

# PRANAV RAMESH BIDARE

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## EDUCATION

**Master of Science in Robotics and Autonomous Systems (Thesis Based MS)**  
Arizona State University, Tempe, AZ

December 2025  
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## SKILLS

- **Programming:** Python, Matlab, C++
- **Frameworks/Tools:** ROS, ROS2, Autoware, CARLA, TensorFlow, PyTorch, OpenCV, Keras, Git, Jira
- **Concepts:** Perception Pipelines, Sensor Calibration and Fusion, Machine Learning, Robotics, Systems Engineering, Artificial Intelligence, Deep Learning, Kalman Filters, End-to-End Learning

## EXPERIENCE

**Researcher, BELIV Lab, Arizona State University**

Jan 2024 - Present

- Designed and implemented a real-time LiDAR-camera sensor fusion pipeline as part of a Vehicle-to-Infrastructure (V2I) late-fusion framework, combining onboard LiDAR with roadside (RSU) monocular cameras to overcome occlusions and extend perception range by 252% (21.6m → 76m) while reducing RMSE to 0.51m
- Orchestrated the setup and calibration of 6 on-board cameras and 2 LiDAR systems leveraging Autoware calibration methods on the lab's autonomous test vehicle
- Established a distributed computing architecture by offloading GPU-intensive perception tasks to a Jetson Orin, reducing system latency and improving throughput for real-time object detection

**Project Trainee, Bosch Global Software Technologies, India**

January 2023 - May 2023

- Contributed to the development of Connected Vehicle Technology within an Agile environment, addressing a variety of customer requirements while utilizing JIRA for task management and Git for version control
- Engineered the proof of concept for Delta Firmware Over-the-Air updates for connected vehicles using Diff and Patch algorithm which led to a reduction in vehicle data consumption

**Research Intern, Centre of Research and Innovation (CORI), PES University**

June 2022 - August 2023

- Innovated a novel GAN architecture for low-light vehicle detection using Python and OpenCV boosting accuracy by 28%. Concurrently developed real-time fire detection systems for space capsules and digit recognition models, achieving 95% and 99% accuracy, respectively

## PROJECTS

### Vehicle-to-Infrastructure (V2I) 3D Object Late Fusion

- Built a sensor fusion perception stack in Python and ROS2, merging onboard LiDAR with infrastructure camera data to extend perception range beyond the ego vehicle's sensors
- Designed and implemented a novel dual-update Kalman Filter that fuses asynchronous and heterogeneous data streams from LiDAR and cameras, addressing challenges such as network delays, different frame rates, and sensor noise, resulting in smoother, more reliable multi-sensor state estimation
- Generated complex urban traffic scenes using CARLA simulation environment with Scenario Runner to validate the sensor fusion pipeline
- Conducted real-time validation of the proposed pipeline using the Ego Vehicle and an RSU Camera setup

### Camera-LiDAR Calibration

- Upgraded an autonomous research vehicle from a single front-facing camera to a 6-camera, 2-LiDAR configuration, enabling 360° surround perception for complex urban driving scenarios.
- Integrated cameras and LiDAR into the Autoware ROS2 pipeline and performed the intrinsic and extrinsic calibration using AprilTag-based PnP and SQPnP optimization, enabling precise spatial alignment for fusion tasks

### Traffic Light and Sign Detection for Autonomous Driving in Challenging Environments

- Engineered a YOLOv11n-based detection pipeline trained on LISA dataset and CARLA-generated augmented dataset—introducing scenarios with motion blur, fog, rain, and occlusions to enhance model robustness across diverse driving conditions.
- Achieved 89.3% mAP@50 on the LISA benchmark and retained 78.1% mAP@50 across augmented tests, demonstrating high resilience to environmental perturbations.

## RESEARCH PAPERS

- “Optimizing Perception Capabilities of Autonomous Vehicles Through V2I Late Fusion using Kalman Filter”, MECC 2025
- “Upgrading an Automated Vehicle Research Platform for Enhanced Perception and Distributed Computing”, IFAC Symposium on Intelligent Autonomous Vehicles 2025
- “Trustworthy Conceptual Explanations for Neural Networks in Robot Decision-Making”, IROS, 2025
- “Design of a Real-Time GAN-based Speech Recognizer for Consumer Electronics”, IEEE ICICT 2023
- “Design and Evaluation of a Vehicle Detection System in Low Light Conditions”, IEEE SPIN 2023
- “Design and Evaluation of an E-Eye for Fire Detection in Human Space Capsule”, ICARES 2022