

# Nirmal Raja Loganathan

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PhD Robotics Researcher | Perception, Manipulation, Motion Planning | Seeking Summer 2026 Internships (CPT eligible)

## DOCTORAL RESEARCH

### Multi-Robot Perception & Planning for Cooperative Assembly

July 2025 – Present

- Built a dual-UR5e robotic workcell for PCB assembly using ROS2 Humble and MoveIt2 for synchronized, collision-aware dual-arm planning.
- Integrated stereo vision + YOLO for mm-level part localization and stereo-to-robot extrinsics for reliable execution.
- Developed manipulation skills (grasp, align, insert) and explored sim-to-real transfer with learning from demo's.

## PROFESSIONAL EXPERIENCE

### Research Engineer I | Automation & Industrial Systems Laboratory, MTU

Houghton, MI | Apr 2025 – Aug 2025

- Built a multi-sensor perception system (FLIR thermal + RealSense stereo + RGB) for nighttime pedestrian detection under glare and low visibility.
- Trained YOLO-based thermal models and fused detections with stereo depth to estimate 3D pedestrian distance at 25 FPS (<5% error up to 40m).
- Improved stereo-thermal calibration using CLAHE and filtering, increasing successful field runs by 80%.

### Software Engineer – Vehicle Perception | Advanced Power Systems Research Center Calumet, MI | Oct 2023 – Aug 2025

- Led perception development for ARPA-E NextCar (Level 4 autonomy): lane detection (YOLOv8), stop-line detection, and lateral offset estimation. [Published](#) at the SAE WCX 2025 and adopted by consortium partners.
- Designed a 9-point calibration system achieving 0.166m lateral error; validated using RTK GPS
- Deployed real-time models on NVIDIA AGX Orin (30 FPS) and reduced latency by 32% using CUDA optimization.

### Lead AI Research Engineer | Sairam Techno Incubator Foundation

Chennai, India | Mar 2021 – Aug 2023

#### Project 1: Ad Astra Autonomous Rover for Mars Exploration (\$1M Funded)

- Built a full autonomy stack for a Mars rover including stereo SLAM, terrain classification, and astronaut detection.
- Achieved 4cm RMS pose error and enabled 2km autonomous navigation in outdoor terrain.
- Reduced replanning time from 450ms to 50ms using CUDA-accelerated Hybrid A\* and MPC control.

#### Project 2: Jarvis Vision – Autonomous Drone System for Flood Rescue

- Developed a real-time drone perception system using YOLOv5 and RGB-D localization on 90K+ frames.
- Estimated flood-water depth using stereo disparity with centimeter-level RMSE at 20 FPS.
- Implemented precision landing using ArUco-based pose estimation.

### Future Ready Talent Intern | Microsoft

Remote | Sep 2021 – pr 2022

- Built a vehicle detection and clustering system using Azure Computer Vision + DBSCAN for lane-level traffic analysis.
- Designed cloud-based ingestion and visualization pipelines using Azure Functions and Cosmos DB.

## EDUCATION:

### Ph.D. in Computational Science & Engineering | Michigan Technological University, MI, USA

Fall 2025 - Fall 2028

### M.S. in Data Science | Michigan Technological University, MI, USA

Fall 2023 - Spring 2025

### B.E. in Electronics & Communication Engineering | Anna University, TN, India

Fall 2019 - Spring 2023

## OTHER PROJECTS

### Human Walking Intent Prediction – Boston Dynamics Spot Robot Dog

Fall 2024

- Built a real-time collision avoidance system using Detectron2 and MediaPipe (88% accuracy).
- Designed cm-level calibration and deployed on Spot CORE I/O at 30 FPS using LiDAR + stereo fusion.

### Deepfake Detection (DFD50)

Spring 2024

- Developed a ResNeXt-50 + LSTM model achieving 97% accuracy on DFDC/FF++ datasets.
- Optimized training with AdamW and augmentation, reducing loss from 0.67 to 0.10.

### AI Debugging Chatbot (GPT-4 + CodeBERT)

Fall 2023

- Built a GPT-4 + CodeBERT assistant with AST-based error detection.
- Reduced Python debugging time by 40% and deployed on AWS EKS (50+ users).

### ML-Based Prosthetic Arm Control

Spring 2023

- Developed a ML pipeline to control a prosthetic arm using residual limb signals, improving precision and usability.
- Designed preprocessing and classification pipeline for real-time inference. [Published](#) at the IEEE ICCCNT 2023.

## TECHNICAL SKILLS

**Programming:** Python, C++, C, R, Julia | **Simulation & Digital Twins:** Isaac Sim, OpenUSD, Unity

**Robotics & Systems:** ROS/ROS2, MoveIt2, SLAM, Sensor Fusion, Calibration, Linux, Docker, Git, GitLab CI/CD

**Machine Learning & Vision:** PyTorch, TensorFlow, OpenCV, CUDA, scikit-learn, NumPy, Pandas, MLflow, Hugging Face

**Hardware Platforms:** NVIDIA Jetson (Orin, Xavier, Nano), AStuff Spectra | **Cloud Platforms:** AWS, Azure, GCP

**Core Areas:** Computer Vision, Robotics, Motion Planning, Perception Systems, Data Structures & Algorithms