AYUSH PATHAK

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EDUCATION

North Carolina State University, Raleigh, NC Aug 2023 – May 2025
Master of Science, *Computer Science* **3.77 / 4 GPA**
Related Coursework*: Computer Control of Robots, Cyber Physical Systems, Machine Learning with Graphs, Software for Robotics*
Co-curriculars*:* **Graduate Research Assistant** at Baker Lab (Drosophila research), Peng Gao Lab (Collaborative robotics research)

Pune University, Pune, India Aug 2017 – May 2021
Bachelor of Engineering, *Computer Engineering*
Extracurriculars: ABU-ROBOCON, IIT-Bombay E-Yantra, Dean's List (2019, 2020)

EXPERIENCE

Christa Baker Lab, NCSU, NC Oct 2023 – Present
Graduate Research Assistant (Drosophila Auditory System Modeling)

- **Engineered synchronization** of a **two-photon microscope** and **audio delivery system** for **calcium imaging**, achieving **90% improvement** in **data loading** and **code efficiency** by updating **legacy MATLAB code** and integrating **TTL triggers**.
- Collaborated and **modeled Drosophila auditory neural pathways** in **Python/Brian2**, cutting **experiment runtime by 70%** through **parallelized simulations** validated against **FlyWire.ai**
- **Designed experiments** analyzing **neural activation** in response to **mating songs** and **validated model predictions**, leveraging expertise in **neural data analysis, computational modeling,** and **cross-system integration (MATLAB, Python, electronics)**.

Persistent Systems, Pune, India Jul 2021 – May 2023
Software Engineer

- Designed and developed a **custom Salesforce application**, *Contact Center*, using **Lightning Flow (ScreenFlow)**, **Apex**, and **Lightning Web Components (LWC)**, reducing manual processes by **30%** and improving user efficiency.
- Built **scalable server-side logic** with **Queueable**, **Batch**, and **REST APIs**, optimizing data handling with **SOQL queries** and reducing processing time by **25%**.
- Integrated **RESTful APIs** for seamless communication between Salesforce and external systems, reducing synchronization errors by **35%** and ensuring robust **data integration**.
- Authored 15+ technical documents following ISO 9001 standards, ensuring audit-ready Salesforce configurations.

PROJECTS

Autonomous Navigation System for Indoor Mobile Robot – ROS2, SLAM, Controller Design, Simulation

- Developed an **autonomous navigation system** using **ROS 2**, **Gazebo**, and **SLAM algorithms (AMCL)**, achieving **90% path accuracy** in complex 10-minute runs and reducing localization errors by **25%** through **sensor adaptive control**.
- Implemented A* path planning and **Linear Quadratic Optimal Control**, optimizing trajectory tracking and reducing navigation time by **30%** in dynamic environments.
- Built a **robust control system** for obstacle avoidance and accurate localization, improving system reliability by **40%** and enabling seamless operation in real-world scenarios.

Tri-Wheeled Mobile Chassis – Vectored Motion, CAD, Arduino, Motors

- **Redesigned the movement system** from an Ackermann model to a **tri-wheeled chassis with omni wheels**, enabling **omnidirectional motion** and increasing maneuverability by **100%**.
- **Developed a vector-based movement control system** using **BLDC motors, high-power motor drivers, and encoder-based feedback**, reducing drift errors by **40%** and allowing precise real-time navigation via a gaming controller.
- **Optimized chassis design in SolidWorks** with aluminum extrusions, reducing weight by **30%**, improving efficiency, and directly enhancing the **speed and accuracy of the object-throwing mechanism**, leading to **1st place in the National Design Virtual Round of ROBOCON 2019**.

Real-Time 3D Pose Pedestrian Collision Prediction System

- **Achieved 89.3% orientation accuracy** without dataset-specific training using novel head/body vector equations.
- **Reduced occlusion errors by 42%** via knowledge-based height correlation for distance approximation.
- **Boosted processing speed to 15 FPS** using YOLOv3/SORT tracking paired with 14-keypoint temporal analysis.
- **Achieved 60.62% intention prediction accuracy** via GRU classifier analyzing pedestrian speed/group dynamics.

SKILLS

Programming & Software: Python, MATLAB, C++, Apex, JavaScript, ROS 2, Gazebo, Brian2, Salesforce, Lightning Web Components (LWC), Lightning Flow (ScreenFlow), SOQL, RESTful APIs, AWS

Robotics & Control: SLAM (Simultaneous Localization and Mapping), Optimal Control, Controller Design, Sensor Fusion, Mobile Robot Simulation, Path Planning

OS: Linux, Windows