ZHONGYU LI

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RESEARCH INTERESTS

I am interested in creating new generations of dynamic robots, such as humanoids and other bio-inspired robots, to make them more intelligent, agile, robust, and safe, and ultimately, useful. My research lies in the combination of control, optimization, motion planning, reinforcement learning, imitation learning, and multi-agent interaction.

EDUCATION

University of California, Berkeley, Dept. of Mechanical Engineering — California, USA
Ph.D. Student in Controls and Robotics — Fall 2019 – Spring 2025

- 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*

PROFESSIONAL EXPERIENCE

University of California, Berkeley — Berkeley, CA
Graduate Student Researcher, Hybrid Robotics Group, Advisor: Prof. Koushil Sreenath — Fall 2019 – Present
Visiting Undergraduate Researcher, Hybrid Robotics Group, Advisor: Prof. Koushil Sreenath — Nov 2018 – May 2019

Carnegie Mellon University — Pittsburgh, PA
Visiting Undergraduate Researcher, Microdynamic Systems Lab, Advisor: Prof. Ralph Hollis — Aug 2017 – Aug 2018

AWARDS & HONORS

- **Selected as one of the Rising Stars in Mechanical Engineering (in the US)** 2023
- **Selected as one of 30 RSS Pioneers (across the globe)** 2023
- 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)

Peer-Reviewed Journals

[J1] **Z. Li**, X. B. Peng, P. Abbeel, S. Levine, G. Berseth, K. Sreenath, "Reinforcement Learning for Versatile, Dynamic, and Robust Bipedal Locomotion Control", *International Journal of Robotics Research (IJRR)*, 2024.
[Paper][Video] Media: [MIT Technology Review]

[J2] **Z. Li**, J. Zeng, S. Chen and K. Sreenath, "Autonomous Navigation of Bipedal Robots in Height-Constrained Environments", *International Journal of Robotics Research (IJRR)*, 2023.
[Paper][Video] Media: [Video Friday]

[J3] 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: [Video Friday]

Journals in Review

[RJ1] H. Zhang, **Z. Li**†, X. Zeng, L. Smith, K. Stachowicz, D. Shah, L. Yue, Z. Song, W. Xia, S. Levine, K. Sreenath, Y. H. Liu, "Traversability-Aware Legged Navigation by Learning from Real-World Visual Data", *arXiv preprint arXiv:2410.10621*, 2024. (in submission to *IEEE Transactions on Robotics (T-RO)*)
[Paper]

[RJ2] L. Yue, Z. Song, J. Dong, **Z. Li**, H. Zhang, L. Zhang, X. Zeng, K. Sreenath, Y. H. Liu, "Online Omnidirectional Jumping Trajectory Planning for Quadrupedal Robots on Uneven Terrains", *arXiv preprint arXiv:2411.04494*, 2024. (in submission to *International Journal of Robotics Research (IJRR)*)
[Paper]

Peer-Reviewed Conferences

[C1] X. Huang*, Y. Chi*, R. Wang*, **Z. Li**†, X. B. Peng, S. Shao, B. Nikolic, K. Sreenath, "DiffuseLoco: Real-Time Legged Locomotion Control with Diffusion from Offline Datasets", *Conference on Robot Learning (CoRL)*, 2024.
[Paper]

[C2] Z. He, K. Lei, Y. Ze, K. Sreenath, **Z. Li**, H. Xu, "Learning Visual Quadrupedal Loco-Manipulation from Demonstrations", *International Conference on Intelligent Robots and Systems (IROS)*, 2024.
[Paper][Website]

[C3] Z. Su*, X. Huang*, D. Ordoñez-Apraez, Y. Li, **Z. Li**, Q. Liao, G. Turrisi, M. Pontil, C. Semini, Y. Wu, K. Sreenath, "Leveraging Symmetry in RL-based Legged Locomotion Control", *International Conference on Intelligent Robots and Systems (IROS)*, 2024.
[Paper][Website]

[C4] X. Huang, Q. Liao, Y. Ni, **Z. Li**†, L. Smith, S. Levine, X. B. Peng, K. Sreenath, "HiLMa-Res: A General Hierarchical Framework via Residual RL for Combining Quadrupedal Locomotion and Manipulation", *International Conference on Intelligent Robots and Systems (IROS)*, 2024.
[Paper][Video]

[C5] **Z. Li**, X. B. Peng, P. Abbeel, S. Levine, G. Berseth, K. Sreenath, "Robust and Versatile Bipedal Jumping Control through Reinforcement Learning", *Robotics: Science and Systems (RSS)*, 2023.
[Paper][Video] Media: [Video Friday]

[C6] 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", *International Conference on Intelligent Robots and Systems (IROS)*, 2023.
[Paper][Video][Code] Media: [Video Friday]

[C7] 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", *International Conference on Intelligent Robots and Systems (IROS)*, 2023.
[Paper][Video] Media: [IEEE Spectrum Feature][Tech Xplore][TechCrunch][DailyMail][DailyMail]

[C8] Y. Zeng, S. He, H. H. Nguyen, **Z. Li**, K. Sreenath, J. Zeng, "i2LQR: Iterative LQR for Iterative Tasks in Dynamic Environments", *Conference on Decision and Control (CDC)*, 2023.
[Paper]

[C9] 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]

[C10] 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: [Video Friday][Tech Xplore]

[C11] 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]

[C12] 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]

[C13] **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]

[C14] 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]

[C15] 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: [Video Friday]

[C16] 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]

[C17] **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: [MIT Technology Review][Tech Xplore][Inverse][MathWorks][heise (German)][DeepTech (Chinese)]

[C18] 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: [Daily Mail][New Scientist][Tech Xplore][Daily Californian][Independent][Futurism][China Daily][DeepTech (Chinese)]

[C19] 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]

[C20] **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: [Video Friday]

[C21] **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: [Video Friday, IEEE Spectrum]

Conferences in Review

[RC1] Y. Ouyang, J. Li, Y. Li, **Z. Li**, C. Yu, K. Sreenath, Y. Wu, "Long-horizon Locomotion and Manipulation on a Quadrupedal Robot with Large Language Models", *arXiv preprint arXiv:2404.05291*, 2024. (In submission to ICRA 2025)
[Paper]

[RC2] K. Ryu, Q. Liao, **Z. Li**, K. Sreenath, N. Mehr, "CurricuLLM: Automatic Task Curricula Design for Learning Complex Robot Skills using Large Language Models", *arXiv preprint arXiv:2409.18382*, 2024. (In submission to ICRA 2025)
[Paper]

[RC3] Q. Liao, B. Zhang, X. Huang, X. Huang, **Z. Li**, K. Sreenath, "Berkeley Humanoid: A Research Platform for Learning-based Control", *arXiv preprint arXiv: 2407.21781*, 2024. (In submission to ICRA 2025)
[Paper][Website] Media: [IEEE Spectrum Feature]

[RC4] Z. Chen*, X. He*, Y. J. Wang*, Q. Liao, Y. Ze, **Z. Li**, S. Sastry, J. Wu, K. Sreenath, S. Gupta, X. B. Peng, "Learning Smooth Humanoid Locomotion through Lipschitz-Constrained Policies", *arXiv preprint arXiv: 2410.11825*, 2024. (In submission to ICRA 2025)
[Paper][Website]

[RC5] C. Dai*, X. Liu*, K. Sreenath, **Z. Li**, R. Hollis, "Interactive Navigation with Adaptive Non-prehensile Mobile Manipulation", *arXiv preprint arXiv:2410.13418*, 2024. (In submission to ICRA 2025)
[Paper]

INVITED TALKS

- **Can We Bridge Model-based Control and Model-free RL on Legged Robots?**
  - 09/2022, GRASP SFI, University of Pennsylvania [Video]
  - 09/2022, Mila – Quebec AI Institute
  - 11/2022, Beijing Academy of Artificial Intelligence (BAAI)
- **Towards Safe, Robust, and Dynamic Legged Robots and Beyond**
  - 07/2023, Southern University of Science and Technology (SUSTech)
  - 08/2023, Institute for Interdisciplinary Information Sciences, Tsinghua University
  - 08/2023, Huzhou Research Institute, Zhejiang University
  - 02/2024, Seminar in the group of Prof. Guanya Shi, Carnegie Mellon University
  - 03/2024, Seminar in the group of Prof. Ding Zhao, Carnegie Mellon University

- 04/2024, Berkeley Control Seminar, UC Berkeley
- 09/2024, AI Institute, Shanghai Jiao Tong University
- 10/2024, Seminar in the group of Prof. Sophia Shao, UC Berkeley

- **Towards General-Purpose Robots from the Perspectives of Legged Robots**
  - 06/2024, Guest Lecture in Deep Learning, IIIS, Tsinghua University

TEACHING

University of California, Berkeley

Graduate Student Instructor

- [DEWA]: **Optimization & Machine Learning with Applications to Energy Systems** 2020 - 2024
  Graduate Level, Class Size: ~20, 2 Classes per Year
  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 (~160 students) in a primary school for underrepresented students

STUDENT MENTORING

Berkeley Students:

Alumni Stats (by 10/2024): 25/34 had one or more publications, 30/34 continued in robotics research.

C. Cummings, Undergrad → M.S./Ph.D. at Penn State MechE — Best Amusement Paper Finalist in IROS 2020, Pub: [C20]
H. Wang, Undergrad → Ph.D. at UMN MechE
L. Yang, Undergrad → Ph.D. at Caltech MechE — Best Service Paper Finalist in ICRA 2021, Pub: [C{18, 15, 14, 9, 7}, J3]
A. Xiao, Visiting → Ph.D. at NUS CS — Best Service Robot Paper Finalist in ICRA 2021, Pub: [C{18, 15}]
W. Tong, Visiting → M.S at UMich Robotics — Best Service Robot Paper Finalist in ICRA 2021, Pub: [C18]
S. Gilroy, M.Eng → Boston Dynamics — Pub: [C15]
D. Lau, M.Eng → Nissan Motor Corporation — Pub: [C15]
M. Sun, Undergrad → M.S. at Penn GRASP — Pub: [C15]
X. Cheng, Visiting → M.S. at CMU RI — Pub: [C17]
C. Yang, Visiting → M.S. at ETH Robotics — Pub: [J3]
G. N. Sue, Undergrad → M.S. at CMU RI — Pub: [J3]
H. Shen, Undergrad → M.S. at Berkeley EECS — Pub: [J3]
Y. Chi, Undergrad → Ph.D. at Berkeley EECS — Pub: [C1, J3]
Y. Ji, M.Eng → Research Intern at MIT — Best RoboCup Paper Finalist in IROS 2022, Pub: [C10]
Y. Sun, M.Eng → Q. Bio — Best RoboCup Paper Finalist in IROS 2022, Pub: [C10]
J. Navarro, M.S. → UC Berkeley
Z. Zang, Undergrad → Co-Founder of Starpath Robotics
M. Zhang, Visiting → Hedge Fund
Y. Xiang, Visiting → M.S. at ETH Robotics — Pub: [C7]
H. Zhang, Visiting → Ph.D. at CUHK Robotics — Pub: [C9, RJ1]
B. Basireddy, Undergrad → Lacework — Pub: [C9]
Q. Liao, Visiting → Ph.D. at Berkeley MechE — Pub: [RC{2, 3, 4}, C{3, 4, 6}]
X. Liu, Visiting → M.S. at CMU RI — Pub: [RC5]
X. Huang, Visiting → Ph.D. at Berkeley MechE — Pub: [RC3, C{7, 4, 3, 1}]
M. Nguyen, Undergrad → M.S. at Berkeley EECS
V. Sangli, Undergrad
K. Wang, Visiting
J. Long, Visiting
Y. Ni, Undergrad (Co-mentored) → M.S. at Stanford CS — Pub: [C{4, 7}]
G. Feng, Undergrad (Co-mentored) → Quant Trading — Pub: [C9]
S. Gschwind, Undergrad (Co-mentored)
Z. Su, Undergrad (Co-mentored) — Pub: [C3]
Z. He, Undergrad (Co-mentored) — Pub: [C2]
C. Dai, M.S. at CMU RI (Co-mentored) — Pub: [RC5]

Outreach:

K. Fletcher, Amgen Scholars Program, Summer 2021
K. Mehrizi, Transfer-to-Excellence Research Program, Summer 2021
A. Zhou, High School Research Intern, Summer 2023

ACADEMIC SERVICE

Journal Reviewer:

The International Journal of Robotics Research (IJRR), Transactions on Robotics (T-RO), Transactions on Mechatronics (T-Mech), Transactions on Pattern Analysis and Machine Intelligence (TPAMI), Robotics and Automation Letters (RA-L), Robotics & Automation Magazine (RAM), Transactions on Cognitive and Developmental Systems (TCDS), Frontiers in Neurorobotics, Transactions on Industrial Electronics, Journal of Zhejiang University (JZUSA).

Conference Reviewer:

Robotics: Science and Systems (RSS), International Conference on Robotics and Automation (ICRA), International Conference on Intelligent Robots and Systems (IROS), International Conference on Humanoid Robots (Humanoids), International Conference on Automation Science and Engineering (CASE), The Conference on Robot Learning (CoRL), Conference on Decision and Control (CDC), Control Conference Africa (CCA).