

JAY KARHADE

Generalizing Multi-Modal Perception for SLAM

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Education

Robotics Institute, Carnegie Mellon University <i>Master of Science in Robotics (MSR)</i>	August 2022 – Present GPA: 4.08/4
Birla Institute of Technology and Sciences, Pilani <i>B.E. in Electrical and Electronics</i>	August 2018 – June 2022 CGPA: 8.88/10

Research Experience

AirLab, Carnegie Mellon University <i>Graduate Student Researcher, advised by Prof. Sebastian Scherer</i>	September 2022 – Present Pennsylvania, USA
<ul style="list-style-type: none">Working on various localization and mapping projects at the intersection of 3D vision and robotics.Key research outcomes – Developed AnyLoc for visual place-recognition and SplaTAM, for dense SLAM.Key system efforts – Developed a decentralized multi-robot SLAM pipeline, scaling it to 3 robots, demonstrating it to Army Research Labs(ARL). Also built a ship position detection module, successfully demonstrating it to Lockheed.Collaborations–Dr Wenshan Wang, and Prof Deva Ramanan for multi-modal gaussian mapping and pre-training.	
Advanced Robotics Center, National University of Singapore <i>Undergraduate Research Attachment, advised by Prof. Marcelo Ang H Jr.</i>	January 2021– December 2021 Singapore
<ul style="list-style-type: none">Improved point cloud rendering with adversarial networks. 15% improvement in rendering metrics on ScanNet and Matterport by introducing discrete-wavelet losses.	
Edifice Lab, Arizona State University <i>Summer Research Intern, advised by Prof. Thomas Czerniawski</i>	May 2021– July 2021 Arizona, USA
<ul style="list-style-type: none">Conducted literature reviews and experiments to integrate dynamic object removal with collaborative SLAM. Demonstrated a simulation of developed collaborative SLAM method with RTABMAP Multi-session.	
Prof. Rajesh Tripathy, BITS Pilani <i>Research Assistant, advised by Prof. Rajesh Tripathy</i>	Jan 2021– June 2022 Hyderabad, India
<ul style="list-style-type: none">Worked on signal processing with AI for solving various healthcare diagnostic tasks.Developed time-frequency domain representations features and designed learning mechanisms to improve performance.	

Industry Experience

Indian Meteorological Department <i>Summer Intern</i>	May 2020 – August 2020 Maharashtra, India
<ul style="list-style-type: none">Worked on a system for visibility estimation in airports using classical image processing.Developed a GAN-based architecture for image-dehazing and fog image synthesis.	
Swift Robots <i>Robotics Engineering Intern</i>	July 2019 – Jan 2021 India
<ul style="list-style-type: none">Developed autonomous mobile robots for restaurant deliveries and later for UVDisinfectionDeveloped a custom Web-UI for robot control, and Visualization using ROS and JavaScript.Contributed to building a custom ROS Navigation Stack with NFC based docking.	

Selected Conference Publications

*=Equal Authorship

- [1] **SplaTAM: Splat, Track & Map 3D Gaussians for Dense RGB-D SLAM**
Nikhil Keetha, **Jay Karhade**, Krishna Murthy Jatavallabhula, Gengshan Yang, Sebastian Scherer, Deva Ramanan, Jonathon Luiten, (*Under Review*) [\[Paper\]](#)[\[Website\]](#)
- [2] **AnyLoc: Towards Universal Place Recognition**
Nikhil Keetha*, Avneesh Mishra* **Jay Karhade***, Krishna Murthy Jatavallabhula, Sebastian Scherer, K. Madhava Krishna, Sourav Garg, *RAL, 2023, ICRA 2024.* [\[Paper\]](#)[\[Website\]](#)
- [3] **Robust Lidar Place Recognition with RoPE enhanced OverlapTransformer**
Jay Karhade, Sebastian Scherer, Last Mile Delivery Workshop, *IROS 2023.* [\[Short Paper\]](#)

- [4] **SubT-MRS: A Subterranean, Multi-Robot, Multi-Spectral and Multi-Degraded Dataset for Robust SLAM**
Shibo Zhao et. al, (*Under Review*). [\[Paper\]](#)[\[Website\]](#)
- [5] **Multi-Frequency-Aware Patch Adversarial Learning for Neural Point Cloud Rendering**
Jay Karhade*, H. Zhu*, K.S.* Chung, R. Tripathy, W. Lin, Marcelo H Ang Jr, *Arxiv 2022*. [\[Paper\]](#)[\[Code\]](#)
- [6] **On-board Electrical, Electronics and Pose Estimation System for Hyperloop Pod Design**
Nihal Singh*, **Jay Karhade***, Ishika Bhattacharya*, Prathamesh Saraf*, Plava Kattamuri*, Alivelu Manga Parimi (*ICCAR*), 2021. [\[Paper\]](#)

Selected Journal Publications

- [1] **Time–frequency-domain deep learning framework for the automated detection of heart valve disorders using PCG signals**
Jay Karhade, Shaswati Dash, Samit Kumar Ghosh, Dinesh Kumar Dash, Rajesh Kumar Tripathy *IEEE Transactions on Instrumentation and Measurement*, 2022. [\[Paper\]](#)
- [2] **AFCNNNet: Automated detection of AF using chirplet transform and deep convolutional bidirectional long short term memory network with ECG signals**
Tejas Radhakrishnan*, **Jay Karhade***, Samit Kumar Ghosh, Priya Ranjan Muduli, RK Tripathy, U Rajendra Acharya *Computers in Biology and Medicine*, 2021. [\[Paper\]](#)
- [3] **Multichannel multiscale two-stage convolutional neural network for the detection and localization of myocardial infarction using vectorcardiogram signals**
Jay Karhade, Samit Kumar Ghosh, Pranjali Gajbhiye, Rajesh Kumar Tripathy, U Rajendra Acharya, *Applied Sciences*, 2021. [\[Paper\]](#)
- [4] **Deep learning enabled classification of real-time respiration signals acquired by MoSSe quantum dot-based flexible sensors**
Naveen Bokka, **Jay Karhade**, Parikshit Sahatiya, *Journal of Materials Chemistry B*, 2021. [\[Paper\]](#)

Teaching Experience

BITS-446 Pattern Recognition (Jan 2021 – May 2021)

Reviewing Experience

CVPR, RSS, RAL, Field Robotics Journal, IEEE Access.

Organizing and Outreach

1. Workshop Co-organizer, *Closing the Loop on Localization*, **IROS 2023**
2. Workshop Co-organizer, *ICCV'23 Workshop on Robot Learning and SLAM*, **ICCV 2023**
3. Co-organizer, *Tartan Planning Series*, **CMU, 2023**

Research Awards and Grants

Winter School Presentation Award, Robotics Institute, UTS July 2021
Best Presentation award for implementation on 3-D Aortic Deformation Reconstruction

BITSAA Travel Grant April 2021
BITSAA-IRU Travel Partial Scholarship for presenting research at ICCAR

Competitions

HyperLoop India June 2019-July 2021
Electrical Subsystem Team Lead

- Among the only 2 student teams ever from India to make it to the Hyperloop Competition Finals
- Worked on hybrid EKF-RNN pose-estimation of pod . Introduced the possibility of Li-Fi communication.

Leadership

1. CMU AI-Undergrad Mentor, October 2022 - Present
2. Chairperson, IEEE Student Branch, April 2019 - June 2021
3. Treasurer, I-Cell, CIIE, October 2019-June 2020
4. Duathlon Captain, August 2020 - June 2021
5. All India Rank - 55, National Defence Academy, June 2018