

Sumanth Tangirala

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RESEARCH INTERESTS

Data-driven reachability analysis for verifying robot controllers, especially black-box learned policies such as RL and behavior cloning policies. Related interests include uncertainty quantification, conformal prediction, and planning and control for robots with complex dynamics.

EDUCATION

Rutgers, the State University of New Jersey, New Brunswick NJ, USA
PhD in Computer Science 2024 – 2029 (expected)

- Advisor: Kostas E. Bekris

MS in Computer Science, GPA: 3.97/4 2022 – 2024

- Thesis: “Safety and Efficiency for High-dimensional Robots: Integrating Learning, Planning, and Control”

Dhirubhai Ambani University (formerly DA-IICT) Gandhinagar, India
BTech in Information and Communication Technology 2016 – 2020

EXPERIENCE

Graduate Researcher, PRACSYS Lab Sep 2022 – Present
Rutgers, the State University of New Jersey *New Brunswick, NJ, USA*

- Researching methods to estimate where black-box robot controllers reach their goals without failing under stochastic dynamics, so learned policies can be trusted without a model of the policy or the system.
- Co-developed KRAFT, proposed and implemented its contingency-checking safety mechanism, and ran its physical experiments on the MuSHR platform.
- Proposed and implemented the label-based contrastive training variant in MORALS (ICRA 2024).
- Trained the quadrotor RL policy and built the RL-only baseline for Roadmaps with Gaps (IROS 2024).
- In a survey on robot motion generation (ISRR 2024), worked on the sections on explicit planning and control, RL, and behavior cloning.
- Built the STEAP (Simultaneous Trajectory Estimation and Planning) baseline for STELA (RSS 2025).

Prediction Intern (Research) Jun 2025 – Sep 2025
Zoox *Foster City, CA, USA*

- Owned a project to reduce how much simulation it takes to validate the autonomy stack, by estimating its performance metrics from a subset of the logged scenarios.
- Modeled each metric as a Gaussian process over scenario embeddings and used Bayesian optimization to sample the rare events the metrics depend on, then compared this approach with stratified sampling.
- Found a negative result and identified the cause. Embeddings rich enough to predict the metrics were too high-dimensional for GPs, and compressed embeddings lost the signal.

Software Engineer (Intern, then Full-time) Jan 2020 – Jul 2022
Tekion *Bangalore, India*

- Led development of dealership management modules, including the repair-order Kanban and vehicle history.
- Led product-wide frontend changes, coordinating across multiple teams, that enabled global expansion.
- Trained 25+ interns and mentored junior developers in React and Redux.

Research Intern May 2019 – Aug 2019
Indian Space Research Organisation (ISRO) *Ahmedabad, India*

- Classified groundnut and cotton fields in radar (PolSAR) satellite imagery with an RNN-LSTM at 91.2% accuracy, and collected the ground truth in the field.

- Developed deep-learning methods for classifying radar (PolSAR) images, published at PReMI 2019.

PUBLICATIONS

Conference Papers

- [1] Edgar Granados, [Sumanth Tangirala](#), Kostas E. Bekris, “Kinodynamic Trajectory Following with STELA: Simultaneous Trajectory Estimation & Local Adaptation”, *Robotics: Science and Systems (RSS)*, 2025.
- [2] Kostas E. Bekris, Joe Doerr, Patrick Meng, [Sumanth Tangirala](#), “The State of Robot Motion Generation”, *International Symposium of Robotics Research (ISRR)*, 2024.
- [3] Aravind Sivaramakrishnan, [Sumanth Tangirala](#), Edgar Granados, Noah R. Carver, Kostas E. Bekris, “Roadmaps with Gaps over Controllers: Achieving Efficiency in Planning under Dynamics”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024.
- [4] Ewerton R. Vieira*, Aravind Sivaramakrishnan*, [Sumanth Tangirala](#), Edgar Granados, Konstantin Mischaikow, Kostas E. Bekris, “MORALS: Analysis of High-Dimensional Robot Controllers via Topological Tools in a Latent Space”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2024. **Best Paper Award Finalist (Automation)**.
- [5] Tushar Gadhiya, [Sumanth Tangirala](#), Anil K. Roy, “Stacked Autoencoder Based Feature Extraction and Superpixel Generation for Multifrequency PolSAR Image Classification”, *International Conference on Pattern Recognition and Machine Intelligence (PReMI)*, 2019.

Preprints

- [6] Aravind Sivaramakrishnan, [Sumanth Tangirala](#), Dhruv Metha Ramesh, Edgar Granados, Kostas E. Bekris, “KRAFT: Sampling-Based Kinodynamic Replanning and Feedback Control over Approximate, Identified Models of Vehicular Systems”, *arXiv:2409.11522*, 2024.

* Equal contribution

AWARDS

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| • Best Paper Award Finalist (Automation), ICRA
For MORALS | 2024 |
| • NSF-NRT Fellowship, SOCRATES Program
Two years of funding for interdisciplinary research in socially cognizant robotics | 2024 – 2026 |
| • Outstanding Project Award & Outstanding Publication Award
Department of Computer Science, Rutgers University, for MORALS | 2024 |

SKILLS

Methods: Reachability analysis, statistical verification, conformal prediction, active learning, generative models (flow matching, diffusion), reinforcement learning, behavior cloning

Programming: Python, C++, C, Bash

Machine Learning: PyTorch, Stable-Baselines3, scikit-learn, OpenCV, TensorFlow

Robotics: ROS, MuJoCo, Isaac Gym, MuSHR platform

PROFESSIONAL ACTIVITIES

- Reviewer for IEEE RA-L, IEEE T-ASE, ICRA (2025, 2026), and IROS (2024, 2025).