

# KSHITIJ MADHAV BHAT

(412) 641-9491 [kmadhavb@cs.cmu.edu](mailto:kmadhavb@cs.cmu.edu) [linkedin.com/in/kshitij-bhat](https://www.linkedin.com/in/kshitij-bhat) [kshitijbhat.github.io](https://kshitijbhat.github.io)

## EDUCATION

### Carnegie Mellon University, School of Computer Science

Aug. 2024 – May 2026

Master of Science, Robotic Systems Development

Pittsburgh, PA

Coursework: Advanced Computer Vision, Systems Engineering, Manipulation Estimation & Control, Robot Mobility

### Indian Institute of Technology (IIT) Indore

Nov. 2020 – July 2024

Bachelor of Technology, Mechanical Engineering | GPA:8.98/10

Indore, India

Coursework: Computer Vision, Principles of Product Design, Vehicular Communication, Instrumentation & Control

## EXPERIENCE

### Research Intern | IIT Delhi, India

Dec. 2022 – Dec. 2023

- Designed *GLiDR* (CVPR '24), a graph generative network enhanced with topological regularization constraints, to augment sparse LiDAR point clouds and improve SLAM for autonomous driving in dynamic environments.
- Demonstrated that *GLiDR* outperforms existing methods (44% lower Chamfer Distance than state-of-the-art baseline on KITTI) in three real-world and simulated datasets, against five distance metrics with 32× sparser dynamic scans.
- Contributed to *SLACK* (ICIPw '24), a deep generative adversarial model for point injections, demonstrating its superior performance in degrading map quality without compromising scan integrity on KITTI and CARLA-64 datasets.

### Research Intern | Lakehead University, Thunder Bay, Canada (funded by MITACS)

May 2023 – Aug. 2023

- Investigated design parameters of a four-wheel steering and driving (4WS) robot for agricultural applications and engineered hardware using rapid prototyping and Design for Assembly (DFA) techniques.
- Integrated motors with quadrature encoders in steering and driving modules and augmented C firmware for Raspberry Pi Pico microcontrollers enabling joint state data and velocity feedback.
- Developed hardware-agnostic C++ software to interface PID angle and velocity controllers with the main computer using ROS Control framework via serial communication.

### Autonomy Intern | Ati Motors, Bengaluru, India

May 2022 – July 2022

- Optimized Model Predictive Control (MPC) for Autonomous Mobile Robots (AMR) to achieve a 3x reduction in the turning radius, enabling sharp turns and in-place manoeuvres for space-constrained industrial units.
- Reformed MPC cost function optimization problem to consider physical motor constraints and latency, redesigned Jacobian matrix to speed up the solution compute time and validated it with comprehensive on-site testing.
- Shaped a post-processing routine for raw point cloud and IMU data in Rosbags for easy integration and validation of state-of-the-art 3D-LiDAR-based SLAM algorithms on real-world datasets of warehouses and shop floors.

## PROJECTS

### Autonomous Dexterous Bimanual Manipulation | Under Dr. Nancy Pollard, CMU

Sep. 2024 – Present

- Architecting ROS-based software for perception, motion planning, and teleoperation for data collection in a dual-arm configuration using xArm 6 manipulators with printable soft end effectors for autonomous bell pepper harvesting.

### Formation Control of Multiple Micro Aerial Vehicles (MAVs) | Bronze Medal, Inter-IIT Tech Meet 11.0

Dec. 2022 – Feb. 2023

- Developed comprehensive Python API with multi-threading for controlling multiple MAVs and created a robust PID-controlled multi-agent waypoint navigation algorithm with visual feedback from ArUco markers.

### Interval Analysis-based Stochastic Multi-Robot Coverage | Systems and Control Dept., IIT Bombay

Dec. 2021 – Feb. 2022

- Applied a novel Interval Analysis algorithm for parallel multi-robot collision avoidance using Python-wrapped C++ with CGAL and sympy, enhancing probabilistic coverage path planning for hardware-efficient FPGA-based robots.

## TECHNICAL SKILLS

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

**Frameworks / Libraries:** ROS / ROS 2, Pytorch, Keras, OpenCV, Tensorflow, PCL, Open3D

**Other:** Linux, Shell, Git, Docker, Arduino IDE, SolidWorks, AutoCAD,  $\LaTeX$

## SELECTED PUBLICATIONS

**GLiDR: Topologically Regularized Graph Generative Network for Sparse LiDAR Point Clouds**

CVPR 2024

Prashant Kumar, Kshitij Madhav Bhat, Vedang Bhupesh Shenvi Nadkarni, Prem Kalra

**SLACK: Attacking LiDAR-based SLAM with Adversarial Point Injections**

ICIPw 2024

Prashant Kumar, Dheeraj Vattikonda, Kshitij Madhav Bhat, Prem Kalra