ZHONGYU LI

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EDUCATION

University of California, Berkeley, Dept. of Mechanical Engineering — California, USA
Ph.D. Student in Controls, Robotics, and Artificial Intelligence — Fall 2019 –
- Advisor: Prof. Koushil Sreenath

Zhejiang University, Chu Kochen Honors College — Zhejiang, China
B.E. in Mechatronics Engineering — Sept 2014 – June 2019
- Semester Exchange Student in the Dept. of Mechanical Engineering, Columbia University, USA.
- Thesis: Transferring Animation to the Control of Bipedal Robot, *Best Undergraduate Thesis Award*

RESEARCH EXPERIENCE

University of California, Berkeley — Nov 2018 – Present
Graduate Student Researcher — Berkeley, CA
Safe, Robust, and Dynamic Legged Locomotion and Beyond. — Advisor: Prof. Koushil Sreenath
- [Reinforcement Learning]: Research on deep RL framework for dynamic robots to perform agile and robust maneuvers.
- [Optimal Control]: Explore model-based optimal controls for legged robots with stability and safety guarantees.
- [Planning]: Develop end-to-end autonomy for legged robots for complex tasks such as navigation or manipulation.
- [Human-Robot Interaction]: Seek to ascertain the feasibility of human-robot interaction using dynamic legged robots.

Carnegie Mellon University — Aug 2017 – Aug 2018
Research Intern — Pittsburgh, PA
Ballbot Physically Leading People by Human-Robot Interaction System. — Advisor: Prof. Ralph Hollis
- Presented a new human-centered method for indoor service robots to provide visually impaired people with physical assistance and active guidance while traveling through narrow spaces.
- Developed and integrated robot perception and motion planning to perform human-robot interaction which is the first to provide clear and quantitative guidance to the led person.

AWARDS & HONORS

- William S. Floyd, Jr. Graduate Student Fellowship at UC Berkeley — 2022
- **IROS Best RoboCup Paper Finalist** — 2022
- Graduate Division Block Grant Award in Mechanical Engineering at UC Berkeley — 2021
- **ICRA Best Service Robot Paper Finalist** — 2021
- **IROS Best Entertainment and Amusement Paper Finalist** — 2020
- IROS Student and Developing Countries (SDC) Travel Award — 2019
- Best Undergraduate Thesis Award at Zhejiang University — 2019

PUBLICATIONS

(*Equal Contribution, †Project Lead)

[1] Q. Liao, **Z. Li**†, A. Thirugnanam, J. Zeng, and K. Sreenath, "Walking in Narrow Spaces: Safety-critical Locomotion Control for Quadrupedal Robots with Duality-based Optimization", *Preprint,* 2022.
[Paper][Video][Code] Media coverage: [Video Friday]

[2] X. Huang*****, **Z. Li***, Y. Xiang, Y. Ni, Y. Chi, Y. Li, L. Yang, X. B. Peng, K. Sreenath, "Creating a Dynamic Quadrupedal Robotic Goalkeeper with Reinforcement Learning", *Preprint,* 2022.
[Paper][Video] Media coverage: [IEEE Spectrum Feature][Tech Xplore][TechCrunch]

[3] G. Feng*, H. Zhang*, **Z. Li**†, X. B. Peng†, B. Basireddy, L. Yue, Z. Song, L. Yang, Y. Liu, K. Sreenath, S. Levine, "GenLoco: Generalized Locomotion Controllers for Quadrupedal Robots", *Conference on Robot Learning (CoRL)*, 2022.
[Paper][Video][Code]

[4] C. Yang*, G. N. Sue*, **Z. Li***, L. Yang, H. Shen, Y. Chi, A. Rai, J. Zeng, K. Sreenath, "Collaborative Navigation and Manipulation of a Cable-towed Load by Multiple Quadrupedal Robots", *IEEE Robotics and Automation Letters (RA-L)*, 2022.
[Paper][Video] Media coverage: [Video Friday]

[5] Y. Ji*, **Z. Li***, Y. Sun, X. B. Peng, S. Levine, G. Berseth, K. Sreenath, "Hierarchical Reinforcement Learning for Precise Soccer Shooting Skills using Quadrupedal Robots", *International Conference on Intelligent Robots and Systems (IROS),* 2022.
Best RoboCup Paper Finalist. [Paper][Video] Media coverage: [Video Friday][Tech Xplore]

[6] A. Kumar*, **Z. Li***, J. Zeng, D. Pathak, K. Sreenath, J. Malik, "Adapting Rapid Motor Adaptation for Bipedal Robots", *International Conference on Intelligent Robots and Systems (IROS),* 2022.
[Paper][Video]

[7] A. Sripathy, A. Bobu, **Z. Li**, K. Sreenath, D. S. Brown, A. D. Dragan, "Teaching Robots to Span the Space of Functional Expressive Motion", *International Conference on Intelligent Robots and Systems (IROS),* 2022.
[Paper][Video]

[8] **Z. Li**, J. Zeng, A. Thirugnanam, K. Sreenath, "Bridging Model-based Safety and Model-free Reinforcement Learning through System Identification of Low Dimensional Linear Models", *Robotics: Science and Systems (RSS),* 2022.
[Paper][Video]

[9] L. Yang*, **Z. Li***, J. Zeng, K. Sreenath, "Bayesian Optimization Meets Hybrid Zero Dynamics: Safe Parameter Learning for Bipedal Locomotion Control", *International Conference on Robotics and Automation (ICRA),* 2022.
[Paper][Video]

[10] **Z. Li**, J. Zeng, S. Chen and K. Sreenath, "Vision-Aided Autonomous Navigation of Bipedal Robots in Height-Constrained Environments", *Preprint,* 2021.
[Paper][Video] Media coverage: [Video Friday]

[11] S. Gilroy, D. Lau, L. Yang, E. Izaguirre, K. Biermayer, A. Xiao, M. Sun, A. Agrawal, J. Zeng, **Z. Li†** and K. Sreenath, "Autonomous navigation for quadrupedal robots with optimized jumping through constrained obstacles", *International Conference on Automation Science and Engineering (CASE),* 2021.
[Paper][Video] Media coverage: [Video Friday]

[12] J. Zeng*, **Z. Li*** and K. Sreenath, "Enhancing Feasibility and Safety of Nonlinear Model Predictive Control with Discrete-Time Control Barrier Functions". *Conference on Decision and Control (CDC)*, 2021.
[Paper]

[13] **Z. Li**, X. Cheng, X. Peng, P. Abbeel, S. Levine, G. Berseth and K. Sreenath, "Reinforcement Learning for Robust Parameterized Locomotion Control of Bipedal Robots". *International Conference on Robotics and Automation (ICRA),* 2021.
[Paper][Video] Media coverage: [MIT Technology Review][Tech Xplore][Inverse][MathWorks][heise (German)][DeepTech (Chinese)]

[14] A. Xiao, W. Tong, L. Yang, J. Zeng, **Z. Li†** and K. Sreenath, "Robotic Guide Dog: Leading a Human with Leash-Guided Hybrid Physical Interaction". *International Conference on Robotics and Automation (ICRA),* 2021.
Best Service Robot Paper Finalist. [Paper][Video] Media coverage: [Daily Mail][New Scientist][Tech Xplore][Daily Californian][Independent][Futurism][China Daily][DeepTech (Chinese)]

[15] J. Zeng, B. Zhang, **Z. Li** and K. Sreenath, "Safety-Critical Control with Optimal-decay Control Barrier Functions with Guaranteed Point-wise Feasibility". *American Control Conference (ACC),* 2021.
[Paper]

[16] **Z. Li**, C. Cummings and K. Sreenath, "Animated Cassie: A Dynamic Relatable Robotic Character". *International Conference on Intelligent Robots and Systems (IROS),* 2020.
Best Entertainment and Amusement Paper Finalist. [Paper][Video] Media coverage: [Video Friday]

[17] **Z. Li** and R. Hollis. "Toward A Ballbot for Physically Leading People: A Human-Centered Approach". *International Conference on Intelligent Robots and Systems (IROS),* 2019.
[Paper][Video] Media coverage: [Video Friday]

INVITED TALKS

- **Can We Bridge Model-based Control and Model-free RL on Legged Robots?**
  - GRASP SFI, University of Pennsylvania, Sept. 2022 [Video]
  - Mila – Quebec AI Institute, Sept. 2022
  - Beijing Academy of Artificial Intelligence (BAAI), Nov. 2022

TEACHING

University of California, Berkeley
Graduate Student Instructor

- [DEWA]: **Optimization & Machine Learning with Applications to Energy Systems** 2020- 2023
  Graduate Level, Class Size: ~30
  Role: Leading discussion session; Grading.
- [E7]: **Introduction to Computer Programming for Scientists and Engineers** Fall 2020
  Undergrad. Level, Class Size: ~200
  Role: Leading discussion session; Teaching lab session.

Zhejiang University Part-time 2014-2015
Volunteer Teacher
Leading discussion session for ~160 primary school students

STUDENT MENTORING

Berkeley Students:

Alumni Stats (by 2/2023): 17/21 had publications, 18/21 keep doing robotics.

Christine Cummings, Undergrad → M.S. at Penn State MechE Best Amusement Paper Finalist in IROS 2020, Pub: [16]
HungJu Wang, Undergrad → Ph.D. at UMN MechE
Lizhi Yang, Undergrad → Ph.D. at Caltech MechE Best Service Paper Finalist in ICRA 2021, Pub: [14, 11, 9, 4, 3]
Anxing Xiao, Visiting → Ph.D. at NUS CS Best Service Robot Paper Finalist in ICRA 2021, Pub: [14, 11]
Wenze Tong, Visiting → M.S at UMich Robotics Best Service Robot Paper Finalist in ICRA 2021, Pub: [14]
Scott Gilroy, M.Eng → Boston Dynamics Pub: [11]
Derek Lau, M.Eng → Nissan Motor Corporation Pub: [11]
Mengti Sun, Undergrad → M.S. at Penn GRASP Pub: [11]
Xuxin Cheng, Visiting → M.S. at CMU RI Pub: [13]
Chenyu Yang, Visiting → M.S. at ETH Robotics Pub: [4]
Guo Ning Sue, Undergrad → M.S. at CMU RI Pub: [4]
Haotian Shen, Undergrad → M.S. at Berkeley EECS Pub: [4]
Yufeng Chi, Undergrad → Ph.D. at Berkeley EECS Pub: [4]
Yandong Ji, M.Eng → Research Intern at MIT Best RoboCup Paper Finalist in IROS 2022, Pub: [5]
Yinan Sun, M.Eng → Q. Bio Best RoboCup Paper Finalist in IROS 2022, Pub: [5]
Jesus Navarro, M.S. → UC Berkeley
Zixian Zang, Undergrad → Founder at Starpath Robotics
Minghao Zhang, Visiting → Hedge Fund
Yanzhen Xiang, Visiting → M.S. at ETH Robotics Pub: [2]
Hongbo Zhang, Visiting → Ph.D at CUHK Robotics Pub: [3]
Bhuvan Basireddy, Undergrad → Lacework Pub: [3]
Qiayuan Liao, Visiting Pub: [1]
Xiaohan Liu, Visiting
Xiaoyu Huang, Visiting Pub: [2]
Vishnu Sangli, Undergrad
Yiming Ni, Undergrad (Co-mentored) Pub: [2]
Gilbert Feng, Undergrad (Co-mentored) Pub: [3]
Stefanie Gschwind, Undergrad (Co-mentored)

Outreach:

Khari Fletcher, Amgen Scholars Program, Summer 2021
Kavan Mehrizi, Transfer-to-Excellence Research Program, Summer 2021

COMMUNITY SERVICE

Journal Reviewer: RA-L (2021-2023), TPAMI (2022), TCDS (2022), Frontiers in Neurorobotics (2022).
Conference Reviewer: ICRA (2021-2023), IROS (2021-2022), Humanoids (2022), CASE (2021).
Workshop Reviewer: CoRL (2022).

OPEN-SOURCED SOFTWARE

GenLoco [Code]: A generalized RL-based locomotion control framework for various quadrupedal robots.
Quadrupedal MPC-CBF-Duality [Code]: A safety-critical locomotion controller for a quadrupedal robot.
NMPC-DCLF-DCBF [Code]: A collection of implementation examples of MPC, CBFs, and CLFs.

TECHNICAL SKILLS

Programming: C/C++, Python, ROS
Optimization & Learning: IPOPT, CVX, Tensorflow, Pytorch