Lizhi (Gary) Yang

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Education

California Institute of Technology
Ph.D. Candidate, Mechanical Engineering (Robotics, Controls and Dynamics)   *Expected 2027*

California Institute of Technology
M.S. Mechanical Engineering   *2024*

University of California, Berkeley
B.S. Electrical Engineering and Computer Sciences   *2022*

Summary of Skills

Robotics systems development, reinforcement learning, optimization, robot safety filters, robot simulation, perception-enabled control, computer vision, ROS, C++, Python, PyTorch

Research Interests

Legged robotics, robot safety, reinforcement learning, perception-enabled control, multi-robot cooperation

Awards and Honors

Spring 2022: Arthur M. Hopkin Award – Selected based on seriousness of purpose and high academic achievement

Professional Experience

California Institute of Technology   **Pasadena, CA**
Ph.D. Candidate   *2022 – Present*
- Designed reinforcement learning and hardware deployment pipeline for humanoid robots, enabling real-world experiments.
- Developed methods to enforce safety in learned control and planning policies, improving robustness of autonomous systems.
- Created push-recovery and uncertainty-aware locomotion frameworks, validated on humanoid platforms.

University of California, Berkeley   **Berkeley, CA**
Student Research Assistant   *2020 – 2022*
- Conducted robotics research on locomotion, perception, and multi-robot collaboration, with deployments on Unitree A1 and MIT Mini Cheetah.
- Built multi-robot system frameworks integrating LiDAR and depth sensing for collaborative load-moving tasks.
- Developed vision-based navigation and obstacle detection stacks in ROS, enabling autonomous quadrupedal navigation.
- Applied reinforcement learning (PPO) and Bayesian optimization for locomotion control, improving stability and adaptablity.

Samsara Inc.   **San Francisco, CA**
Software Engineering Intern   *2021*
- Delivered production features in a 4-person engineering team, contributing to fleet management products.
- Built machine learning benchmarking tools to compare models at scale, improving workflow efficiency for ML engineers.
- Leveraged C++ and Go for backend development and performance optimization.

Research Experience

Caltech AMBER Lab   **Pasadena, CA**
Safety for Learned Control/Planning   *2025 – Present*
- Learned policies for robots often lack safety guarantees.
- Ensure reliable operation of humanoid robots under uncertainty.
- Designed methods to inject safety constraints into learned policies and integrated safety metrics into policy training.
- Enabling robust, safe robot behaviors, paper pending.

Uncertainty-Aware Dynamics for Safe Locomotion   *2024 – 2025*
- Learned dynamics models for humanoids do not match explicit model assumptions.
- Build uncertainty-aware models for obstacle avoidance and robust locomotion.
- Developed a reinforcement learning + generative residual dynamics pipeline; validated on Unitree G1 with onboard LiDAR.
- Robust safe locomotion across environments; disseminated in [1].

Robust Locomotion & Push Recovery   *2022 – 2024*

- Humanoid robots are sensitive to disturbances and mostly uses lower torso strategies to recover.
- Investigate methods of utilizing the upper torso and limbs for steady-state recovery.
- Created frameworks for push-recovery using arms of humanoid robots.
- Achieved stable locomotion with disturbance recovery; supported publications [2].

UC Berkeley Hybrid Robotics Group **Berkeley, CA**

Collaborative Load Moving *2021 – 2022*
- Multi-robot systems must coordinate to move heavy loads.
- Enable quadrupeds to jointly tow payloads safely.
- Designed a cable-towing and sensing framework using LiDAR/depth sensors; deployed on Unitree A1s and MIT Mini Cheetah.
- Demonstrated coordinated load-moving in hardware; related to [8].

Reinforcement Learning for Quadrupeds *2021 – 2022*
- Learning locomotion policies requires robustness to sensory noise.
- Train quadrupeds to locomote and navigate using reinforcement learning.
- Used PPO with depth sensing; transferred policies to Unitree A1 and Mini Cheetah.
- Achieved robust locomotion across environments; see [3].

Safe Parameter Learning for Bipedal Locomotion Control *2021*
- Bipedal locomotion controllers need tuning for stability.
- Learn control parameters efficiently.
- Applied Bayesian optimization to controller parameters; validated on Cassie.
- Outperformed baseline tracking; published as [6].

Autonomous Navigation for Quadrupedal Robot *2020 – 2021*
- Robots must navigate diverse environments.
- Enable autonomous navigation with obstacle clearing.
- Built a navigation stack capable of jumping over obstacles; integrated in ROS.
- Demonstrated on MIT Mini Cheetah; linked to [10].

Robotic Guide Dog *May 2020 – Oct 2020*
- Assistive robots can help visually impaired users.
- Develop a quadruped-based robotic guide dog.
- Built human-robot interaction framework with localization and human detection.
- Successfully guided humans in real-world experiments; see [11].

UC Berkeley Video and Image Processing Lab **Berkeley, CA**

Sensor-aware SLAM-based Frontier Exploration and Mapping *2021*
- Exploration algorithms ignore sensor-specific limitations.
- Improve SLAM-based exploration efficiency.
- Designed a sensor-aware frontier exploration algorithm.
- Coverage improved to 92.8% vs 49% baseline; connected to [9].

Drone Object Detection Using RGB/IR Fusion *2020*
- Drone imagery requires robust detection under varying conditions.
- Fuse RGB and infrared data for detection.
- Trained RGB/IR fusion models in TensorFlow-Keras; deployed on Nvidia Xavier drone.
- Effective real-time detection; related to [7].

Indoor Query System for The Visually Impaired *2019 – 2020*
- Visually impaired users need assistive perception indoors.
- Build a query-based recognition system.
- Developed Android app with 360° and depth cameras; trained MobileNet-v2.
- Accurate object detection for user seen in [12].

Berkeley AI Research **Berkeley, CA**

Spatio-Temporal Action Detection with Multi-Object Interaction *2020*
- Existing video datasets were too limited.
- Improve spatio-temporal action recognition.
- Helped develop spatio-temporal detection models; curated richer dataset.
- Dataset surpassed UCF101-24 in class coverage; results disseminated through BAIR collaborations, as shown in [13].

Publications (* denotes equal contribution)

[1] ***Lizhi Yang**, *Blake Werner, Ryan K. Cosner, David Fridovich-Keil, Preston Culbertson, and Aaron D. Ames. "SHIELD: Safety on Humanoids via CBFs In Expectation on Learned Dynamics". In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. 2025.

[2] **Lizhi Yang**, Blake Werner, Adrian B. Ghansah, and Aaron D. Ames. "Bracing for Impact: Robust Humanoid Push Recovery and Locomotion with Reduced Order Models". In: *IEEE-RAS International Conference on Humanoid Robots (Humanoids)*. 2025.

[3] Gilbert Feng, Hongbo Zhang, Zhongyu Li, Xue Bin Peng, Bhuvan Basireddy, Linzhu Yue, Zhitao Song, **Lizhi Yang**, Yunhui Liu, Koushil Sreenath, and Sergey Levine. "Genloco: Generalized Locomotion Controllers for Quadrupedal Robots". In: *Conference on Robot Learning (CoRL)*. PMLR, 2023, pp. 1893–1903.

[4] Xiaoyu Huang, Zhongyu Li, Yanzhen Xiang, Yiming Ni, Yufeng Chi, Yunhao Li, **Lizhi Yang**, Xue Bin Peng, and Koushil Sreenath. "Creating a Dynamic Quadrupedal Robotic Goalkeeper with Reinforcement Learning". In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. 2023.

[5] Chong Zhang and **Lizhi Yang**. "Generating a Terrain-Robustness Benchmark for Legged Locomotion: A Prototype via Terrain Authoring and Active Learning". In: *IEEE International Conference on Robotics and Automation (ICRA)*. 2023.

[6] ***Lizhi Yang**, *Zhongyu Li, Jun Zeng, and Koushil Sreenath. "Bayesian Optimization Meets Hybrid Zero Dynamics: Safe Parameter Learning for Bipedal Locomotion Control". In: *IEEE International Conference on Robotics and Automation (ICRA)*. 2022.

[7] **Lizhi Yang**, Ruhang Ma, and Avideh Zakhor. "Drone Object Detection Using RGB/IR Fusion". In: *Electronic Imaging: Computational Imaging*. 2022.

[8] Chenyu Yang, Guo Ning Sue, Zhongyu Li, **Lizhi Yang**, Haotian Shen, Yufeng Chi, Akshara Rai, Jun Zeng, and Koushil Sreenath. "Collaborative Navigation and Manipulation of a Cable-Towed Load by Multiple Quadrupedal Robots". In: *IEEE Robotics and Automation Letters* 7.4 (2022), pp. 10041–10048.

[9] Zixian Zang, Haotian Shen, **Lizhi Yang**, and Avideh Zakhor. "Sensor-Aware SLAM-based Frontier Exploration and Mapping". In: *Electronic Imaging: AVM*. 2022.

[10] *Scott Gilroy, *Derek Lau, ***Lizhi Yang**, Ed Izaguirre, Kristen Biermayer, Anxing Xiao, Mengti Sun, Ayush Agrawal, Jun Zeng, Zhongyu Li, and Koushil Sreenath. "Autonomous Navigation for Quadrupedal Robots with Optimized Jumping Through Constrained Obstacles". In: *IEEE CASE*. 2021.

[11] *Anxing Xiao, *Wenzhe Tong, ***Lizhi Yang**, Jun Zeng, Zhongyu Li, and Koushil Sreenath. "Robotic Guide Dog: Leading a Human with Leash-Guided Hybrid Physical Interaction". In: *IEEE International Conference on Robotics and Automation (ICRA)*. Best Paper Award Finalist for Service Robotics. 2021.

[12] **Lizhi Yang**, Ilian Herzi, Avideh Zakhor, Anup Hiremath, Sahm Bazargan, and Robert Tames-Gadam. "Indoor Query System for the Visually Impaired". In: *International Conference on Computers Helping People with Special Needs (ICCHP)*. 2020, p. 517.

[13] Huijuan Xu, **Lizhi Yang**, Stan Sclaroff, Kate Saenko, and Trevor Darrell. "Spatio-Temporal Action Detection with Multi-Object Interaction". In: *EPIC Workshop @ European Conference on Computer Vision (ECCV)*. 2020.

Teaching and Mentoring Experience

UC Berkeley   **CS 61A: Structure and Interpretation of Computer Programs**
Academic Intern   *Jun 2019 – Aug 2019*
Held weekly office hours to help undergraduates with CS concepts and assignments.

Professional Affiliations

UC Berkeley IEEE
Outreach Director   *May 2019 – Jan 2020*
Planned professional and educational outreach events; hosted STEM outreach events.

Community Service and Other Activities

Pioneers in Engineering PiSens
Project Manager   *May 2019 – May 2020*
Led team to develop sensor kits for low-cost robot competitions; organized annual competitions for under-represented students in Bay Area.