

# Sumanth Tangirala

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## RESEARCH INTERESTS

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My research interests are at the intersection of robotics, machine learning, and human-robot interaction. I focus on developing planning algorithms for robotic navigation in dynamic, unstructured environments. Additionally, I am interested in safe, verifiable planning and social navigation for safe human-robot interactions.

## EDUCATION

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**Rutgers, the State University of New Jersey - New Brunswick**

NJ, USA

*Ph.D. in Computer Science, NSF-NRT SOCRATES Fellow*

2024–2029 (Expected)

- Advisor: Kostas E. Bekris

*Master of Science (M.S.) in Computer Science, GPA: 3.97/4*

2022–2024

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

**Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT)**

Gandhinagar, India

2016–2020

*B.Tech. in Information and Communication Technology, GPA: 8.57/10*

## PUBLICATIONS

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### Under Review

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

### Conference Papers

- Kostas E. Bekris, Joe Doerr, Patrick Meng, [Sumanth Tangirala](#), “The State of Robot Motion Generation”, in *International Symposium of Robotics Research (ISRR)*, 2024.
- Aravind Sivaramakrishnan, [Sumanth Tangirala](#), Edgar Granados, Noah Carver, and Kostas E. Bekris, “Roadmaps with Gaps over Controllers: Achieving Efficiency in Planning under Dynamics”, in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024.
- Ewerton R. Vieira\*, Aravind Sivaramakrishnan\*, [Sumanth Tangirala](#), Edgar Granados, Konstantin Mischaikow, and Kostas E. Bekris, “MORALS: Analysis of High-Dimensional Robot Controllers via Topological Tools in a Latent Space”, in *IEEE International Conference on Robotics and Automation (ICRA)*, 2024.
- Tushar Gadhiya, [Sumanth Tangirala](#), and Anil K. Roy, “Stacked Autoencoder Based Feature Extraction and Superpixel Generation for Multifrequency PolSAR Image Classification”, in *Pattern Recognition and Machine Intelligence: 8th International Conference, PReMI 2019*.

## EXPERIENCE

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**Software Engineer**

Jan 2020 - June 2022

*Tekion Corporation*

*Bangalore, India*

- Led the development of software modules for the Dealership Management System, including Kanban Repair Order Dashboards and Vehicle History, and implemented multilingual support to enable global expansion.
- Trained 25+ interns and junior developers in ReactJS and ReduxJS Frontend technologies, significantly improving team capabilities, and mentored teams of interns to develop critical internal tools and features.

## Research Intern

Indian Space Research Organization (ISRO)

May 2019 - Aug 2019

Ahmedabad, India

- Analyzed and extracted features from Dual-Polarised PolSAR satellite image data for land cover classification by employing Pauli, Yamaguchi, and Huynen decomposition algorithms.
- Trained an RNN-LSTM model to leverage the extracted features for discrimination of Ground Nut and Cotton Fields from other land cover classes with an accuracy of 91.2%.

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## RELEVANT SKILLS

**Programming Languages:** Python, C, C++, JavaScript, MATLAB, Bash

**Machine Learning Tools:** PyTorch, StableBaselines3, OpenCV, TensorFlow, Scikit-Learn

**Robotics Tools:** Robot Operating System (ROS), MuJoCo, IsaacGym, MuSHR Robot Platform

**Miscellaneous Tools:** CUDA, NodeJS, REST APIs, ReactJS, ReduxJS

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## COURSEWORK

Socially Cognizant Robotics, Advanced Robotics, Computational Robotics, Computer Vision, Natural Language Processing, GPU Programming - CUDA, Linear Programming, Brain-Inspired Computing

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## PROJECTS

### Obstacle Navigation with Unitree Go1 Robot Using Deep Reinforcement Learning

[Code](#) [↗](#)

- Developed a deep reinforcement learning model to train a robot dog (quadruped) for autonomous navigation through environments with dynamic obstacles, using the IsaacGym simulation platform.
- Employed Proximal Policy Optimization (PPO) and Curriculum Training to engineer a multi-layered policy to perform low-level and high-level motion planning.

### GPU Parallelization of Fuzzy SLIC Super-Pixel Segmentation using CUDA

[Code](#) [↗](#)

- Engineered a CUDA-based parallelization strategy for the Fuzzy Simple Linear Iterative Clustering (SLIC) algorithm, achieving a 200x acceleration in super-pixel image segmentation for images.

### Just-Walk-Out Contactless Shopping

- Designed an IoT-based automated shopping system that allows customers to shop without using traditional checkout processes, inspired by Amazon Go technology.
- Implemented customer identification systems using NFC wristbands and RFID sensors and developed inventory tracking using LIDAR and pressure sensors.
- Implemented a Zigbee network for real-time communication between aisle and central hub processors for item tracking and billing.

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## ACADEMIC AWARDS

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|---|-------------|
| • NSF-NRT Fellowship, SOCRATES Program  | 2024 - 2026 |
| Funded for two years to conduct interdisciplinary research in socially cognizant robotics |             |
| • Outstanding Project Award & Outstanding Publication Award                               | 2024        |
| Awarded by Dept. of CS, Rutgers University for work during the MSCS program               |             |
| • Prime Minister's Merit Scholarship  | 2017-2020   |
| Awarded by the Indian Prime Minister's office for exceptional academic performance        |             |

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## PROFESSIONAL ACTIVITIES

### Conference Paper Peer Reviewing

- IEEE International Conference on Robotics and Automation (ICRA) - 2024
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) - 2024