Lizhi(Gary) Yang

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EDUCATION

California Institute of Technology

PhD Candidate, Mechanical Engineering (Robotics, Controls and Dynamics) Expected June 2027

M.S. Mechanical Engineering June 2024

University of California, Berkeley

B.S., Electrical Engineering and Computer Sciences May 2022

SUMMARY OF SKILLS

Robotic system development * reinforcement learning * robot safety filter synthesis * computer vision

RESEARCH INTERESTS

Loco-manipulation * robot safety * reinforcement learning * perception-enabled control * multi-robot cooperation

AWARDS AND HONORS

- Arthur M. Hopkin Award Spring 2022
    - Selected based on seriousness of purpose and high academic achievement.
- Honors to Date Fall 2020
    - Selected based on semester GPA being top 20%.
- UC Berkeley, Bright Scholar Award Fall 2018 – Spring 2020
    - Selected based on good academic standing.
- Dean's List Spring 2019 – Fall 2019
    - Selected based on semester GPA being top 10%.

RESEARCH EXPERIENCE

Tabletop manipulation with visual-language-action models June 2025 – Current

Caltech AMBER Lab, Pasadena, CA

- Develop pipelines for data collection, finetuning, and deployment of VLA models
- Lead effort into setting up environmental perception
- Investigate ways of injecting safety with post-training or inference-time methods

Enforcing Safety for Robot Systems with Learned Control/Planning Policies March 2025 – Current

Caltech AMBER Lab, Pasadena, CA

- Create methods to inject safety for learned control/planning policies.
- Integrate safety in policy training to enable robust robot operation.
- Investigate ways to describe abstract notions of safety with semantics.

Uncertainty-Aware Dynamics Learning for Safe Humanoid Locomotion March 2024 – March 2025

Caltech AMBER Lab, Pasadena, CA

- Developed reinforcement learning and hardware deployment pipeline for humanoid robots.
- Trained a generative residual dynamics model to enable robust obstacle avoidance
- Validated on a Unitree G1 using onboard LiDAR/localization indoors/outdoors, outperforming baselines.

Robust perception-enabled locomotion for humanoid robots Sept 2022 – March 2024

Caltech AMBER Lab, Pasadena, CA

- Developed a framework for push-recovery during locomotion for humanoid robots utilizing the environment.
- Created a perception and state-estimation package for custom-built humanoid robots.
- Built data-driven control and learning frameworks for legged robots.

Collaborative load-moving for quadrupedal robots Nov 2021 – May 2022

UC Berkeley Hybrid Robotics Group, Berkeley, CA

- Developed a framework for quadrupedal robots to collaborate on the cable-towing-load task.
- Integrate multi-robot system and sensing capabilities including LIDARs and depth cameras.
- Deployed the framework on 2 Unitree A1s and an MIT mini cheetah robot for verification.

Reinforcement learning for quadrupedal robots June 2021 – May 2022

UC Berkeley Hybrid Robotics Group, Berkeley, CA

- Developed a framework for quadrupedal robot locomotion training with Proximal Policy Optimization.
- Introduced depth sensing capabilities into the training pipeline.
- Deployed the framework on a Unitree A1 and MIT mini cheetah robot for verification.

Safe Parameter Learning for Bipedal Locomotion Control Jan 2021 – Sept 2021

UC Berkeley Hybrid Robotics Group, Berkeley, CA

- Applied Bayesian optimization to safe automatic controller parameter learning for bipedal robots.
- Developed a safe automatic parameter learning framework for a variable-height, variable-speed walking controller on a bipedal robot, achieving superior command tracking performance over expert hand-tuned controllers with MATLAB and ROS.
- Deployed the framework and learned parameters on the Cassie robot and performed real-world experiments with good tracking performance.

Autonomous Navigation for Quadrupedal Robot Dec 2020 – Feb 2021

UC Berkeley Hybrid Robotics Group, Berkeley, CA

- Developed an autonomous navigation framework capable of jumping through constrained obstacles.
- Developed the navigation stack, part of the decision-making stack and overall function integration with ROS.
- Deployed the framework on the MIT Mini Cheetah and performed real-world experiments successfully demonstrating the effectiveness of the proposed method.

Robotic Guide Dog May 2020 – Oct 2020

UC Berkeley Hybrid Robotics Group, Berkeley, CA

- Developed a hybrid physical human-robot interaction framework capable of navigating a visually impaired human through narrow spaces using a soft leash.
- Implemented robot localization, human detection, and overall function integration with ROS.
- Deployed the physical human-robot interaction framework on the MIT Mini Cheetah and performed real-world experiments exhibiting success of the proposed method.

Sensor-aware SLAM-based Frontier Exploration and Mapping Jan 2021 – May 2021

UC Berkeley Video and Image Processing Lab, Berkeley, CA

- Implemented a sensor-aware frontier exploration and mapping method via sensor-frontiers.
- Deployed and tested the algorithm on the LoCoBot.
- Extended exploration area from 49% coverage of conventional methods to 92.8%.

Drone Object Detection Using RGB/IR Fusion June 2020 – Dec 2020

UC Berkeley Video and Image Processing Lab, Berkeley, CA

- Implemented an illumination aware RGB/IR fusion model for drone image object detection with Tensorflow-Keras.
- Deployed the fusion model on a Nvidia Xavier drone with Tensorflow-Lite.
- Developed synthetic IR data generation framework using Unreal Engine simulation and CycleGAN to overcome the scarcity of synchronized RGB/IR image pairs and attempt to reduce the sim-to-real gap.

Spatio-Temporal Action Detection with Multi-Object Interaction Feb 2020 – Dec 2020

Berkeley Artificial Intelligence Research, Berkeley, CA

- Assisted in the development of a spatio-temporal action detection model capable of understanding multi-object interaction.
- Pruned the TwentyBN video dataset to include only videos of significant action length and object relevance and produce a new dataset surpassing the number of action classes in the UCF101-24 action video dataset (47 vs. 24).

Indoor Query System for The Visually Impaired May 2019 – July 2020

UC Berkeley Video and Image Processing Lab, Berkeley, CA

- Developed an Android application that uses Tensorflow-Lite, a 360°camera and a depth camera to assist visually impaired people.
- Collected and trained a MobileNet-v2 object detection network to serve as the onboard inference model.
- Validated the accuracy of the system for the disjoint test set from the same buildings in the training set at 99%, and for the test set from new buildings not in the training set at 53%.

PROFESSIONAL EXPERIENCE

PhD Candidate, California Institute of Technology Sept 2022 – Current

- Developed reinforcement learning and hardware deployment pipeline for humanoid robots with Isaac Lab
- Investigated methods of enforcing safety for learned control and planning systems
- Created whole-body push-recovery framework and dynamics-uncertainty-aware safety for humanoid robots

Student Research Assistant June 2020 – May 2022

UC Berkeley, Berkeley, CA

- Conduct research in the area of robotics, focusing on legged robots and the combination of perception and control.
- Investigate robot collaboration, developing frameworks for multi-robot system integration and sensing capabilities using LIDARs and depth cameras.
- Implement computer vision techniques for autonomous navigation and obstacle detection, enhancing robot perception and interaction with the environment.
- Perform reinforcement learning for robot locomotion, introduce depth sensing into the training pipeline, and apply Bayesian optimization for bipedal locomotion control.
- Deploy frameworks on robots like Unitree A1s and the MIT mini cheetah for verification.
- Tools and equipment used include MATLAB, ROS, Pytorch, Tensorflow-Keras, Nvidia Xavier, Unreal Engine, CycleGAN, and various robotic platforms.

Software Engineering Intern May 2021 – Aug 2021

Samsara Inc., San Francisco, CA

- Worked closely with a team of 4 with weekly meetings and sync-ups, communicating project needs.
- Developed new product feature according to customer feedback.
- Developed internal machine learning model benchmarking tool for testing before rollout with great feedback from the team.
- Tools and equipment used include C++ and the Go programming language.

TEACHING & MENTORING EXPERIENCE

Academic Intern June 2019 – Aug 2019

CS 61A Structure and Interpretation of Computer Programs

- Scheduled weekly office hours to answer CS concept & program assignment implementation problems for undergraduate students.

PUBLICATIONS AND PRESENTATIONS

*Publications *: equal contribution*

- **Lizhi Yang***, Blake Werner*, Massimiliano de Sa, and Aaron D. Ames. " CBF-RL: Safety Filtering Reinforcement Learning in Training with Control Barrier Functions." In Submission (2025).
- Blake Werner*, **Lizhi Yang***, and Aaron D. Ames. " Architecture Is All You Need: Diversity-Enabled Sweet Spots for Robust Humanoid Locomotion." In Submission (2025)
- **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." IROS 2025 (2025).
- Ryan M Bena, Gilbert Bahati, Blake Werner, Ryan K Cosner, **Lizhi Yang**, and Aaron D. Ames. " Geometry-Aware Predictive Safety Filters on Humanoids: From Poisson Safety Functions to CBF Constrained MPC." Humanoids 2025 (2025).
- **Lizhi Yang**, Blake Werner, Adrian B. Ghansah, and Aaron D. Ames. "Bracing for Impact: Robust Humanoid Push Recovery and Locomotion with Reduced Order Models." Humanoids 2025 (2025).
- Huang, Xiaoyu, 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." IROS 2023 (2023).
- Zhang, Chong, and **Lizhi Yang**. "Generating a terrain-robustness benchmark for legged locomotion: A prototype via terrain authoring and active learning." ICRA 2023 (2023).
- 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." Conference on Robot Learning, pp. 1893-1903. PMLR (2023).
- **Lizhi Yang***, Zhongyu Li*, Jun Zeng and Koushil Sreenath. "Bayesian Optimization Meets Hybrid Zero Dynamics: Safe Parameter Learning for Bipedal Locomotion Control" ICRA 2022 (2022).
- **Lizhi Yang**, Ruhang Ma and Avideh Zakhor. "Drone Object Detection Using RGB/IR Fusion" Electronic Imaging: Computational Imaging 2022 (2022).
- 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." IEEE Robotics and Automation Letters 7, no. 4: 10041-10048 (2022).

- Zixian Zang, Haotian Shen, **Lizhi Yang** and Avideh Zakhor. "Sensor-aware SLAM-based Frontier Exploration and Mapping" Electronic Imaging: AVM 2022 (2022).
- 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." CASE 2021 (2021).
- 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." ICRA 2021 (2021). (ICRA Best Paper Award Finalist for Service Robotics)
- Huijuan Xu, **Lizhi Yang**, Stan Sclaroff, Kate Saenko, and Trevor Darrell. "Spatio-Temporal Action Detection with Multi-Object Interaction." EPIC@ECCV2020 (2020).
- **Lizhi Yang**, Ilian Herzi, Avideh Zakhor, Anup Hiremath, Sahm Bazargan, and Robert Tames-Gadam. "Indoor Query System for the Visually Impaired." Computers Helping People with Special Needs 12376: 517 (2020).

PROFESSIONAL AFFILIATIONS

Outreach Director May 2019 – Jan 2020

UC Berkeley IEEE

- Planned professional and educational outreach events for the society.
- Hosted STEM outreach events during university open day.

COMMUNITY SERVICE AND OTHER ACTIVITIES

Project Manager May 2019 – May 2020

Pioneers in Engineering PiSens

- Lead a team to develop new sensor kits for low-cost robot competitions.
- Participated in organizing annual robot competitions for the under-represented and low-income students in the Bay Area.