURNAL PAPERS

J1. State-wise Constrained Policy Optimization

W. Zhao, R. Chen, Y. Sun, F. Li, T. Wei, and C. Liu

Transactions on Machine Learning Research (TMLR), 2024.

J2. GUARD: A Safe Reinforcement Learning Benchmark

W. Zhao*, Y. Sun*, F. Li, R. Chen, R. Liu, T. Wei, and C. Liu

Transactions on Machine Learning Research (TMLR), 2024.

WORKSHOP PAPERS

W1. Calibrating AI Trust in Complementary Human-AI Collaboration

H. Hu, Y. Sun, and C. Liu

ICRA Workshop on Public Trust in Autonomous Systems, 2025.

W2. NeSyPack: A Neuro-Symbolic Framework for Bimanual Logistics Packing

B. Li, P. Yu, Z. Tang, H. Zhou, Y. Sun, R. Liu, and C. Liu

RSS Workshop on Benchmarking Robot Manipulation: Improving Interoperability and Modularity, 2025.

W3. Robotic LEGO Assembly and Disassembly from Human Demonstration

R. Liu, Y. Sun, and C. Liu

ACC Workshop on Recent Advancement of Human Autonomy Interaction and Integration, 2023.

PREPRINTS

P1. λ -Reachability: Geometric-Horizon Safety Bellman Equations for Humanoid Safety

R. Chen, S. Li, Y. Sun, and C. Liu

arXiv:2606.16022, 2026.

P2. Contingency Planning for Safety-Critical Autonomous Vehicles: A Review and Perspectives

L. Zheng, L. Zhang, P. Yu, Y. Sun, S. Grammatico, J. Ma, and C. Liu

arXiv:2601.14880, 2026.

P3. Dexterous Safe Control for Humanoids in Cluttered Environments via Projected Safe Set Algorithm

R. Chen, Y. Sun, and C. Liu

arXiv:2502.02858, 2025.

P4. Absolute State-wise Constrained Policy Optimization: High-Probability State-wise Constraints Satisfaction

W. Zhao, F. Li, Y. Sun, Y. Wang, R. Chen, T. Wei, and C. Liu

arXiv:2410.01212, 2024.

*Equal contribution.

EXPERIENCE

Intelligent Control Lab, Robotics Institute, Carnegie Mellon University

Pittsburgh, PA

Research Assistant

Sept. 2021–Present

Develop novel methods for safe planning, learning, and control for humanoid and industrial robotic systems using C++, Python, ROS/ROS 2, MuJoCo, and Isaac Sim.

Instinct Robotics, Inc.

Pittsburgh, PA

Robotics Research Intern

May 2025–Aug. 2025

Developed ROS 2 modules, simulation infrastructure, and motion-planning algorithms for industrial grinding pipelines under physical and dynamic constraints.

Siemens, Inc. | Future of Automation Team

Princeton, NJ

Automation Runtime Systems Intern

July 2023–Oct. 2023

Developed an AR-enhanced, real-time human-robot collaboration system integrating Apple Vision Pro with industrial robots through Siemens' industrial network middleware, OIE.

Zoox, Inc. | Motion Planning and Control Team

Foster City, CA

Software Engineer Intern

May 2022–Aug. 2022

Delivered a new collision-avoidance feature for autonomous vehicles using C++, Protocol Buffers, Bazel, and GTest; evaluated it on more than 7,000 miles of driving data.

SKILLS

Programming: C/C++, Python, MATLAB, Swift, Java
Robotics and ML: ROS/ROS 2, PyTorch, Isaac Sim, MuJoCo, Gazebo, Webots
Tools: Git, Bazel, Protocol Buffers, GTest, SolidWorks
Expertise: robot planning and control, safe reinforcement learning, reachability and safety analysis, humanoid whole-body control, dexterous manipulation, human–robot interaction

ACADEMIC SERVICE

Conference reviewer: NeurIPS 2025; ICRA 2026
Journal reviewer: IEEE Robotics and Automation Letters (RA-L); IEEE Transactions on Industrial Electronics (T-IE)

PROFESSIONAL ACTIVITIES

Demo: “Real-Time Safe Control for Human–Humanoid Interaction” **Nov. 2025**
XRTC Symposium *Pittsburgh, PA*

Presentation: “SHARE: Safe Human–Robot Interaction under Augmented Reality Environment” **May 2025**
Northeast Systems and Control Workshop *New York City, NY*

Presentation: “Automatic Polishing of Complex Surfaces by Real-Time Planning and Control” **Nov. 2023**
Pittsburgh Robotics Discovery Day *Pittsburgh, PA*

HONORS AND AWARDS

First Prize, What Bimanuals Can Do (WBCD) Competition, IEEE ICRA	2025
Outstanding Graduate	2020
Outstanding Student Leader	2019
Robot Skills World Champion, VEX Robotics World Championship	2019
First Prize Scholarship (top 5%)	2019
National Scholarship (top 1%)	2018
National Scholarship (top 1%)	2017