ANQI LI

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anqili.github.io

RESEARCH INTERESTS

My research focuses on bringing sample efficiency and formal performance guarantees to 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

· High-speed off-road autonomous driving on complex terrains

· Safe reinforcement learning with structured policy classes

· Learning spatially coordinated policies from human demonstrations

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 Aug. 2017 – May 2019
Graduate Research Assistant *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 June 2017 – Aug. 2017
Research Intern, CNTK Group *Redmond, WA*

· Video synthesis from images using generative adversarial networks

Carnegie Mellon University Oct. 2015 – May 2017
Graduate Research Assistant *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

[J3] J. Urain, **A. Li**, P. Liu, C. D'Eramo, and J. Peters, "Composable Energy Policies for Reactive Motion Generation and Reinforcement Learning." *International Journal of Robotics Research, 2023*

[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

[C16] **A. Li**, D. Misra, A. Kolobov, C.-A. Cheng, "Survival Instinct in Offline Reinforcement Learning." *Neural Information Processing Systems (NeurIPS), 2023* **(Spotlight)**

[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, "RMP^2: 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

[W2] **A. Li**, D. Misra, A. Kolobov, C.-A. Cheng, "Survival Instinct in Offline Reinforcement Learning and Implicit Human Bias in Data." *ICML Workshop on Interactive Learning with Implicit Human Feedback, 2023* **(Oral Presentation)**

[W1] **A. Li***, C.-A. Cheng*, M. A. Rana, N. Ratliff, and B. Boot, "RMP^2: 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

Survival Instinct in Offline Reinforcement Learning

- Microsoft Research RL Reading Group, July 2023

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 Workshop on Geometry and Topology in Robotics, July 2021

HONORS

– **EECS RisingStars (101 worldwide)** 2023

– **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

LEADERSHIP AND PROFESSIONAL SERVICE

– 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 Mar. 2020 – June 2020, Sept. 2022 – Dec. 2022
Graduate Teaching Assistant *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 Jan. 2018 – May 2018
Graduate Teaching Assistant *Atlanta, GA*

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

SKILLS

Programming Laguages	Python, MATLAB, C/C++, Java
Automatic Differentiation Libraries	PyTorch, Tensorflow
Simulators	OpenAI Gym, MuJoCo, PyBullet
Robotic Software	ROS