

Siva Maneparambil Kailas

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Research Interests: I am broadly interested in multi-agent systems and embodied AI. My experience in multi-agent systems spans multi-agent reinforcement learning, deep learning, statistical learning, informative path planning, task allocation, explainability, and interpretability. My experience in embodied AI includes imitation learning, social navigation, multi-arm manipulation, and computer vision for pose estimation/object detection.

EDUCATION AND COURSEWORK

Georgia Institute of Technology (College of Computing, School of Interactive Computing) August 2023 – Present

- **PhD in Robotics, Research Assistant in School of Interactive Computing STAR Lab, GPA: 4.00/4.00**
- **Robotics Coursework:** Graduate Artificial Intelligence (PhD), Deep Reinforcement Learning for Intelligent Control, Explainable Artificial Intelligence, Robotics Research, Human-Robot Interaction

Carnegie Mellon University (School of Computer Science, Robotics Institute) August 2021 – August 2023

- **MSc in Robotics, Research Assistant in Robotics Institute AART Lab, GPA: 4.00/4.00**
- **Thesis:** Multi-Robot Information Gathering for Spatiotemporal Environment Modelling
 - **Thesis Committee:** Prof. Katia Sycara, Prof. George Kantor, Sha Yi
- **Robotics Coursework:** Machine Learning (PhD), Deep Learning for Robotics, Statistical Techniques in Robotics, Math Fundamentals for Robotics, Computer Vision, Multi-Robot Planning and Coordination, Kinematics, Dynamics, and Control
- **Awards:** National Science Foundation Graduate Research Fellowship

Arizona State University (CIDSE/SCAI and Barrett, The Honors College) August 2016 – May 2020

- **BSc in Computer Science, Minor in Economics, Minor in Statistics, GPA: 4.00/4.00**
- **Thesis:** CNN-based Pose Initialization with Uncertainty Estimation
 - **Thesis Committee:** Prof. Heni Ben Amor, Dr. Renaud Detry
- **Awards:** President's Award, Arizona Top Scholar, Intel Scholarship, Moeur Award (Highest Academic Standing)
- **Dean's List Award:** Spring 2020, Fall and Spring 2019, Fall and Spring 2018, Fall and Spring 2017, Fall 2016
- **Computer Science Coursework:** Machine Learning, Deep Learning, Artificial Intelligence, Robotics, Operating Systems, Compiler Theory, Computer Organization, Web Development, Data Science, Distributed Computing, Data Structures, Algorithms, Software Engineering, Database Management, Computational Theory
- **Electrical Engineering Coursework:** Random Signal Analysis, Microprocessor Design, University Physics, Electrical Circuits, Signals and Systems, Intel Core Architecture and PCIe
- **Mathematics Coursework:** Probability Theory, Statistics, Linear Algebra, Discrete Mathematics, Differential Equations, Multi-Variate Calculus, Mathematical Structures
- **Economics Coursework:** Econometrics, Financial Economics, Microeconomic Theory, Macroeconomic Theory

RECENT RESEARCH AND WORK EXPERIENCE

STAR Lab (Georgia Institute of Technology): Research Assistant September 2023 – Present

- Developing and evaluating an explainable post-hoc learning-based approach for multi-agent systems
- Investigating methods towards generalization in embodied single-/multi-agent learning using Habitat simulator
- Investigating human preference-aware multi-agent task allocation framework with defined suboptimality bounds

AART Lab (Carnegie Mellon University): Research Assistant September 2021 – Present

- Developing multi-agent adaptive sampling and informative path planning algorithms for environment learning
- Developed single-agent informative path planning framework for dynamic information maps using learned MCTS
- Worked on multiagent reinforcement learning (RL) approach for interpretable emergent communication
- Developed human-agent testbed to evaluate multi-agent RL approach for emergent interpretable communication

Air Force Research Lab: Research Assistant June 2022 – September 2023

- Investigating human-swarm trust when showing benevolent and self-interested behaviors in human-agent teaming
- Developed experimental testbed and various stimuli of each behavior for differing levels of affordances

REACT Lab (Harvard University): Research Assistant June 2019 – May 2023

- Developed multiagent reinforcement learning (RL) POMDP solver with rollout and approximate policy iteration
- Applied our multiagent RL solver to autonomous repair problem and outperformed current multiagent RL solvers

- Conducted simulation studies for collecting data on single-agent RL POMDP solver in sequential repair domain

Interactive Robotics Lab (Arizona State University): Research Assistant **September 2018 – December 2023**

- Developed satellite with robotic arm for autonomous assembly via learned motion primitives with NASA JPL
- Developed efficient low-power 6D model-based tracking system with sample-efficient optimization for satellite
- Developed ConvNet for single shot 6D pose estimation and predictive uncertainty measure for visual servoing
- Investigating various imitation learning approaches for bimanual robotic manipulation with Intrinsic (Google X)

Amazon.com Inc: Software Development Engineer **June 2019 – August 2019, July 2020 – October 2021**

- Designed and developed numerous scalable serverless microservices using Amazon Web Services technologies
- Created full-stack web app for Fulfillment by Amazon project managers to perform internal business operations

Intel Corp: Engineering Intern **May 2017 – August 2017, May 2018 – August 2018**

- Created a web server and web app for developers to have real-time access to current internal audit status
- Created Python modules to be used in all scripts developed by Intel Functional Safety organization
- Worked on implementing continuous integration feedback loop for robust automation framework

Translational Ultrasound Research Lab (Mayo Clinic): Research Assistant **January 2018 – May 2019**

- Created echocardiographic marker to guide catheter for noninvasive cardiac surgery using ultrasound imaging
- Designed and developed a miniaturized circuit for optimal waveform generation to use in operation room setting

Fulton School of Engineering (Arizona State University): Teaching Assistant **August 2017 – May 2020**

- Assisted students in computer science and electrical engineering classes by teaching and reinforcing concepts
- Assisted professor in preparing course material and assessment activities for various engineering courses

SKILLS AND TRAINING

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| <ul style="list-style-type: none">• C, C++, C#, Java, Bash, Python (scikit-learn, pandas, numpy, scipy)• OpenCV, ViSP, Keras (TensorFlow), Pytorch (LibTorch), Eigen, TooN | <ul style="list-style-type: none">• MATLAB (Robotics System Toolbox), Octave• Robot Operating System (ROS), Gazebo• Assembly (MIPS, x86)• PSpice, LTSpice, Logisim | <ul style="list-style-type: none">• Amazon Web Services• HTML, CSS, JavaScript• Angular, React, Typescript• Node.js, PHP, Apache• SQL, Oracle DB• Ajax, jQuery, Bootstrap |
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PUBLICATIONS AND POSTERS

- **Kailas, S.**, Jain, S., & Ravichandar, H. (2025). Evaluating and Improving Graph-based Explanation Methods for Multi-Agent Coordination. International Conference on Autonomous Agents and Multiagent Systems (AAMAS).
- **Kailas, S.**, Deolasee, S., Kim, W., Luo, W., & Sycara, K. (2025). Integrating Multi-Robot Adaptive Sampling and Informative Path Planning for Spatiotemporal Environment Prediction. IEEE International Conference on Robotics and Automation (ICRA).
- Chen, L., **Kailas, S.**, Deolasee, S., Luo, W., Kim, W., & Sycara, K. (2025). Distributed Multi-robot Source Seeking in Unknown Environments with Unknown Number of Sources. IEEE International Conference on Robotics and Automation (ICRA).
- Gadipudi, S. B., Deolasee, S., **Kailas, S.**, Luo, W., Sycara, K., & Kim, W. (2025) OffRIPP: Offline RL-based Informative Path Planning. IEEE International Conference on Robotics and Automation (ICRA). (Submitted)
- Deolasee, S., **Kailas, S.**, Luo, W., Sycara, K., & Kim, W. (2024) DyPNIPP: Predicting Environment Dynamics for RL-based Robust Informative Path Planning. IEEE Robotics and Automation Letters (IEEE RA-L). (Submitted)
- Drolet, M., Stepputtis, S.*, **Kailas, S.***, Jain, A., Schaal, S., & Amor, H.B. (2024). A Comparison of Imitation Learning Algorithms for Bimanual Manipulation. IEEE Robotics and Automation Letters (IEEE RA-L). (* denotes equal contribution)
- Chhablani, G.*, Ummettuguli, M. K.*, & **Kailas, S.*** (2024). Curriculum Learning for GPS-Free Indoor Social Navigation. Conference on Computer Vision and Pattern Recognition (CVPR) Embodied AI Workshop. (* denotes equal contribution)
- Drolet, M., Stepputtis, S., **Kailas, S.**, Jain, A., Schaal, S., & Amor, H.B. (2024). A Comparison of Imitation Learning Algorithms for Bimanual Manipulation. Conference on Robot Learning Workshop on Whole-Body Control and Bimanual Manipulation (CoRL WCBM).
- **Kailas, S.**, Luo, W., & Sycara, K. (2023). Multi-robot Adaptive Sampling for Supervised Spatiotemporal Forecasting. EPIA Conference on Artificial Intelligence.

- Bhattacharya, S., **Kailas, S.**, Badyal, S., Gil, S., & Bertsekas, D. (2023). Multiagent Reinforcement Learning: Rollout and Policy Iteration for POMDP with Application to Multi-Robot Problems. *IEEE Transactions on Robotics (IEEE TRO)*.
- **Kailas, S.** (2023). Multi-Robot Information Gathering for Spatiotemporal Environment Modelling.
- Karten, S., **Kailas, S.**, & Sycara, K. (2023). Emergent Compositional Concept Communication through Mutual Information in Multi-Agent Teams. *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*.
- Karten, S., Tucker, M., **Kailas, S.**, & Sycara, K. (2023). Towards True Lossless Sparse Communication in Multi-Agent Systems, *IEEE International Conference on Robotics and Automation (ICRA)*.
- Jong, A., Yu, M., Dhrafani, D., **Kailas, S.**, Moon, B., Sycara, K., & Scherer, S. (2023). WIT-UAS: A Wildland-fire Infrared Thermal Dataset to Detect Crew Assets from Aerial Views. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*.
- Capiola, A., Lyons, J. B., Harris, K. N., aldin Hamdan, I., **Kailas, S.**, & Sycara, K. (2023). “Do what you say?” The combined effects of framed social intent and autonomous agent behavior on the trust process. *Computers in Human Behavior*, 149, 107966.
- Karten, S., Tucker, M., **Kailas, S.**, & Sycara, K. (2022). Towards True Lossless Sparse Communication in Multi-Agent Systems. *Conference on Neural Information Processing Systems (NeurIPS) Deep RL Workshop*.
- Karten, S., Tucker, M., Li, H., **Kailas, S.**, Lewis, M., & Sycara, K. (2022). Interpretable Learned Emergent Communication for Human-Agent Teams. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Workshop on Human Theory of Machines and Machine Theory of Mind for Human-Agent Teams*.
- Jong, A., Moon, B., **Kailas, S.**, Yuan, J., Sycara, K., & Scherer, S. (2022). Learned Informed Monte Carlo Tree Search for Informative Path Planning on Dynamic Time-varying Information. *IEEE International Conference on Robotics and Automation (ICRA)*. (Submitted)
- Karten, S., Tucker, M., Li, H., **Kailas, S.**, Lewis, M., & Sycara, K. (2022). Interpretable Learned Emergent Communication for Human-Agent Teams. *IEEE Transactions on Cognitive and Developmental Systems (IEEE TCDS)*.
- Bhattacharya, S., **Kailas, S.**, Badyal, S., Gil, S., & Bertsekas, D. (2020). Multiagent Rollout and Policy Iteration for POMDP with Application to Multi-Robot Repair Problems. *Conference on Robot Learning (CoRL)*.
- Sonawani, S., **Kailas, S.**, Detry, R., Alimo, R., Backus, S., McCormick, R., Mukherjee, R., Wehage, K. & Amor, H.B. (2020). Robotic In-Space Assembly with Arm-Augmented Cubesats. *International Conference on Robotics and Automation (ICRA) Opportunities and Challenges in Space Robotics*. (Best Poster Award)
- **Kailas, S. M.** (2020). Convolutional Neural Network for Pose Initialization with Uncertainty Estimation.
- Sonawani, S., **Kailas, S.**, Ben Amor, H., & Detry, R. (2019). Autonomous In-Space Assembly with Arm-Augmented Cubesats. *JPL Research Poster Conference. (SURP-ASU)*
- Belohlavek, M., **Kailas, S.**, Vaitkus, V., Kumar, V., Fatemi, M., & Katayama, M. (2019). Portable System for Intracardiac Injection Catheter Navigation with a Novel Use of Doppler Echocardiography. *Echo Hawaii*.
- Dakhane, A., Tweedley, S., **Kailas, S.**, Marzke, R., & Neithalath, N. (2017). Mechanical and microstructural characterization of alkali sulfate activated high volume fly ash binders. *Materials & Design*, 122, 236-246.
- Dakhane, A., Das, S., **Kailas, S.**, & Neithalath, N. (2016). Elucidating the Crack Resistance of Alkali-Activated Slag Mortars Using Coupled Fracture Tests and Image Correlation. *Journal of the American Ceramic Society*, 99(1), 273-280.
- **Kailas, S.**, Gu, J., & Zenhausern, F. (2015). Developing a Vertical Flow Immunoassay for Monitoring VEGF Level in the Aqueous Humor for Neovascular Eye Diseases. *TGen Intern Symposium*.

ADDITIONAL PROJECTS

- Designed and implemented RL methods for bipedal and quadrupedal locomotion using MuJoCo XLA (JAX)
- Designed and implemented robotic navigation from LIDAR, RGB Camera, and IMU on real-world robot system
- Implemented various approaches for computer vision tasks including scene classification and object tracking
- Implemented forward and inverse kinematic solvers for WAM robotic arm with control and dynamics simulation
- Implemented multiple numerical solvers for path planning, optimization, and point cloud surface detection
- Implemented online learning algorithms for stochastic and adversarial multi-armed bandit scenarios
- Developed big data pipeline to analyze metagenomic data to determine functional networks via network analysis
- Developed software for colorimetric image analysis of biological assay to determine positive or negative result
- Developed software to predict tensile strength of the material using Digital Image Correlation with MATLAB
- Developed deep neural net to predict customer loyalty from customer-merchant data from Elo credit card dataset