

ANQI LI

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anqili.github.io

RESEARCH INTERESTS

My research focuses on providing formal performance and safety guarantees for robot learning. Specific research topics include offline reinforcement learning (RL), safe RL, learning stable dynamical systems/policies, learning from human demonstrations, and planning & control with guarantees.

EDUCATION

University of Washington

Sept. 2019 – Dec. 2023 (expected)

Ph.D. student in Computer Science & Engineering

Seattle, WA

· Advisor: Prof. Byron Boots, GPA: 3.96/4.00

Georgia Institute of Technology

Aug. 2017 – Aug. 2019

Ph.D. student in Robotics

Atlanta, GA

· Advisors: Prof. Magnus Egerstedt & Prof. Byron Boots, GPA: 4.00/4.00

· Transferred to the University of Washington in Sept. 2019

Carnegie Mellon University

Aug. 2015 – May 2017

Masters in Robotics

Pittsburgh, PA

· Advisor: Prof. Katia Sycara, GPA: 4.00/4.00

Zhejiang University

Sept. 2011 – July 2015

Bachelor of Engineering in Automation

Hangzhou, China

· GPA: 3.93/4.00, Rank: 1/132

RESEARCH EXPERIENCE

University of Washington

Sept. 2019 –

Graduate Research Assistant

Seattle, WA

- Offline reinforcement learning with unlabeled and mislabeled data
- Safe reinforcement learning with structured policy classes
- Learning spatially coordinated policies from human demonstrations
- Learning stable policies from demonstrations through learning diffeomorphisms

Facebook AI Research

June – Sept. 2021

Research Intern

Remote

- Learning from expert demonstrations under different dynamics

NVIDIA Research

May – Aug. 2019, June – Sept. 2020

Robotics Research Intern

Seattle, WA

- Fully differentiable composable policy class for robot learning
- Learning Riemannian motion policies from human demonstrations

Georgia Institute of Technology
Graduate Research Assistant

Aug. 2017 – May 2019
Atlanta, GA

- Multi-objectives motion generation for multi-robot systems
- Distributed second-order optimization for multi-agent systems
- Formally correct behavior composition for robot teams

Microsoft Research
Research Intern, CNTK Group

June 2017 – Aug. 2017
Redmond, WA

- Video synthesis from images using generative adversarial networks

Carnegie Mellon University
Graduate Research Assistant

Oct. 2015 – May 2017
Pittsburgh, PA

- Topology-based coordination for large teams of robots
- State abstraction for multi-robot systems under uncertainty
- Human action prediction for cyber-physical systems using recurrent neural networks

PUBLICATIONS

(* indicates equal contribution)

Journal Publications

- [J2] K. Van Wyk, M. Xie, **A. Li**, M.A. Rana, B. Babich, B. Peele, Q. Wan, I. Akinola, B. Sundaralingam, D. Fox, B. Boots, and N. Ratliff, “Geometric Fabrics: Generalizing Classical Mechanics to Capture the Physics of Behavior.” *IEEE Robotics and Automation Letters (RA-L)*, 2022 (**Best Paper Award**)
- [J1] P. Pierpaoli, **A. Li**, M. Srinivasan, X. Cai, S. Coogan, and M. Egerstedt, “A Sequential Composition Framework for Coordinating Multi-robot Behaviors.” *IEEE Transactions on Robotics (T-RO)*, 2020

Conference Publications

- [C15] **A. Li**, B. Boots, C.-A. Cheng, “MAHALO: Unifying Offline Reinforcement Learning and Imitation Learning from Observations.” *International Conference on Machine Learning (ICML)*, 2023
- [C14] X. Meng, N. Hatch, A. Lambert, **A. Li**, N. Wagener, M. Schmittle, J. Lee, W. Yuan, Q. Chen, S. Deng, G. Okopal, D. Fox, B. Boots, A. Shaban, “TerrainNet: Visual Modeling of Complex Terrain for High-speed, Off-road Navigation.” *Robotics: Science and Systems (R:SS)*, 2023
- [C13] M. A. Rana*, **A. Li***, D. Fox, S. Chernova, B. Boots, and N. Ratliff, “Towards Coordinated Robot Motions: End-to-End Learning of Motion Policies on Transform Trees.” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2021
- [C12] **A. Li***, C.-A. Cheng*, M. A. Rana, M. Xie, K. Van Wyk, N. Ratliff, and B. Boot, “RMP²: A Structured Composable Policy Class for Robot Learning.” *Robotics: Science and Systems (R:SS)*, 2021
- [C11] J. Urain, **A. Li**, P. Liu, C. D’Eramo, and J. Peters, “Composable Energy Policies for Reactive Motion Generation and Reinforcement Learning.” *Robotics: Science and Systems (R:SS)*, 2021

- [C10] N. Ratliff, K. Van Wyk, M. Xie, **A. Li**, and M. A. Rana, “Generalized Nonlinear and Finsler Geometry for Robotics.” *IEEE Conference on Robotics and Automation (ICRA)*, 2021
- [C9] M. A. Rana, **A. Li**, D. Fox, B. Boots, F. Ramos, and N. Ratliff, “Euclideanizing Flows: Diffeomorphic Reductions for Learning Stable Dynamical Systems.” *Conference on Learning for Dynamics and Control (L4DC)*, 2020
- [C8] **A. Li**, and C.-A. Cheng, B. Boots, and M. Egerstedt, “Stable, Concurrent Controller Composition for Multi-Objective Robotic Tasks.” *IEEE Conference on Decision and Control (CDC)*, 2019
- [C7] M. A. Rana*, **A. Li***, H. Ravichandar, M. Mukadam, S. Chernova, D. Fox, B. Boots, and N. Ratliff, “Learning Reactive Motion Policies in Multiple Task Spaces from Human Demonstrations.” *Conference on Robot Learning (CoRL)*, 2019
- [C6] **A. Li**, M. Mukadam, M. Egerstedt, and B. Boots, “Multi-Objective Policy Generation for Multi-Robot Systems Using Riemannian Motion Policies.” *International Symposium on Robotics Research (ISRR)*, 2019
- [C5] **A. Li**, and M. Egerstedt, “On the Trade-Off Between Communication and Execution Overhead for Control of Multi-Agent Systems.” *American Control Conference (ACC)*, 2019
- [C4] **A. Li**, L. Wang, P. Pierpaoli, and M. Egerstedt, “Formally Correct Composition of Coordinated Behaviors Using Control Barrier Certificates.” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2018
- [C3] **A. Li**, W. Luo, S. Nagavalli, and K. Sycara, “Decentralized Coordinated Motion for a Large Team of Robots Preserving Connectivity and Avoiding Collisions.” *IEEE Conference on Robotics and Automation (ICRA)*, 2017
- [C2] **A. Li**, W. Luo, S. Nagavalli, N. Chakraborty, and K. Sycara, “Handling State Uncertainty in Distributed Information Leader Selection for Robotics Swarms.” *IEEE Conference on System, Man and Cybernetics (SMC)*, 2016
- [C1] **A. Li**, M. Lewis, C. Lebiere, K. Sycara, S. S. Khatib, Y. Tang, M. Siedsma, and D. Morrison, “A Computational Model Based on Human Performance for Fluid Management in Critical Care.” *IEEE Symposium Series on Computational Intelligence (SSCI)*, 2016

Workshop Papers

- [W1] **A. Li***, C.-A. Cheng*, M. A. Rana, N. Ratliff, and B. Boot, “RMP²: a Differentiable Policy Class for Robotic Systems with Control-Theoretic Guarantees.” *3rd NeurIPS Workshop on Robot Learning*, 2020; *Microsoft Reinforcement Learning Day*, 2021

Preprints & Technical Reports

- [TR3] M. Xie, **A. Li**, K. Van Wyk, F. Dellaert, B. Boots, and N. Ratliff, “Imitation Learning via Simultaneous Optimization of Policies and Auxiliary Trajectories.”, *arXiv preprint arXiv:2105.03019*, 2021
- [TR2] N. Ratliff, K. Van Wyk, M. Xie, **A. Li**, and M. A. Rana, “Optimization Fabrics.”, *arXiv preprint arXiv:2008.02399*, 2020
- [TR1] P. Pierpaoli, H. Ravichandar, N. Waytowich, **A. Li**, D. Asher, and M. Egerstedt, “Inferring and Learning Multi-Robot Policies by Observing an Expert.”, *arXiv preprint arXiv:1909.07887*, 2019

Thesis

- [T1] **A. Li**, “Decentralized Coordinated Motion for Robot Teams Preserving Connectivity and Avoiding Collisions.”, *Master’s Thesis, Carnegie Mellon University, 2017*

INVITED TALKS & POSTERS

Learning Reactive Robot Motion Policies with Control-theoretic Guarantees

- Microsoft Research AI Breakthroughs, September 2020
- Robotics Colloquium@UW, November 2020
- NVIDIA GTC, April 2021
- Robotics Seminar@UIUC, May 2021

Safe and Efficient Robot Learning Using Riemannian Motion Policies

- R:SS’21 Workshop on Geometry and Topology in Robotics

HONORS

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| – R:SS Pioneer (30 worldwide) | 2022 |
| – NVIDIA Graduate Fellowship (5 worldwide) | 2020 |
| – Georgia Robotics Fellowship | 2017 |
| – ICRA RAS Travel Grant | 2017 |
| – GSA Conference Funding, CMU | 2016, 2017 |
| – Siebel Scholar Class of 2017 (72 worldwide) | 2016 |
| – Outstanding Graduate (top 5%), ZJU | 2015 |
| – Excellent Undergraduate Thesis Award (top 10%), ZJU | 2015 |
| – Chu Kochen Scholarship (top 0.2%, highest honor), ZJU | 2014 |
| – National Scholarship (top 1%), China | 2013 |
| – First-Class Scholarship for Outstanding Students (top 3%), ZJU | 2013, 2014 |
| – Excellent Student Awards, ZJU | 2012, 2013, 2014 |

LEADERSHIP AND PROFESSIONAL SERVICE

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| – Faculty Chair, R:SS Pioneers Workshop | 2023 |
| – Student Volunteer, American Control Conference | 2021 |
| – Volunteer, Computer Science & Engineering Ph.D. Admission, University of Washington | 2020 – 2022 |
| • Student Area Chair in Robotics (2021 – 2022), Student Reader (2020 – 2022) | |
| – Mentor, Pre-Application Mentorship Service*, University of Washington | 2020 – 2022 |
| • Hosted 1-on-1 mentoring meetings to provide information on graduate school applications | |
| • Provided verbal and written feedback on prospective students’ Ph.D. application materials | |

* *The PAMS program is especially designed to assist PhD applicants from underrepresented communities and related organizations*

- Member of Executive Board, RoboGrads, Georgia Institute of Technology 2018 – 2019
 - President (May – Aug. 2019), Vice-President Academics (May 2018 – May 2019)
 - Initiated faculty-student lunch events in the robotics community
 - Organized student seminars where students present their research to their peers
- Research Breakout Room Host, Allen School Women’s Research Day 2021
 - Shared research and career development experience with women undergraduate researchers
- Reviewer
 - **Journals:** IEEE Robotics and Automation Letters (RA-L); European Journal of Control (EJC)
 - **Conferences:** IEEE International Conference on Robotics and Automation (ICRA); Robotics: Science and Systems (R:SS); Conference on Robot Learning (CoRL); IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS); IEEE Conference on Decision and Control (CDC); IEEE International Conference on Robot & Human Interactive Communication (RO-MAN)
 - **Workshops:** NeurIPS Workshop on Imitation Learning and its Challenges in Robotics, AAAI Student Abstract and Poster Program, R:SS Pioneers Workshop

TEACHING EXPERIENCE

University of Washington
Graduate Teaching Assistant

Mar. 2020 – June 2020, Sept. 2022 – Dec. 2022
Seattle, WA

- CSE-599W: Reinforcement Learning, Spring 2020, Instructor: Prof. Byron Boots
- CSE/AMATH 579: Intelligent Control Through Learning and Optimization, Fall 2022, Instructor: Prof. Byron Boots

Georgia Institute of Technology
Graduate Teaching Assistant

Jan. 2018 – May 2018
Atlanta, GA

- CS-3630: Introduction to Robotics and Perception, Spring 2018, Instructor: Prof. Sonia Chernova

SKILLS

Programming Languages

Python, MATLAB, C/C++, Java

Automatic Differentiation Libraries

PyTorch, Tensorflow

Simulators

OpenAI Gym, MuJoCo, PyBullet

Robotic Software

ROS