

## EDUCATION

<b>Northeastern University</b> , Boston, MA	May 2024
Master of Science in Robotics, Concentration: Electrical and Computer Engineering.	GPA: 3.8
<b>Vishwakarma Government Engineering College</b> , Ahmedabad, IN	June 2022
Bachelor of Technology in Instrumentation and Control Engineering.	GPA: 3.9

## SKILLS

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

**Software and Frameworks:** CUDA, TensorFlow, ROS, ROS2, AirSim, Nvidia IsaacSim, Gazebo, Rviz, Fusion 360, Altium.

**Libraries and Tools:** OpenCV, Sklearn, PyTorch, Pandas, NumPy, PyTorch, Eigen, Point Cloud Library (PCL), CMake.

## RESEARCH EXPERIENCE

<b>Autonomy &amp; Intelligence Laboratory</b> , Northeastern University, Boston, MA	Dec 2022 - Present
<b>Research Assistant.</b> ( <i>Algorithms/Technologies</i> – Eigen, PyTorch, Gazebo, TensorFlow C++, PCL, ROS2, OctoMap, PCL)	
<ul style="list-style-type: none"><li>• Built a 3D metric-semantic map by fusing Lidar data and semantic segmented images for off-road robot navigation.</li><li>• Aiming to create a Risk-aware Model Predictive Control for faster navigation on uneven terrain, simulating the environment in Microsoft AirSim and Nvidia Isaac Simulator, and performing Lidar-Camera extrinsic Calibration.</li></ul>	

## ACADEMIC PROJECTS

<b>Structure from Motion (SFM)</b> , Northeastern University	Boston, MA
<i>Algorithms/Technologies</i> – Lucas-Kanade (KLT) tracker and Optical Flow, NumPy, OpenCV, Python.	March 2023 - April 2023
<ul style="list-style-type: none"><li>• Implemented factorization method for SFM based on Cholesky decomposition and KLT-based feature tracker for given 100 images.</li></ul>	
<b>Image Mosaicing and Stereo Vision</b> , Northeastern University	Boston, MA
<i>Algorithms/Technologies</i> – Feature detection, OpenCV, RANSAC, Homography, Epipolar Geometry, C++.	Feb 2023 - March 2023
<ul style="list-style-type: none"><li>• Devised an algorithm for detecting and aligning features in multiple images through Homography estimation and subsequent panorama generation. A depth estimation algorithm was also performed to determine the disparity between stereo images.</li></ul>	
<b>Navigation stack using IMU and GPS</b> , Northeastern University	Boston, MA
<i>Algorithms/Technologies</i> – Complimentary Filter (CF), ROS, Python, C++, Git, Pandas, NumPy.	Jan 2023 - Feb 2023
<ul style="list-style-type: none"><li>• Formulated a ROS driver using IMU and GPS for autonomous navigation. Employed Allan variance analysis to assess IMU stability and integrated Complimentary Filter and Dead reckoning algorithms to accurately estimate the vehicle's true position.</li></ul>	
<b>Motion detection using simple Image Filtering</b> , Northeastern University	Boston, MA
<i>Algorithms/Technologies</i> – CMake, C++, OpenCV, Convolution, Noise estimation, Spatial Filters.	Jan 2023 - Feb 2023
<ul style="list-style-type: none"><li>• Created a motion detection algorithm leveraging temporal evolution and a derivative of Gaussian Filter over image sequences. Also developed a noise estimation algorithm with a 98% accuracy rate.</li></ul>	
<b>Autonomous Navigation and SLAM</b> , Northeastern University	Boston, MA
<i>Algorithms/Technologies</i> – PRM, RRT, A*, Particle Filters, ROS, Python, OpenCV, Visual odometry.	Sept 2022 - Dec 2022
<ul style="list-style-type: none"><li>• Developed an autonomous system for reconnaissance in simulated disaster zones using Cartographer-based SLAM and frontier exploration. Achieved accurate victim detection (13 out of 15) through extrinsic camera calibration.</li></ul>	

## WORK EXPERIENCE

<b>Studio Carbon</b>	Gandhinagar, IN
<b>Embedded Engineer Intern</b>	March 2022 - Sept 2022
<ul style="list-style-type: none"><li>• Designed and executed a feed-forward and PID control system, achieving a 5° motor positioning error from 20°.</li><li>• Programmed firmware for a smart stepper motor, BLE stack for a fitness device, and closed-loop control for laser-based distance sensor counting taps accurately.</li></ul>	
<b>WeHear Hearing Solutions</b>	Ahmedabad, IN
<b>Embedded Engineer Intern</b>	Jan 2019 - July 2019
<ul style="list-style-type: none"><li>• Developed a BLE-based hearing aid device employing bandpass filtering on MEMS I2S microphone data.</li><li>• Utilized RTOS to optimize data communication and filtering, reducing latency from 400ms to 90ms while enhancing audio quality.</li><li>• Created multi-layer PCBs to industry standards for product level, increasing battery runtime from 2.5 hours to 5.5 hours.</li></ul>	

## ACTIVITIES

<b>Gujarat Technological University Robotics Club</b>	Ahmedabad, IN
<b>Management and Technical Core Team Member (Mech. And EECE)</b>	Aug 2019 - Sept 2022
<ul style="list-style-type: none"><li>• Mentored and trained a team of 45 members in the intricacies of robotics, for the ABU Robocon competition in 2022 and 2021.</li><li>• Led an electronics team of 12 members and designed an intelligent power system and multi-layer controller PCBs for the robots.</li><li>• Implemented PID control and Kalman filtering on IMU and wheel odometry for autonomous robot navigation.</li><li>• Utilized Free-RTOS to control various actuators of a semi-autonomous robot with better task shifting and task scheduling.</li></ul>	