

Tarun Ramakrishnan (Tarun R)

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Research

My research lies at the intersection of **3D computer vision** and **robotics**, with a focus on robot perception algorithms that enable reliable autonomous navigation. Currently, I am particularly interested in visual-inertial SLAM and relocalization.

Education

MS by Research in Computer Science

Aug 2025 – Present

International Institute of Information Technology (IIIT) Hyderabad, India

Advisors: Prof. Madhava Krishna and Prof. Sourav Garg

GPA: 9.50/10.00

Thesis: Robot Scene Understanding and Relocalization (in progress)

Coursework: Advanced NLP, Robotics: Dynamics and Control, Robotics: Planning and Navigation

B.Tech in Mechatronics Engineering

Aug 2020 – Jun 2024

SRM Institute of Science and Technology, Kattankulathur, India

Thesis: Campus-Scale Autonomous Ackermann-Steering Robot

GPA: 8.24/10.00

Publications and Patents

SILICA: Repurposing Diffusion Priors for Joint Glass Segmentation and Depth Estimation

[Project Page](#) | [Code](#) | [arXiv](#)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2026

Tarun R, Anuj Verma, Laksh Nanwani, Sourav Garg, Madhava Krishna

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

[Project Page](#) | [Code](#) | [arXiv](#)

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

Naman Kumar*, Antareep Singha*, Laksh Nanwani*, Dhruv Potdar, **Tarun R**, Fatemeh Rastgar, Simon Idoko, Arun Kumar Singh, Madhava Krishna (* equal contribution)

System and Method for 3D Point Cloud Rectification Using Depth Sensor with Revolved Reflective Optics

Indian Patent Application No. 202541131469 (filed, 2025)

Laksh Nanwani, **Tarun R**, Madhava Krishna

Work Experience

Teaching Assistant

Jul 2026 – Present

Mobile Robotics (CS7.503), IIIT Hyderabad

[Website](#)

- Lectured on coordinate transforms, helped prepare the SLAM lecture slides, and guided student capstone projects.
- Designed coding assignments and mid-semester exam papers, graded the exams, and conducted vivas.

Graduate Researcher

Aug 2025 – Present

Robotics Research Center (RRC), IIIT Hyderabad

[Website](#)

- Developing visual-inertial mapping and relocalization that fuses a recurrent learned frontend, a scene coordinate regression (SCR) network as the implicit map, and IMU preintegration in a factor graph.
- Leading the Smart Wheelchair team; exploring 3D scene-graph-based instruction generation for assisted long-horizon wayfinding.
- Added a traversability model with a planar ground constraint to self-supervised ACE0-style implicit maps, improving reconstruction and relocalization, and closed the loop with an MPPI controller.
- Led SILICA (first author, IROS 2026) for joint glass segmentation and depth from Stable Diffusion priors, and built the Mirage18k dataset (38 indoor scenes); almost 20% better than the state of the art zero-shot.

Hardware Lab Administrator

Jul 2025 – Present

Robotics Research Center (RRC), IIIT Hyderabad

[Website](#)

- Manage the robotics hardware lab, which serves 40+ students, including maintaining the lab's 3D printers and modernizing the robots' power systems and PCBs.
- Maintain CI/CD pipelines for multiple ground robots, and migrated them from legacy ROS to current releases.

Research Fellow

Jun 2024 – Jul 2025

Robotics Research Center (RRC), IIT Hyderabad

[Videos](#) | [Code](#)

- Built Phase 2 of the Autonomous Wheelchair Project from the ground up, developing the full 3D LiDAR-based hardware and software stack on an NVIDIA Jetson Orin NX, including sensor mounts and a power PCB.
- Wrote a real-time C++ 3D LiDAR relocalization system in ROS 2 (global branch-and-bound search with coarse-to-fine registration) and MPC/MPPI controllers, dockerized with CI/CD for multiple wheelchairs.
- Deployed the system in shopping malls, the GMR Airport Innovex center at Hyderabad, office buildings, and academic blocks, running it for hundreds of hours.

Systems and Mechanical Engineer

Jan 2025 – Jul 2025

The Energy Labs, India

[Videos](#) | [Code](#)

- Designed several in-house quadrotors from scratch for different payloads and weights, and manufactured them for sale as commercial products.
- Developed ROS 2 system integration for GPS-denied flight using visual-inertial odometry.

Drivetrain Engineer

Nov 2020 – Jul 2022

Team 1.618, Formula Student Team, SRM Institute of Science and Technology

- Led drivetrain engineering for a 30-member hybrid Formula Student car team, including a planetary coupling and an eccentric chain tensioner.

Lectures and Academic Service

Guest Lecturer, Visual and LiDAR SLAM – RRC Summer School 2026

May – Jun 2026

Guest Lecturer, ROS 2 and Capstone Project – RRC Summer School 2025

May – Jun 2025

Reviewing: Delegate reviewer for IEEE Robotics and Automation Letters (RA-L) 2025 and IEEE International Conference on Robotics and Automation (ICRA) 2027

Academic Projects

Traversability-Aware Indoor Navigation

[Slides](#)

- Used diffusion foundation model priors for indoor floor segmentation and depth estimation.
- Wrote a Numba-based GPU MPPI controller, soft-constrained to generate trajectories only within the segmented traversable region.

Transparent Object Grasping with a Modified SILICA

[Slides](#)

- Trained SILICA with CLIP conditioning to predict glass objects and glass scenes separately, greatly reducing false positives.
- Used the model's transparent-object segmentation and depth to generate grasps with NVIDIA GraspGen, and wrote an RRT* planner to reach and pick up the object.

Omnidirectional Vision-LiDAR Calibration and Fusion Framework

[Slides](#)

- Wrote a C++ ROS 2 driver and image stitcher for the Insta360 camera. Since the camera does not timestamp its images, designed a synchronization method from scratch to align its output with a Livox MID-360 LiDAR.
- Built a targetless extrinsic calibration pipeline for a LiDAR, five RealSense cameras, and an Insta360 camera using the LightGlue matcher.
- Used this setup to collect over 2 TB of multi-sensor data in a shopping mall.

Surfing Scout the Quadrupe

[Slides](#)

- Designed a 12-servo controller PCB and wrote C firmware with micro-ROS to interface with the ROS 2 stack.
- Wrote a ROS 2 actuator driver, body-to-leg inverse kinematics, and a C++ IMU-based controller that tracks target body motions.

Awards and Certifications

Overall Champions, Formula Imperial (7th season), with Team 1.618

Nov 2021

Imperial Society of Innovative Engineers (ISIE India)

ID: ISIE/VFI2021/W/076

Certified SolidWorks Associate (CSWA), Mechanical Design

Aug 2021

Dassault Systèmes

ID: C-CNMJ6H3WEP

Skills

Technical: Python, C/C++, Linux, ROS/ROS 2, PyTorch, GTSAM, JAX, CasADi, OpenCV, Rerun, SolidWorks

Languages: English (fluent), Tamil (native), Telugu, Hindi