

SRIRAM SIVA

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RESEARCH INTERESTS

Vision: Developing intelligent surface robots capable of adapting navigation and perception on the fly in unstructured environments through machine learning research on robot self-reflection, representation learning, and behavior adaptation

Interests: Robot Learning; Machine Learning (ML) for Robot Autonomy; Autonomy in Unstructured & Uncertain Environments; Supervised/Unsupervised Learning; Reinforcement Learning (RL)

EDUCATION

2017–2023 **Ph.D., Computer Science: Robot Autonomy, ML & AI**, *Colorado School of Mines*.
Thesis: Robot Learning for Lifelong Autonomy in Unstructured Environments
Advisor: Dr. Hao Zhang, Associate Professor, University of Massachusetts, Amherst

2012–2016 **B. Tech., Mechanical Engineering**, *Amrita University*.

SKILLS

Coding Tools C/C++, Python, Matlab, TensorFlow, Keras, Robot Operating System (ROS), Open Motion Planning Library (OMPL), Point Cloud Library (PCL), OpenCV, SolidWorks, Linux

RESEARCH EXPERIENCE

Aug 2016 – Present **Ph.D. Researcher**, *HUMAN-CENTERED ROBOTICS LAB*, Colorado School of Mines.

- Primary researcher and contributor to US DEVCOM ARL SARA project on robot perceptual and navigation adaptation for lifelong autonomy in unstructured and uncertain environments, reducing navigation failures by 20% against state-of-the-art heuristics-based methods.
- Primary researcher and contributor to DARPA project on multi-robot autonomy with adaptation to failures in uncertain navigation scenarios. Preceding work on perception for navigation adaptation won the best paper finalist for cognitive robotics at IROS, 2021.
- Primary research on machine learning-based visual SLAM and motion planning for robot navigation in underground and subterranean environments, with demonstrations in EDGAR experimental mine.
- Development of ML-based lifelong omnidirectional sensor fusion for place recognition and localization in feature sparse environments (Patent:US20200389601A1). Actively deployed in *FactorEarth*.

Aug 2013 – **Student Researcher**, *AMRITA ROBOTICS LAB*, Amrita University.

- May 2016
- System Identification, estimation, filtering, and development of non-linear advanced controls for zero overshoot UAV maneuvers. Autonomy for quad- and tri-rotor aerial vehicles

May 2015 – **Research Intern**, *FORD MOTORS*, Chennai, India.

- Aug 2015
- Motion planning methods for windshield PU applying KUKA and ABB robotic manipulators, reducing PU wastages ($\approx 6\%$) and minimizing windshield cracks.

May 2014 – **Research Intern**, *RENAULT-NISSAN AUTOMOTIVE LTD.*, Chennai, India.

- Aug 2014
- Motion planning methods for Spot welding ABB manipulators in an assembly line to optimize time of maneuver using lesser waypoints.

HONORS AND AWARDS

- 2021 **Best Paper Award – Cognitive Robotics**, *FINALIST – IROS*.
- 2020 – 2021 **Research Fellowship**, *COMPUTER SCIENCE DEPT., COLORADO SCHOOL OF MINES*.
- 2020 – 2021 **Publication Award**, *HUMAN CENTERED ROBOTICS LAB*.
- 2021 **Travel Grants for Research Collaborations**.
- 2021 **Best Poster**, *RUNNER-UP – C-MAPP @ COLORADO SCHOOL OF MINES*.
- 2015 **Best UAV Design and Flight**, *WINNER – INDIAN INSTITUTE OF SPACE AND TECHNOLOGY*.
- 2014 **Academic Excellence Scholarship**, *AMRITA UNIVERSITY*.

PUBLICATIONS

- [1] **Sriram Siva**, Maggie Wigness, John G. Rogers, Long Quang, and Hao Zhang. NAUTS: Negotiation for Adaptation to Unstructured Terrain Surfaces. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022.
- [2] **Sriram Siva**, Maggie Wigness, John G. Rogers, Long Quang, and Hao Zhang. Self-Reflective Terrain-Aware Robot Adaptation for Consistent Off-Road Ground Navigation. Under review, *International Journal of Robotics Research (IJRR)*.
- [3] **Sriram Siva**, Maggie Wigness, John G. Rogers, and Hao Zhang. Enhancing Consistent Ground Maneuverability by Robot Adaptation to Complex Off-Road Terrains. In *Conference on Robot Learning (CoRL)*, 2021, **Selected for Oral Presentation (6.5% acceptance)**.
- [4] Ryan Blake Jackson*, Sihui Li*, Santosh Balajee Banisetty, **Sriram Siva**, Hao Zhang, Neil Dantam, and Tom Williams. An Integrated Approach to Context-Sensitive Moral Cognition in Robot Cognitive Architectures. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2021, **Finalist for Best Paper Award on Cognitive Robotics**.
- [5] **Sriram Siva**, Maggie Wigness, John G. Rogers, and Hao Zhang. Enhancing Ground Maneuverability Through Robot Adaptation to Complex Unstructured Off-Road Terrains. *Association for the Advancement of Artificial Intelligence (AAAI)*, Spring Symposium Series, 2021.
- [6] **Sriram Siva**, and Hao Zhang. Robot Perceptual Adaptation to Environment Changes for Long-Term Human Teammate Following. *The International Journal of Robotics Research (IJRR)*, 2020.
- [7] Boyless, Nathaniel, Jiayi Liu, **Sriram Siva**, and Hao Zhang. Spherical Image Based Registration and Self-Localization for Onsite and Offsite Viewing. *U.S. Patent Application 16/889,578*, filed December 10, 2020.
- [8] **Sriram Siva***, Zachary Nahman*, and Hao Zhang. Voxel-Based Representation Learning for Place Recognition Based on 3D Point Clouds. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020.
- [9] **Sriram Siva**, Maggie Wigness, John G. Rogers, and Hao Zhang. Robot Adaptaion to Unstru- cuted Terrains by Joint Representation and Apprenticeship Learning. In *Robotics: Science and Systems (RSS)*, 2019.
- [10] Fei Han, **Sriram Siva**, and Hao Zhang. Scalable Representation Learning for Long-Term Augmented Reality-Based Information Delivery in Collaborative Human-Robot Perception. *International Conference on Virtual, Augmented and Mixed Reality (VAMR)*, 2019.
- [11] **Sriram Siva**, and Hao Zhang. Metacognitive Reasoning of Perceptual Inconsistency for Illusion Detection. *Robotics: Science and Systems (RSS)*, Workshop paper, 2018.

- [12] **Sriram Siva**, and Hao Zhang. Omnidirectional Multisensory Perception Fusion for Long-Term Place Recognition. *IEEE International Conference on Robotics and Automation (ICRA)*, 2018.
- [13] **Sriram Siva**, and Hao Zhang. Robot Adaptation to Environment Changes in Long-Term Autonomy. *IEEE International Conference on Robotics and Automation (ICRA)*, Workshop paper, 2018.
- [14] **Sriram Siva***, Peng Gao*, Yiming Deng*, and Hao Zhang. Multisensory Internal Pipe Threat Prediction Using Inline Inspection Robots. *IEEE International Conference on Robotics and Automation (ICRA)*, Abstract-Only Poster, 2018.
- [15] **Sriram Siva***, Brian Reily*, and Hao Zhang. Fast Deployment of Multi-Robot Autonomy in Underground Environments. *IEEE International Conference on Robotics and Automation (ICRA)*, Abstract-Only Poster, 2018.
- [16] Peng Gao, **Sriram Siva**, Anthony Micciche, and Hao Zhang. Collaborative Scheduling with Adaptation to Failure for Heterogeneous Robot Teams. Under review, *International Conference on Robotics and Automation (ICRA)*, 2023.
- [17] Brian Reily, **Sriram Siva**, Terran Mott, Chuang Gan, and Hao Zhang. Decentralized and Communication-Free Multi-Robot Navigation through Distributed Games. Under review, *International Conference on Robotics and Automation (ICRA)*, 2023.
- [18] Sihui Li, **Sriram Siva**, Terran Mott, Tom Williams, Hao Zhang, and Neil Dantam. Command Rejection in Privacy-Sensitive Contexts: An Integrated Robotic System Approach. Under review, *Robotics and Automation Letters (RAL)*, 2023.

REVIEWING EXPERIENCE

- 2022 Conference on Robot Learning (**CoRL**)
- 2019-2022 IEEE Robotics and Automation Letters (**RA-L**)
- 2019-2022 IEEE International Conference on Robotics and Automation (**ICRA**)
- 2019-2022 IEEE International Conference on Intelligent Robots and Systems (**IROS**)
- 2021 IEEE International Conference on Safety, Security, and Rescue Robotics (**SSRR**)
- 2018-2019 IEEE-RAS International Conference on Humanoid Robots (**HUMANOIDS**)
- 2018-2020 Association for the Advancement of Artificial Intelligence (**AAAI**)

OUTREACH EXPERIENCE

- 2018 – **Program for Robotics Outreach on Gender and Racial Equity in School and Society**
present (**PROGRESS**)
 - Mentor at the *Program for Robotics Outreach on Gender and Racial Equity in School and Society* (PROGRESS), providing CS outreach and education in a way that serves the needs of a diverse and inclusive society.
 - Student representative for outreach at HCR Lab, educating the public on the benefits of robotics technology to society, providing robot demonstrations and inspiring K-12 students to pursue careers in robotics and other Science, Technology, Engineering, and Math (STEM) fields.

MENTORSHIP EXPERIENCE

- 2018 – **Mentorship at Human-Centered Robotics Lab**,
present *Guiding students with various research and development problems in robotics, machine learning, programming, publishing, and helping with technical skills for robotics..*

- Nathaniel Gyory (M.S. Thesis - Spring 2023): LEARNING NAVIGATION IN LEGGED ROBOTS
- Zachary Nahman (M.S. Thesis - Fall 2019): ROBOT LEARNING FOR LOOP CLOSURE DETECTION AND SLAM
- Saichand Bandarupalli (M.S. Thesis - Fall 2018): OBJECT DETECTION IN UNDERGROUND MINES
- Logan Diagler (Undergrad: Summer 2021-Fall 2022): AUTONOMOUS ROBOT NAVIGATION
- Nicholas Estoll (Undergrad: Fall 2021): MULTI-ROBOT AUTONOMY SIMULATOR DEVELOPMENT
- Ella Gibb (Undergrad: Fall 2021): ROBOT CONTEXT LEARNING
- Prashasth Satish (Undergrad: Summer 2021): ROBOT LEARNING FOR ADAPTIVE NAVIGATION
- Gazi Mahbub Morshed (Undergrad: Fall 2020): LONG-TERM REPRESENTATION LEARNING

2021 **Google Explore CSR Hidden Talents**

- Mentor undergraduates from underrepresented groups and motivate and encourage them to pursue CS research.
- Introducing different aspects of research to undergraduate students, sharing my journey through graduate school, choosing a career path, and making graduate school a lot less daunting and more tangible path to pursue.

TEACHING EXPERIENCE

2018 **Teaching Assistant – CS442: Operating Systems**

- Assisted in taking classes for students, grading assignments, and holding weekly office hours.
- This course covers process communication and synchronization, resource management, virtual memory, file systems, networking and distributed systems.

2017 **Teaching Assistant – CS473/573: Human Centered Robotics**

- Assisted in teaching students how robots perceive and react to human behaviors through learning and 3D perception, utilizing ROS, Python, C++, and OpenCV.
- Graded students on both projects and homework based on automated python scripts.

IN THE PRESS

- CNET, **Watch a Spot Robot Explore an Old Mine**, Sep 2020.
- CGTN, **Engineers develop robots that are able to do dangerous jobs**, Jul 2018.
- Associated Press, The Denver Post, Fox News, **US officials consider new tool to combat mine spills: Robots**, Jan 2018.

PROFESSIONAL AFFILIATIONS

- Student member of *American Association for the Advancement of Science* (AAAS)
- Student member of *Institute of Electrical and Electronics Engineers* (IEEE).