# Deelip Kumar Gummadidala

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## EDUCATION

**Northeastern University, Boston, MA** Dec 2026

**Master of Science in Robotics**, Concentration : Electrical and Computer Engineering GPA : 3.84/4.0

Coursework: Machine Learning and Pattern Recognition, Robot Sensing and Navigation, Mobile Robotics, Robotic Science and Systems, Robot Mechanics and Control, Computer Vision ,Natural Language Processing, Human Movement Simulation

**Vignana Bharathi Institute of Technology, Telangana, India** May 2023

**Bachelor of Technology in Mechanical Engineering, Minor : Internet of Things** GPA :8.68/10

## TECHNICAL SKILLS

**Programming and OS** :Python (NumPy, SciPy, pandas, OpenCV), C, C++, MATLAB, Linux/Ubuntu, ROS, ROS 2

**Softwares** : SOLIDWORKS, Fusion360, AutoCAD 2D and 3D, STM32CubeIDE, Ultimaker Cura

**Embedded & Hardware** : STM32G474RE (ARM Cortex-M4), NVIDIA Jetson Orin Nano, Arduino Mega, ESP32, SimpleFOC Mini (DRV8313), ST-LINK, Raspberry Pi,Intel RealSense D435, Encoders,IMU, Lidar,cameras

**Proficiencies** : Root Cause Failure Analysis (RCFA), Robotic Sensor Calibration, Accelerated Life Testing (ALT), Thermal & Optical Drift Characterization, Rapid Prototyping (3D Printing), EKF Sensor Fusion

## WORK EXPERIENCE

**Mechanical &Mechatronics Engineering Intern / Co-op 10Beauty, Burlington, MA** Jan 2026 -July 2026

- Designed and executed 30+ thermal and optical calibration tests on 5MP machine-vision cameras at 65–80°C; leveraged Python, NumPy, pandas, and OpenCV to analyze sensor data, quantifying 3–5 px spatial drift and thermal lens warping.
- Engineered an active cooling enclosure with redesigned chassis rear panel and dual heatsinks, reducing machine warm-up time by 80% (3 hours to 13–20 minutes) and stabilizing camera intrinsic drift to within 0.25 px for improved calibration.
- Architected an automated Accelerated Life Testing (ALT) bench (Arduino Mega/ESP32) running 25,000+ cycles on a 3-DOF arm under production speeds
- Identified discrete wire fatigue failures across dedicated GPIO channels within 3 days, leading to redesigned structural arm brackets and optimized wire harness routing to eliminate mechanical wear
- Programmed ESP32 Wi-Fi firmware to transmit real-time cycle counts, temperature data, and fault alerts directly to a custom Telegram bot for 24/7 unattended reliability monitoring

**Mechatronics Intern, Segritech, India** Jan 2024 - April 2024

- Designed mechanical sorting mechanisms and actuators in Fusion 360; validated prototypes via 3D printing and electromechanical bench testing
- Deployed OpenCV classification pipelines on an NVIDIA Jetson for RGB camera quality grading, optimizing sorting accuracy and throughput

## PROJECTS

**Autonomous Mobile Robot Platform (Differential Drive & Embedded Telemetry)** May 2026 – Present

- Architected bare-metal C firmware on an STM32G474RE executing dual-axis FOC at 20 kHz SVPWM with 4 kHz ISR and a 4.0 Mbps DMA UART bridge to NVIDIA Jetson, integrating hardware CRC16-CCITT packet verification and a 300 ms failsafe watchdog
- Interfaced dual 14-bit AS5048A encoders and a BNO085 9-DOF IMU over isolated SPI buses; deployed Runge-Kutta 2 integration and an Extended Kalman Filter (EKF) at 50 Hz to fuse wheel odometry with IMU yaw, eliminating slip and heading drift
- Synthesized planar 2D LiDAR scans from Intel RealSense D435 depth streams at 30 Hz via depthimage_to_laserscan; designed a directional safety controller enforcing a ±28° arc limit (0.25m threshold) while preserving reverse escape maneuvers
- Deployed RTAB-Map visual SLAM (5cm grid) and tuned Nav2 Regulated Pure Pursuit for corner deceleration; built Python diagnostic suites (hardware_test.py) and Foxglove WebSocket telemetry to monitor TF, costmaps, and motor states over Wi-Fi

**Autonomous Navigation Failure & Collision Prediction|Machine Learning** Oct2025 - Dec 2025

- Formulated an a priori collision prediction pipeline as a binary classification task across 300 BARN benchmark navigation environments, mapping topological map complexity to local planner failure modes to mitigate catastrophic field damage
- Extracted 10 topological metrics (path tortuosity, dispersion, clearance via L2 transform) and normalized inputs using StandardScaler; handled 76:24 class imbalance via cost-sensitive learning with balanced class weights to optimize recall
- Benchmarked 5 classifiers using 5-fold GridSearchCV; Random Forest attained top F1-score of 0.88 (ROC-AUC: 0.81) on E-Band, proving path tortuosity and obstacle dispersion predict failure risks far more accurately than raw obstacle density

**Dynamic Object Tracking and Motion Planning with PX150 Arm, Northeastern University** March 2025

- Implemented vision-guided manipulation in ROS 2 on a 5-DOF arm integrating YOLOv8 object detection, ArUco tracking, and MoveIt! planning.
- Executed hand-eye extrinsic calibration to map camera frames to the robot base; calculated collision-free motion trajectories in joint space, enabling sub-centimeter end-effector positioning and stable closed-loop pursuit of moving objects.