

Rakshith Baskar

Tempe, AZ

Github: github.com/Bexprove

Robotics Systems Engineer specializing in real-time controls, embedded networking, and middleware optimization for autonomous platforms. Proven track record of architecting low-latency ROS 2 stacks, tuning DDS for high-frequency data streams, and deploying safety-critical drive-by-wire systems. Experience bridging the gap between perception, planning, and firmware on heterogeneous hardware (NVIDIA Jetson, x86).

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EDUCATION

- **Arizona State University** Tempe, Arizona, USA
MS in Robotics & Autonomous Systems (Systems Engineering); GPA: 3.93 Present
Courses: Real-Time Embedded Systems, Mechatronics Systems, Multi-Robot Systems, Robotics Systems I, Systems Engineering, Linear Algebra
- **Vellore Institute of Technology** Chennai, India
B.Tech in Computer Science Engineering (AI & Robotics); CGPA: 7.40 Sep 2020 - July 2024
Courses: Autonomous Mobile Robots, Robot-Based Industrial Automation, IoT, Data Structures & Algorithms, Simulation & Modeling

EXPERIENCE

- **Student Research Assistant (Autonomous Systems), BELIV Lab** Arizona State University, Mesa, AZ
May 2025 – Present (Apprenticeship) Prof. Junfeng Zhao
 - **Middleware & Latency Optimization:** Optimized planning and networking stacks by tuning DDS (Data Distribution Service) QoS parameters; achieved a 22% reduction in end-to-end latency and improved runtime stability for high-frequency sensor streams.
 - **Safety-Critical Drive-by-Wire:** Engineered the interface between the ROS 2 autonomy stack and Ford Mach-E drive-by-wire system, bridging sensor inputs directly to controls for safe, closed-loop field testing at 100 Hz.
 - **Low-Level Networking:** Architected a CAN-to-Ethernet communication bridge between embedded ARM modules (Jetson) and x86 compute units; analyzed network latency and optimized bandwidth message flow.
 - **Telemetry & Diagnostics:** Built custom telemetry pipelines and observability tools to visualize kernel-level performance, enabling rapid fault detection and diagnostics during live vehicle deployments.
 - **End-to-End Integration:** Spearheaded the integration of Autoware on edge hardware, validating sensor fusion (LiDAR/Stereo Camera) and localization pipelines for real-world operation.
- **Graduate Grader & Lab Assistant (System Engineering)** Arizona State University, Mesa, AZ
Jan 2026 – May 2026 Prof. Junfeng Zhao
 - **Embedded Fleet Maintenance:** Managed the assembly, calibration, and maintenance of a fleet of Rosmaster X3 embedded robots, ensuring hardware reliability for hardware-in-the-loop (HIL) lab exercises.
 - **System Architecture Instruction:** Guided students in utilizing existing ROS packages to dissect robotic system implementation, explaining the end-to-end data flow from sensor drivers (LiDAR, Camera, IMU) to control interfaces.
 - **Real-Time Troubleshooting:** Performed live diagnostics during lab sessions to resolve failure modes in ROS communication, motor drivers, and middleware configuration, reducing downtime for student teams.
- **Research Intern (Robotics Manipulation), MAEDA Lab** Yokohama National University, Yokohama, Japan
Dec 2023 – Mar 2024 Prof. Maeda Yusuke
 - **Near Real-Time Control:** Architected and implemented near real-time control modules for Denso VP6242 and Cobotta robots in C++ and ROS 2, ensuring precise actuator synchronization for robotic 3D printing.
 - **Embedded Resource Optimization:** Optimized assembly planning algorithms by tuning motion parameters, reducing computational load by 90% to enable efficient operation on constrained embedded systems.
 - **Mechatronics Simulation:** Performed structural simulations in ANSYS and MATLAB to evaluate mechanical stability, leading to a 25% reduction in structural deformation.
 - **System Validation:** Executed performance validation under varied build configurations, authoring technical reports to support collaborative publication efforts.

PROJECTS

- **LLM-Powered Multi-Drone Fleet (Systems & Control): Aug 2025 – Dec 2025**
 - Developed a custom ROS 2 Controller node to bridge high-level LLM logic with PX4 Autopilot, implementing ENU-to-NED coordinate transformations and automatic state management.
 - Engineered a monitor node to cross-reference AI commands with real-time telemetry to prevent hallucinations, ensuring physical feasibility and safety prior to execution.
 - Designed a multi-agent architecture using Google Gemini API to autonomously distribute tasks across 3 heterogeneous drones.
- **Real-Time Lateral Control System (Lane Keeping): Jan 2025 – Apr 2025**
 - Engineered a high-frequency (20 Hz) ROS 2 control node implementing a PID algorithm to minimize cross-track error (CTE), achieving stable autonomous lane keeping on curved trajectories.

- Built a robust perception pipeline using OpenCV to estimate vehicle heading and lane curvature in real-time, feeding error metrics directly to the controller.
- Tuned control gains (K_p, K_d) to eliminate oscillation and overshoot, validating performance with $\pm 2^\circ$ heading precision.
- **Autonomous Maze Solving with Robotic Arm: Aug 2024 – Nov 2024**
 - Developed a ROS 2 autonomous motion planning framework enabling a 6-DOF manipulator to navigate a 4×4 maze.
 - Implemented pixel-to-world coordinate mapping using OpenCV and A^* search for optimal path computation, integrated with MoveIt 2 for joint trajectory execution.
 - Built a Gazebo digital twin for Sim-to-Real validation, ensuring safe motion and task repeatability before deployment.

SKILLS SUMMARY

- **Core Stack:** C++ (14/17), Python, Linux Kernel (PREEMPT_RT), Bash, SQL
- **Robotics Middleware:** ROS 2 (Humble/Jazzy), DDS Tuning (FastDDS), MoveIt 2, Gazebo, Docker, RTOS, Autoware
- **Networking & Tools:** TCP/UDP, Socket Programming, CAN Bus, Wireshark, Git, Jenkins, Latency Optimization
- **Controls & Algorithms:** PID, MPC, Kalman Filtering (EKF), Motion Planning (A^*/RRT), State Estimation, TF Trees
- **Hardware Platforms:** NVIDIA Jetson (Orin/Xavier), Ford Mach-E (Drive-by-wire), Microcontrollers (STM32), LiDAR, IMU

CERTIFICATIONS

- **MATLAB Certifications:** Fundamentals, Programming Techniques, Data Processing and Visualization
- **Universal Robots:** e-Series Application (Core, Application & Pro Track)
- **Udemy:** Advanced Kalman Filtering and Sensor Fusion