Sumanth Tangirala

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EDUCATION

Rutgers, the State University of New Jersey - New Brunswick   2022 - 2024

Masters in Computer Science   GPA: 3.9/4.0

- Specializing in Robotics with a thesis on Kinodynamic Planning for High-Velocity Mobile Robots, with a special focus on Motion Planning with Velocity Goals
- Relevant Courses: Advanced Robotics, Socially Cognizant Robotics, Computer Vision, Natural Language Processing

Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT)   2016 - 2020

Bachelors in Technology, Information and Communication Technology   GPA: 8.57/10

- Recipient of the (Indian) Prime Minister's Merit Scholarship from 2017 to 2020
- Relevant Courses: Machine Learning, Internet-of-Things, Data Mining, Introduction to GPU Programming

PUBLICATIONS

Roadmaps with Gaps over Controllers: Achieving Efficiency in Planning under Dynamics

*Aravind Sivaramakrishnan & Noah R. Carver & **Sumanth Tangirala** & Kostas E. Bekris; Submitted for review to the 2024 International Conference on Robotics and Automation (ICRA)*

- Led the quadrotor-focused research within the project to train aerial robot controllers to overcome aerodynamic conditions using reinforcement learning techniques such as Hindsight Experience Replay and Soft-Actor-Critic, and was instrumental in the integration of this methodology for quadrotor motion planning algorithms

MORALS: Analysis of High-Dimensional Robot Controllers via Topological Tools in a Latent Space

*Ewerton R. Vieira & Aravind Sivaramakrishnan & **Sumanth Tangirala** & Edgar Granados & Konstantin Mischaikow & Kostas E. Bekris; Submitted for review to the 2024 International Conference on Robotics and Automation (ICRA)*

- Conceptualized and implemented a contrastive loss term, which refined the autoencoder's performance by enhancing the distinction between successful and failed trajectories in the latent space
- Led the evaluation process on a complex 67-dimensional humanoid robotic system, validating the efficacy of the MORALS framework in accurately estimating regions of attraction for high-dimensional controllers

Stacked Autoencoder Based Feature Extraction and Superpixel Generation for Multifrequency PolSAR Image Classification

*Tushar Gadhiya & **Sumanth Tangirala** & Anil K. Roy; In: Pattern Recognition and Machine Intelligence. PReMI 2019. Lecture Notes in Computer Science, vol 11942. Springer, Cham*

- Implemented Stacked Auto-Encoders to reduce the dimensionality of feature vectors, Super-Pixel segmentation for denoising the reduced feature vector, and achieved terrain classification using Multi-Frequency Fully-Polarized Polarimetric Synthetic Aperture Radar (PolSAR) data

RESEARCH EXPERIENCE

PRACSYS Lab, Rutgers University   Jan 2023 - Present

Graduate Researcher   New Brunswick, NJ

- Developing methods for efficient motion planning strategies in uncertain and dynamic conditions using Reinforcement Learning and other data-driven techniques, with my current focus on achieving velocity goals for high-velocity robots
- Researching the field of high-dimensional robotic controller analysis in collaboration with the DATA-INSPIRE TRIPODS Institute by applying topological tools such as Morse Graphs to model robot dynamics accurately
- Engineered a perception and communication system in the lab using Robot Operating System (ROS) and OpenCV to facilitate the development and evaluation of closed-loop controllers for the MuSHR robot and other mobile robots

Smart City Lab, DA-IICT   Aug 2018 - Dec 2019

Undergraduate Researcher   Gandhinagar, India

- Conducted research on feature extraction, geospatial satellite image segmentation, and classification techniques for Fully Polarized PolSAR data using Deep Learning methods under the guidance of Prof. Anil Roy

Center for WIMS², University of Michigan
Undergraduate Research Assistant - IoT Solutions Developer

May 2019 - Nov 2019
Gandhinagar, India

- Architected an IoT solution using Raspberry Pis and Bluetooth-Low-Energy (BLE) protocol to remotely control and process data from environmental sensors in a collaboration between Center for WIMS² and Smart City Lab, DA-IICT
- Engineered a NodeJS backend service to manage sensor data for reliable connectivity and data flow over the internet
- Built a user-friendly GUI using Python for sensor control and data visualization between the sensors and end-users

Indian Space Research Organization (ISRO)
Research Intern

May 2019 - Aug 2019
Ahmedabad, India

- Analyzed Dual-Polarised PolSAR data for land cover classification, a less explored area compared to the prevalent focus on Fully Polarized PolSAR, using advanced decomposition algorithms, guided by Dr. Sanid Chirakkal
- Developed a time-series Machine Learning model to leverage these features to discriminate Ground Nut and Cotton Fields from other land cover classes using PolSAR data collected from Gujarat, India with an accuracy of 91.2%

WORK EXPERIENCE

Tekion Corporation
Software Engineer

Jan 2020 - Jun 2022
Bangalore, India

- Developed systems that utilized data from sensors such as RFID and Odometers in cars to identify and diagnose vehicle issues for more than 700 dealerships through feature engineering and predictive machine learning models
- Developed recommender systems, employing techniques like collaborative filtering, that use historical repair order data to recommend relevant automobile repair jobs, enhancing customer satisfaction and service efficiency
- Promoted early for delivering robust products in short timeframes and given responsibility of managing a team of 3

KEY PROJECTS

Obstacle Navigation with Unitree Go1 Robot Using Deep Reinforcement Learning

Sep 2023 - Present

Github Repository: https://github.com/sumanth-tangirala/Obstacle-Navigation-with-Go1-Sim

- Training a controller policy for a robot dog to navigate an environment with obstacles simulated in NVIDIA IsaacGym
- Employing deep reinforcement techniques such as Proximal Policy Optimization (PPO), Actor-Critic, and Curriculum Training for motion planning to build a two-layer policy to control the low-level and high-level controls of the robot

GPU Parallelization of Fuzzy SLIC Super-Pixel Segmentation using CUDA

Sep 2019 - Nov 2019

Github Repository: https://github.com/sumanth-tangirala/Fuzzy-SLIC-CUDA-Parallelization

- Designed a parallelization plan for Fuzzy Simple Linear Iterative Clustering (SLIC) for super-pixel image segmentation
- Achieved a 200x speedup in comparision with sequential computation for images with dimensions up to 2048x2048

Just-Walk-Out Contactless Shopping (Inspired by Amazon Go)

Feb 2019 - Apr 2019

- Architected an automated shopping experience, enabling customers to shop without traditional checkout processes
- Developed systems for customer detection using NFC bands and RFID sensors; item quantification using LIDAR and pressure sensors; communication of item pickup from aisle processors to hub processors using the Zigbee network

SKILLS

Programming Languages:	Python, C/C++, JavaScript
Machine Learning Tools:	PyTorch, TensorFlow, Scikit-Learn, OpenCV, Stable Baselines
Robotics & Simulation Tools:	Robot Operating System (ROS), Mujoco, IsaacGym
Technologies & Libraries:	Raspberry Pi, Jetson, CUDA, NumPy

LEADERSHIP & EXTRA-CURRICULAR ACTVITIES

Student Body Government, DA-IICT - *Elected Member*   Apr 2018 - Dec 2019
Represented students to campaign for multiple student welfare efforts, ensuring student voices reach administration
Student Placement Cell, DA-IICT - *Elected Deputy Convenor*   Apr 2018 - Dec 2019
Led a team of 30 to organise the campus placement process and its preparation for 450+ students across 200+ companies
Developers Student Club, DA-IICT - *Core Member*   Aug 2016 - Dec 2019
Drove tech initiatives, like educational sessions for students, hackathons, and digital solutions for local businesses