

NIBARKAVI NARESH BABU AMUTHA

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EDUCATION

MS Robotics, University of Michigan, Ann Arbor | CGPA: 3.64/4.0

Aug 2022 - Apr 2024

Course Highlights: Deep Learning for Robot Perception, Machine Learning, Algorithmic Robotics, Mobile Robotics, Programming for Robotics

BE Robotics and Automation, PSG College of Technology, Coimbatore | CGPA: 8.6/10.0

Jun 2018 - May 2021

SKILLS - Python, C++, C, MATLAB, Linux, ROS, PyTorch, Docker, Git, OpenCV, NumPy, SciPy, TensorFlow, CUDA, PyBullet

WORK EXPERIENCE

Robotics R&D Engineer - Hachidori Robotics, Bengaluru

Jul 2021 – Jun 2022

- Integrated Kalman Filter with IMU data, limiting sensor drift to 1° for reliable navigation in autonomous mobile robots.
- Engineered a tele-operated Mobile Guided Vehicle equipped with an overhead bandsaw unit for precise windmill blade cutting. Devised algorithms in Python and embedded C to enable 360° maneuverability, encompassing both joystick-controlled linear motion and switchable modes for curved trajectories with versatile cutting radii. Achieved a comprehensive system where all motions were executed at variable speeds in accordance with joystick magnitude.

Intern - Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam [\[Publication\]](#)

Dec 2020 – Jun 2021

- Resolved spatial awareness challenges in nuclear reactor core inspections, arising from the hexagonal lattice structure of the reactor core subassemblies, through fusion of camera and IMU data.
- Devised a unique numbering system for the reactor core subassemblies based on their spatial coordinates.
- Developed a data-driven algorithm in C++ leveraging this system and successfully identified the orientation of the inspection system in real-time. This work was published after rigorous prototype testing as it reduced the inspection time by at least 50%.

RESEARCH EXPERIENCE

University of Michigan Field Robotics Group, Ann Arbor (advised by Katherine A. Skinner) [\[Reports\]](#)

Underwater 3D Reconstruction using Imaging Sonar and Monocular Camera

Jun 2023 – present

- Developed a driver and a visualizer for an imaging sonar for real-world data acquisition employing ROS in Python and C++.
- Deduced the transformation matrix between sonar and camera and the scaling factor impacting depth by formulating and solving an optimization problem by visually correlating features from their time-synced data.
- Investigating Neural Implicit Representations and Gaussian Splatting while designing and conducting numerous underwater experiments by reproducing and extending state-of-the-art 3D reconstruction models such as [SeaThru-NeRF](#) and [Neusis](#).

Shipwreck Detection and Analysis

Jan 2023 – May 2023

- Developed an algorithm to provide GPS coordinates for shipwrecks detected via [STARS](#) from side-scan-sonar dataset, with 30m resolution. The data was pre-processed, robot poses were interpolated, and multiple shipwreck contours were detected.
- Formulated a confidence score using pixel-wise segmentation of regions of interest to rank the shipwreck sites for archaeological significance, aiding Thunder Baby National Marine Sanctuary in underwater exploration.

KEY PROJECTS

Robotics Systems Laboratory [\[Reports\]](#)

Sep 2023 – Dec 2023

- Implemented and tested multiple features for a robotic system with a 5DoF manipulator and camera: teach-and-repeat mechanisms, camera calibration, forward and inverse kinematics and a vision system for detecting blocks of various colors and shades, determining size and pose. Incorporated behavior planning for pick-and-place, automating block sorting and stacking.
- Constructed a differential drive robot equipped with a LIDAR and camera; integrated PD motor controller and odometry with IMU error correction. Implemented frontier-based explorational SLAM with particle filter, A* path planning, avoiding obstacle via visual servoing. Innovated updating particles weight factoring LIDAR rays using depth-constrained breadth-first search.

Volume-DROID: Real-Time Volumetric Mapping with DROID-SLAM [\[Publication, GitHub\]](#)

Jan 2023 – Apr 2023

- Generated real-time 3D semantic map from camera input by integrating Volumetric Mapping and Deep Visual SLAM. Infused Convolutional Bayesian Kernel for geometrically mapping the 3D points to voxels and their semantic labels.
- Attained precise localization and mapping ensuring minimal deviation with Absolute Trajectory Error of 0.018 and accurate reconstruction of relative transformations with Relative Pose Error of 0.003 in comparison to ground truth.

Region-Based Semantic Factorization in GANs [\[Colab, Report\]](#)

Aug 2022 – Dec 2022

- Reproduced [ReSeFa](#) to factorize latent space semantics with pre-trained StyleGAN2 and find meaningful semantic directions.
- Extended the algorithm of selectively editing targeted regions of interest of human faces to include factorizing animal faces.

PUBLICATIONS

- Peter S, Sandilya SG, Ashwin S, **Nibarkavi NA**, Emaad G. Volume-DROID: A Real-Time Implementation of Volumetric Mapping with DROID-SLAM. *Advances in Artificial Intelligence and Machine Learning*. 2023; 3 (3): 73.
- Thirumalaesh A, **Nibarkavi NA**, Winston SJ, Jose J, Rathika PD. Real-time sub-assembly identification through IMU data fusion with vision sensor for an inspection system. *International Journal of Nuclear Energy Science and Technology* ,16(2), pp.80-96.
- Shalikhra R, **Nibarkavi NA**, Puhazhmathi M, Suresh M. Automation of Vehicle Door. *International Research Journal of Automotive Technology*.