

Mrinal Verghese

Graduate Student

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Research Theme

I'm interested in building few-shot robot learning methods capable of operating in real-world environments and solving useful tasks for humans. My work often leverages retrieval-based methods and large pretrained models. For more information on my research work, please see my website at <http://mrinal.verghese.org/>.

Education

Ph.D. Robotics, Carnegie Mellon University, Pittsburgh Aug 2021-Present
Advised by Prof. Chris Atkeson

M.S. Robotics, Carnegie Mellon University, Pittsburgh Aug 2020 - Aug 2021
Advised by Prof. Chris Atkeson

B.S. Mathematics-Computer Science, University of California, San Diego Sep 2016 - June 2020
Relevant courses include: Sensing and Estimation in Robotics*, Planning and Learning in Robotics*, Robot Reinforcement Learning*, Deep Learning and Neural Networks, Numerical Methods for Physical Modeling.
(* denotes graduate-level class)

Research Experience

Research Scientist Intern, FAIR (Fundamental AI Research), Meta Jun 2023 - Nov 2023
I was an intern with the FAIR embodied AI team advised by Ruta Desai on grounding large language models to visual information for task planning.

Graduate Research Assistant, Atkeson Lab Sep 2020 - Present
My research work explores methods for data-efficient robot task learning for household tasks. This includes task planning with large language models, efficient skill learning, and understanding task constraints from exploration. Please see my website for a complete list of projects.

Undergraduate Research Assistant, Advanced Robotics and Controls Lab Sep 2016 - Oct 2020
I worked on decomposing configuration space to accelerate proxy collision checking for motion planning. This work has been accepted to *Robotics and Automation Letters* and

was presented at the *International Conference on Robotics and Automation* in May 2022. My prior work looked at robust model-free methods for the control of surgical tendon-based continuum manipulators in constrained environments. I presented a first-author paper on an adaptive visual controller based on this work at the *International Symposium on Robotics Research* in October 2019.

Machine Learning Research Intern, Brain Corporation June 2019 - Sep 2019
I investigated methods for accelerating kinodynamic search-based planning using heuristics learned via Inverse Reinforcement Learning. I was able to reduce the number of nodes expanded during a search by two orders of magnitude in unseen environments.

Teaching Experience

Co-Instructor, 16-890 Robot Cognition for Manipulation, CMU Spring 2023
Co-designed and taught a seminar class on robot cognition, focusing on robot task learning. Selected class topics and papers, and led discussions.

Teaching Assistant, 16-745 Optimal Control and Reinforcement Learning, CMU Spring 2023
TA for graduate-level optimal control class. Held office hours and graded assignments

Teaching Assistant, 16-264 Humanoids, Robotics Institute, CMU Spring 2022
TA for an undergraduate class on humanoid robotics. Created assignments, held office hours, and graded work.

Teaching Assistant, Code in Place, Stanford Spring 2021
Volunteer TA for code in place, a Stanford program that offers the first half of CS106A to students around the world. Lead weekly sections.

Instructional Assistant, Deep Learning and Neural Networks, UC San Diego Spring 2020
Graded assignments and held office hours. Average Rating: 4.6/5

Instructional Assistant, Supervised Machine Learning, UC San Diego Winter 2020
Taught a weekly discussion section and held office hours. Average Rating: 4.8/5

Publications

User-in-the-loop Evaluation of Multimodal LLMs for Activity Assistance

M Verghese*, B Chen*, H Eghbalzadeh, T Nagarajan, R Desai

Under Submission to the European Conference on Computer Vision 2024

Using Memory-Based Learning to Solve Tasks with State-Action Constraints

M Vergheese and C Atkeson

International Conference on Robotics and Automation 2023

May 29- June 2, London, UK, 2023

[\[https://arxiv.org/abs/2303.04327\]](https://arxiv.org/abs/2303.04327)

Configuration Space Decomposition for Scalable Proxy Collision Checking in Robot Planning and Control

M Vergheese, N Das, Y Zhi, M Yip

Robotics and Automation Letters and International Conference on Robotics and Automation,

May 23-27, Philadelphia, PA, 2022

[\[https://arxiv.org/abs/2201.04314\]](https://arxiv.org/abs/2201.04314)

Model-free Visual Control for Continuum Robot Manipulators via Orientation Adaptation

M Vergheese, F Richter, A Gunn, P Weissbrod, M Yip

International Symposium on Robotics Research (ISRR), Oct. 6-10, Hanoi, Vietnam, 2019.

[\[https://arxiv.org/abs/1909.00450\]](https://arxiv.org/abs/1909.00450)

Robot Control of Endoscopic Instruments using Flexible Polymer Sheath

A Gunn, **M Vergheese**, W Wong, P Weissbrod, M Yip IEEE/RSJ Int. Conference on Intelligent

Robots and Systems. In Workshop: Continuum Robots in Medicine: Design, Integration, and

Applications, Vancouver, Canada, Sept. 23, 2017.

Talks

Configuration Space Decomposition for Scalable Proxy Collision Checking in Robot Planning and Control, International Conference on Robotics and Automation (ICRA), May 22, Philadelphia, United States, 2022.

Model-free Visual Control for Continuum Robot Manipulators via Orientation Adaptation
Spotlight presentation, International Symposium on Robotics Research (ISRR), Oct. 8, Hanoi, Vietnam, 2019.

Improving Planning in Autonomous Navigation via Learning

Invited talk, ECE 148 - Introduction to Autonomous Vehicles, UC San Diego, March 9, 2021.

Mentorship

Yiqi Wang (Masters Student CMU ECE)	2023-2024
Vignesh Rajmohan (Masters Student CMU ECE)	2022-2023
Yuemin Mao (Undergraduate Student CMU MechE and CMU Robotics)	2022-2023
Longping Zhang (UIUC Undergraduate Student Mathematics)	2022-2023

Awards

NSF Graduate Research Fellowship Program Honorable Mention

2022

Service

Reviewer, Robotics Institute PhD committee 2022-2024

Reviewing PhD applications for the Robotics Institute at Carnegie Mellon.

Member, Robotics Institute Climate Committee

Monitoring the overall working climate of the CMU robotics institute and working on various initiatives related to DEI and student well-being. Leading sub-committee on student recruiting and admissions.

Reviewer, International Conference on Robotics and Automation

Reviewed submissions to the International Conference on Robotics and Automation

Reviewer, Robotics and Automation Letters

Reviewed submissions to the Robotics and Automation Letters Journal

Reviewer, Robotics Institute Summer Scholars

Reviewed applicants for the Carnegie Mellon Robotics Institute's undergrad summer research program