

# Yilang Liu

(+1) 513-223-2453

[yilang.liu@yale.edu](mailto:yilang.liu@yale.edu)

---

## EDUCATION

### Yale University

*Ph.D. Candidate in Mechanical Engineering*

*M.S. & M.Phil in Mechanical Engineering (en route to Ph.D.)*

New Haven, CT

*Expected Graduation May 2027*

### Carnegie Mellon University

*M.S. in Mechanical Engineering – Research Program*

Pittsburgh, PA

*May 2022*

### Chongqing University

*B.E. in Mechanical Design, Manufacture and Automation*

Chongqing, China

*April 2020*

### University of Cincinnati

*B.S. in Mechanical Engineering (Cum Laude)*

Cincinnati, OH

*April 2020*

---

## PUBLICATION

You, Haoxiang, **Liu, Yilang**, Ian Abraham "[Accelerating Visual-Policy Learning through Parallel Differentiable Simulation](#)". Advances in Neural Information Processing Systems (**Spotlight** NeurIPS 2025)

**Liu, Yilang**, Haoxiang You, and Ian Abraham. "[Sample-Based Hybrid Mode Control: Asymptotically Optimal Switching of Algorithmic and Non-Differentiable Control Modes](#)". IEEE International Conference on Robotics and Automation (ICRA) 2026,

Christian Hughes, **Yilang Liu**, Julia Engdahl, Houston Warren, Darrick Lee, Fabio Ramos, Travis Miles, Ian Abraham "Asymptotically Optimal Ergodic Coverage on Generalized Motion Fields". Robotics: Science and Systems 2026 (under review)

**Liu, Yilang**, and Haoxiang You. "[Hybrid Mode Sample-Based Control](#)". RSS 2025 Workshop on Whole-Body Control and Bimanual Manipulation: Applications in Humanoids and Beyond, 2025,

**Liu, Y.**, and Barati Farimani, A. "[An Energy-Saving Snake Locomotion Pattern Learned in a Physically Constrained Environment With Online Model-Based Policy Gradient Method](#)." ASME. J. Mechanisms Robotics.

**Y. Liu**, Y. Chen, H. Li. "[Design an Augmentation Exoskeleton to Enhance lifting Strength](#)" ASME IMECE2020-24658, 2020

---

## RESEARCH EXPERIENCE

### Asymptotically Optimal Ergodic Coverage on Generalized Motion Fields

New Haven, CT

*Advisor: Prof. Ian Abraham*

*06/2025-Present*

- Developed a flow-adaptive ergodic trajectory optimization framework for robotic exploration in time-varying environments using Maximum Mean Discrepancy (MMD) metrics.
- Derived a theoretical formulation of ergodic coverage on evolving domains, enabling coverage guarantees under dynamic flow fields.
- Designed and implemented a sampling-based trajectory optimization algorithm capable of planning exploration paths in non-convex and flow-constrained environments.
- Demonstrated the approach on multiple robotic platforms, including aerial drones (crazyflies) and Unitree Go2 quadruped robots, validating coverage performance in both simulation and real-world experiments.
- Achieved up to **42% improvement** in exploration performance over information-theoretic baselines in dynamic flow environments.

### [Accelerating Visual-Policy Learning through Parallel Differentiable Simulation](#)

New Haven, CT

*Advisor: Prof. Ian Abraham*

*01/2025-06/2025*

- Proposed **D.Va (Decoupled Visual-Based Analytical Policy Gradient)**, a novel method for accelerating visual policies by **10x wall-clock time** using parallel differentiable simulation.
- Proposed to decouple visual observations from computation graphs, eliminating differentiating through rendering and achieving training a humanoid running policy in **4 hours** on a single GPU.
- Implemented visual policy learning method from differentiable rendering as baseline comparison using PyTorch3D and proving smoother first-order policy gradient without differentiating through render.
- Benchmarked model-free and model-based visual policy learning approaches and showed **5x higher rewards** in humanoid running tasks against existing algorithms.
- Provided an empirical analysis of analytical policy gradients and highlighted the new opportunities for integrating policy learning with trajectory optimization techniques.

## Sample-Based Hybrid Mode Control

Advisor: Prof. Ian Abraham

New Haven, CT  
12/2024-04/2025

- Designed a sample-based control strategy for high-dimensional long-horizon tasks using hybrid control theory, achieving complex mode switching behaviors.
- Analyzed theoretical correctness and proved performance guarantees on optimizing mode sequencing.
- Achieved **85% higher reward** in manipulation and **41% in humanoid locomotion** vs. baselines, enabling contact-rich in-hand manipulation.
- Implemented state estimation module for real world Unitree Go2 deployment based on an extended Kalman filter using proprioception information.
- Deployed **real-time torque-level** agile locomotion of a Unitree Go2 quadruped capable of switching from footstand to handstand within sample-based predictive control framework.

## **Stochastic Hybrid Control for Evaluating and Learning Adaptive Locomotion Skills**

Advisor: Prof. Ian Abraham

New Haven, CT  
08/2023-04/2024

- Designed an approach of assessing locomotion policy optimality via optimal control principles
- Proposed to integrate arbitrary policies learned offline with dynamic models learned online to determine the local optimality for legged locomotion policies
- Demonstrated efficient policy learning empirically by significantly reducing the wall clock training time while still achieving robust adaptive locomotion skills in hours instead of days

## **PROFESSIONAL EXPERIENCE**

---

### **Yale University**

Graduate Student Researcher

New Haven, CT  
09/2022-Present

- Conduct research in robotics and autonomous systems, developing algorithms for data-driven robotics controls and vision-based policy learning.
- Served as Teaching Fellow for ENAS 773: Introduction to Robotics, Control, and Learning, leading recitations, mentoring student projects, holding office hours, and grading coursework.
- Completed Ph.D. qualifying examination and graduate coursework in robotics, control, and machine learning.

### **Dexmate Inc.**

Robotics Intern

Santa Clara, CA  
10/2025-01/2026

- Trained a reinforcement learning policy using Proximal Policy Optimization (PPO) on [Dexmate Vega](#), a mobile robot with dual arm design, guided by the motion planning techniques (RRT). Achieving 100% success rate of grasping cube using 6-DoF dexterous hand in Genesis and Isaac Sim environment.
- Deployed imitation learning algorithm Action Chunking with Transformers (ACT) on the real Dexmate Vega robot with policy trained from bimanual teleoperated dataset. Achieving successful bottle grasping and placing from vision.
- Implemented a Vision-Language-Action (VLA) model  $\pi_{0.5}$  for real robot deployment and smoothed up the action chunk transition with Real-Time Action Chunking (RTC) in PyTorch. Achieving smooth action execution with high speed control rate ( $\sim 20$ Hz).
- Optimized and streamlined the existing training and deployment framework in LeRobot. Achieving comprehensive log and checkpoint saving on Wandb.

## **SKILLS**

---

Robotic Platform: Simulation: MuJoCo, Isaac Gym, Genesis, Brax. Hardware: ROS 1, ROS 2, Unitree A1, Unitree Go2  
Programming Language: Python, C++