

ANTAREEP SINGHA

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RESEARCH EXPERIENCE

Nanyang Technological University(NTU), Singapore

Jul, 2025 – present

Graduate Research Assistant @ Algorithmic Robotics Group(ARG) Computer Vision, TAMP

Advisors: Yoonchang Sung, Yoonwoo Kim

- Working on Occlusion-Aware Motion Planning for Manipulators via scene hallucinations using 3D reconstruction models.
- Planning discrete actions in unordered and occluded 3D scenes using POMDP, to fetch a target object.

International Institute of Information Technology, Hyderabad (IIITH)

Jan, 2024 – Oct, 2025

Research Associate @ RRC-(Autonomous Wheelchair) Generative Modeling, Optimal Control

Advisors: K. Madhava Krishna, Arun Kumar Singh

- Developed Crowd-FM, a Conditional Flow Matching-based local planner for socially compliant trajectory generation (**Accepted - ICRA 2026**).
- Developed CrowdSurfer, a VQ-VAE-based trajectory generator for dense crowds (**ICRA 2025**).
- Proposed Multi-CrowdSurfer, extending generative priors to decentralized MAPF (**AAAI WoMAPF 2026**).
- Designed and deployed a Model Predictive Control (MPC) pipeline using CasADi with polygonal SDF constraints, for my **Bachelor's Thesis**.
- Migrated entire autonomous wheelchair stack from ROS Noetic → ROS2, improving stability and modularity.

Indian Institute of Technology, Madras (IITM)

May 2023 – July 2023

Summer Fellow - (SFP 2023) FPGAs, RTL and Digital Design

Advisors: Anil Prabhakar, Nitin Chandrachoodan

- Implemented a Verilog-based DAQ module on RedPitaya STEMLab for real-time peak detection.
- Built Gaussian peak generators using PYNQ overlays on Zynq-7010 for hardware simulation.

EDUCATION

Nanyang Technological University, Singapore

Aug 2025 – May 2027(expected)

MSc. in EEE(Computer Control and Automation)

(**Relevant Coursework:** Machine Vision, Deep Learning & Neural Networks, NLP)

Puducherry Technological University, Puducherry

Aug 2020 – May 2024

B.Tech in Mechatronics Engineering — First Class with Distinction

CGPA: 9.08/10

(**Relevant Coursework:** Industrial Robotics, Control Systems)

PUBLICATIONS

Crowd-FM: Learned Optimal Selection of Conditional Flow Matching-generated Trajectories for Crowd Navigation

Antareep Singha, Laksh Nanwani, Mathai Mathew Pulicken, Samkit Jain, Phani Teja S., Arun Kumar Singh, K. Madhava Krishna

Accepted - IEEE International Conference on Robotics and Automation(ICRA), 2026

Multi-CrowdSurfer: A Position Paper on Applying Single-Agent Generative Priors to Decentralized MAPF

Antareep Singha, Laksh Nanwani, Arun Kumar Singh, K. Madhava Krishna

7th International Workshop on Multi-Agent Path Finding, AAAI 2026

CrowdSurfer: Sampling Optimization Augmented with Vector-Quantized Variational AutoEncoder for Dense Crowd Navigation

Naman Kumar*, Antareep Singha*, Laksh Nanwani*, Dhruv Potdar, Tarun R, Fatemeh Rastgar, Simon Idoko, Arun Kumar Singh, K. Madhava Krishna

IEEE International Conference on Robotics and Automation(ICRA), 2025

An FPGA based Real-Time Video Processing system on Zynq 7010

Antareep Singha

IEEE Second International Conference on Advances in Computational Intelligence and Communication (ICACIC), 2023

TECHNICAL SKILLS

Languages: Python, C/C++, PDDL, MATLAB

Frameworks and Tools: PyTorch, ROS/ROS2, Jax, CasADi, Git, Gazebo, PyBullet, Isaac Lab

Areas of Interest: Computer Vision, Motion Planning, Reinforcement Learning, Optimal Control

PROJECTS

Occlusion-Aware prehensile motion planning via Scene Hallucinations(in-progress) Source Code

- Planning actions to search for occluded target objects in 3D belief space using POMDP.
- Using 3D scene hallucination and reconstruction to mitigate uncertainty.
- Research in progress for **CoRL 2026**.

Social Navigation on an Autonomous Wheelchair Source Code

- Designed Crowd-FM(Conditional Flow Matching-based planner) achieving > 20% improvement over CoHAN 2.0, CrowdSurder, and DRL-VO. Led a team of 4 researchers.
- Developed CrowdSurfer (VQ-VAE-based trajectory planner) achieving 40% success-rate improvement over DRL-VO. Co-led a team of 5 researchers.
- Built custom CasADi MPC integrated with SDF-based constraints.

Costmap-Diffusion(in-progress) Source Code

- Learning to generate **scene-specific top-down local costmap representations** using Diffusion, to model social behavior from ego-demonstrations.
- The core idea is to modify the local costmap based on visual perception inputs to model social behavior. The generated costmaps can be used by any off-the-shelf planner.

Torch-MPPI Source Code

- Built and open-sourced a Model Predictive Path Integral(MPPI)-based 2D path planner completely using PyTorch.
- This pipeline was used to benchmark and perform ablations on Crowd-FM.

Temporal-RRT Path Planner Source Code

- Implemented a 3D temporal RRT planner to determine multiple simultaneous shortest paths and checked for collision avoidance to ensure that no two independently computed paths occupy the same grid point at any given time step.

HONOURS & AWARDS

- Reviewer for IEEE ICRA 2026 submissions.
- Awarded Travel Grant by RAS to present my work at both IEEE ICRA 2025 in Atlanta and ICRA 2026 in Vienna.
- ICRA 2025 work showcased during IIIT Hyderabad RnD Showcase to 300+ attendees.
- **Best Paper Award** at PTU Genesis 2023 (FPGA on Zynq 7010).