

HARISH KUMAR BALAJI

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EDUCATION

University of Illinois at Urbana-Champaign, M.Eng. Autonomy and Robotics | IL, USA **GPA: 4.0/4.0** Aug 2024 - May 2026
Anna University, B.Eng. Electronics and Communication | Chennai, India **GPA: 8.63/10** Aug 2017 - May 2021
Relevant Coursework: Autonomous Vehicle Systems, Principles of Safe Autonomy, Real-Time and Cyber-Physical Systems, Computer Graphics, Computer Vision, Deep Learning, Control Systems, Embedded Systems, Computer Architecture & Organization

WORK EXPERIENCE

Zipline, Simulation Engineering Intern - **South San Francisco, CA** Aug 2025 - Dec 2025

- Contributing to the development of Zipline's **Rust-based physics simulator** and integrating it into Software, Hardware, and **Model-in-the-Loop** frameworks to validate the full autonomy stack across Guidance, Navigation, and Control (GNC) domains.

Skydio, Systems Design Engineer Intern - **San Mateo, CA** May 2025 - Aug 2025

- Engineered a **JSON-based world generation framework** for Skydio's in-house simulator with **GPU instancing**, reducing GPU memory usage by **65%** per GLTF file and enabling mixed-reality integration of custom 3D objects into **Google Photorealistic 3D Tiles**.
- Built **kernel** and **system-level** features for Skydio's next-generation remote controller, focused on sensor calibration and integrating with **Hardware-In-the-Loop (HIL)** test bench to validate performance across **simulation** and **real drone** platforms.

EarthSense, Robotics Simulation Software Engineer Intern - **Champaign, IL** Dec 2024 - May 2025

- Developed a high-fidelity **Dual Ackermann** steering plugin for **Gazebo Harmonic** via **ROS 2 Control**, accurately simulating the 1,000 lb Terramax robot's 4-wheel kinematics, with integrated GPS, IMU, and multi-camera sensors modeled with realistic noise, achieving simulation accuracy within **10 cm** of real-world trajectories.
- Built a **Dockerized** digital twin with a **custom encoder plugin** and **CI-integrated deployment**, replicating the robot's proprietary autonomy and vision systems while reducing manual testing by **85%**.

Thoughtworks, Consultant Developer - India Mar 2021 - Aug 2024

- Developed and integrated perception-based awareness modules with V2X systems for self-driving quarry trucks through **C++**, enhancing operational safety and efficiency.
- Designed **custom Rviz plugins** to visualize perception messages, improving debugging efficiency by **60%** and enhancing visualization clarity for both stakeholders and the autonomy team.
- Led the design and development of scenario-based tests for autonomous driving algorithms with **CARLA Simulator** and the vehicle platform, **Pixkit**, improving reliability and reducing deployment issues by **40%** through CI pipeline. Utilized **Docker** for environment management and built a custom **Yocto Linux** image for the platform.

Speedways Electric, IoT and Robotics Intern - India Jun 2020 - Aug 2020

- Architected a **Python-based** socket server for real-time data exchange with line-following AGVs in warehouse settings.
- Implemented **Dijkstra's** algorithm for optimal path planning, collision avoidance, and dynamic re-routing, reducing delivery time by **30%** and enabling successful entry into the warehouse automation market.

PROJECTS / LEADERSHIP

Autonomous Agent and Ground-Truth Simulation Framework - **GitHub** Jan 2025 - May 2025

- Directed a 5-member team to develop an **open-source, high-fidelity digital twin** of the street-legal EV (Polaris GEM e4), integrating **calibrated LiDAR**, cameras, IMU, and GPS sensors within a **photorealistic 3D-reconstructed** environment built from drone data in **Gazebo**.
- Engineered a **dynamic agent** simulation and **scene-generation** framework with configurable pedestrian and vehicle behaviors, implementing **real-time ground-truth pipelines** to enable closed-loop validation of the end-to-end autonomy stack (**GEMstack**).

Japan Automotive AI Challenge by Society of Automotive Engineers, Japan (JSAE) - **Finalist** Jun 2023 - Nov 2023

- Led a 3-member team to optimize **Autoware's behavior path planner** and implemented a custom **RRT planner** for obstacle avoidance in narrow paths for a driverless golf cart.
- Secured second position in the **simulation** round and participated in the **finals** held at the University of Tokyo.

AWS Deepracer League by Amazon Web Services (AWS) - **Runner-up** Jan 2022 - May 2022

- Coordinated a 4-member team to achieve third position in the "AWS Deepracer League - Nationals", skillfully applying various strategies in creating a **Reinforcement Learning** model for autonomous racing through RoboMaker simulation framework.

5th World Robotics Championship by Times Technoxian - **Runner-up** Mar 2019 - Sep 2019

- Led a 5-member team to achieve second place in the "Micromouse - Mazesolver" competition by designing a self-navigating robot that utilized a modified left-wall follower algorithm on resource-constrained hardware like **Arduino Mega**, enabling efficient navigation and solving of intricate mazes.

TECHNICAL SKILLS

Programming Languages	C++, Rust, Python, C, Bash, Bitbake, Java
Technologies/Frameworks	ROS, Docker, Linux, Bazel, gRPC, Protobuf, Snapcraft, Git, Buildkite, YOCTO Project, AWS
Developer Tools	VS Code, Arduino, PUML, IntelliJ, MATLAB, MURAL
Simulators/Libraries	Gazebo, CARLA, LGSVL, CUDA, OpenCV, SciPy