Anushka Satav G

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PROFILE

I am a passionate, **research-driven** robotics engineer, committed to solving real-world challenges by advancing **autonomous navigation**, **motion planning**, and **robot manipulation** to elevate robotics globally. With hands-on experience deploying autonomous behaviors and perception-driven control pipelines on **aerial, aquatic, and ground robots**, I specialize in **integrating AI, perception, and control pipelines** for **intelligent robotic systems**. My work focuses on advancing **Sim2Real** performance, autonomous decision-making, and practical deployment of robotics in complex environments. Fuelled by a desire to **invent and simplify** and **deliver results**, I design impactful solutions, **learning** daily to make robots agile and impactful.

EDUCATION

Masters in Robotics and Autonomous Systems (AI): Arizona State University, Tempe, AZ **August 2024 - May 2026**

Achievements: CGPA: **4/4**, NAMU Scholarship Holder ($10,000), Engineering Graduate Fellowship Holder ($1000)

Relevant coursework: Artificial Intelligence, Robotic Systems-I & II, Algebra, Experimentation & Deployment of Robots, Space Robotics & AI, NLP, Mechatronics

Bachelor of Technology in Robotics and Automation: MIT World Peace University, Pune, India **August 2019 – July 2023**

Achievements: CGPA: **9.7/10**, Silver Medalist, Second Rank holder, Merit Scholarship Holder 2019, 2020-21, 2021-22 ($3000)

SKILLS

Programming and Robotics: **Python**, **C, C++, ROS/ROS2, Linux (Ubuntu), MATLAB/Simulink, SolidWorks, Fusion 360, CAD, ABAQUS, ANSYS Workbench, FEA, Drones, Machine Learning (YOLO, OpenCV), Control System, Path Planning, NLP, Gazebo, MoveIt!**

Research and Tools: **Prototyping, Robot Manipulation, Computer Vision**, Microsoft Office tools**, Git/GitHub**, **Docker**

Key Strengths: **Problem-solving**, **Effective Communication**, Technical/Verbal/Written **Presentations**, **Teamwork, Leadership, Management**

PUBLICATIONS AND PRESENTATIONS

Towards Robotic Trash Removal with Autonomous Surface Vessels **May 2025**

*IEEE International Conference on Robotics and Automation (**ICRA**)*

- Paper accepted for "Robots in the Wild" Track at the IEEE International Conference on Robotics and Automation 2025, Atlanta, Georgia, USA.
- Developed an autonomous USV system for trash detection and collection in outdoor aquatic environments.
- Integrated YOLOv8 for trash detection, autonomous navigation, and real-time decision-making using ROS.

A State-of-the-Art Review on Robotics in Waste Sorting: Scope and Challenges **May 2023**

*Q2 Journal- International Journal on Interactive Design and Manufacturing (**IJIDeM**)*

- Demonstrated **ownership** by diving deep into investigating robotic systems' transformative potential in waste management.

Overview of Autonomous Vehicles and its Challenges **December 2022**

Conference- Techno-Societal 2022: 4th International Conference on Advanced Technologies for Societal Applications

EXPERIENCE

Research Volunteer **January 2025 – August 2025**

AAIR Lab, Arizona State University **AZ, USA**

- Exploring robot **motion planning** and **path planning** pipelines, learning **ROS**, **Gazebo**, and simulation techniques.
- Executed fundamental **MoveIt**-based control tasks to test and understand **ROS** fundamentals.

Robotics Engineering Intern **May 2023 - November 2023**

Void Robotics **(Remote)**

- Tackled **robotics** tasks with Arduino libraries, Nav2 for **autonomous navigation**, and **ROS2** software development, enhancing system efficiency.
- Debugged and wrote reliable code, fostering **team trust** through consistent remote collaboration.
- Studied ROS 2 basics and advanced, Git and GitHub from scratch, and operated Linux with confidence.

R & D Intern **February 2023 - September 2023**

Hexagon Manufacturing Intelligence Pvt. Ltd. **Pune, India**

- Conducted **simulations** (static, linear, non-linear, and dynamic) of 10 different models creating non-linear materials on MSC Apex, Nastran, and Dytran, creating custom Python tools for FEA automation.
- Created a tool to **automate model building processes, constraints, boundary conditions, post-processing** for Top Load Analysis on MSC Apex using Nastran for non-linear analysis, **upholding high standards** to reduce model creation time by **90%** (from 20 to less than 2 min).

RESEARCH INTERESTS

Robotics: Autonomous Systems, Mobile Robots, Human-Robot Interaction, Sim2Real Transfer, Intelligent Motion Planning, Perception-driven Control, Robot Manipulation, Space Robotics.

Artificial Intelligence: Large Language Models (LLMs), Natural Language Processing (NLP), Deep Learning, Computer Vision, Reinforcement Learning, Multi-Modal AI.

PROJECTS

Autonomous Drone – Rock Detection, Mapping & Landing in PX4 Gazebo **March 2025 – April 2025**

Arizona State University | RAS 598 – Space Robotics and AI **(A+)** **Tempe, AZ**

- Developed a **ROS2**-based autonomous drone system using **PX4 SITL** to identify, map, and analyze cylindrical rock formations in simulation.
- Implemented a boustrophedon (lawnmower) search strategy with real-time ArUco marker detection and precision landing on target cylinder.
- Designed a complete mission pipeline with state transitions:
  TAKEOFF → SURVEY → GOTO_MARKER → HOVER → DESCEND → LAND.
- Evaluated performance across multiple trials with partial success in precision landing, refined frame transformations and descent logic.

Parrot Minidrone – Autonomous Visual Tracking and Target Landing (Final Project) **March 2025 – April 2025**

Arizona State University | RAS 546 – Robotic Systems II **(A+)** **Tempe, AZ**

- Programmed the Parrot Mambo Minidrone in **MATLAB** Simulink to follow red square attached to **Line Follower Robot** with image processing.
- Designed **Stateflow**-based control logic for color tracking and correction, and adaptive descent with error thresholding.
- Tuned image preprocessing and centroid extraction for reliable navigation and smooth landing performance in dynamic conditions.

Parrot Minidrone – Red Line Following & Precision Landing **March 2025 – April 2025**

Arizona State University | RAS 546 – Robotic Systems II **(A+)** **Tempe, AZ**

- Programmed the Parrot Mambo Minidrone in **MATLAB Simulink** to autonomously follow a red line and land on a red circular target.
- Designed image processing logic for dynamic line tracking and color-based descent correction.
- Tuned adaptive control using centroid detection and error thresholding to ensure smooth trajectory and accurate landing.

PitchPerfect – Real-Time AI Feedback for Mock Interviews (24-Hour, 2nd Prize Winner, $300 Award) **April 2025**

Arizona State University | Innovation Hackathon 2025 **Tempe, AZ**

- Developed a Gradio-based **NLP** web application integrating **whisper.cpp**, **Vander**, and **Olama** to transcribe mock interview videos, analyze sentiment and relevance, and provide instant feedback to users.
- Designed a dynamic UI supporting **video input**, **practice/interview modes**, **performance score** & **visual reports** with color-coded insights.
- Delivered a fully functional prototype within 24 hours, demonstrating rapid development, AI integration, and **teamwork**.
- Created an innovative solution to help job seekers enhance interview skills with **real-time, data-driven feedback**.

Autonomous Surface Vessel – Vision-Guided Trash Detection & Scientific Survey **March 2025 – April 2025**

Arizona State University | RAS 598 – Space Robotics and AI **(A+)** **Tempe, AZ**

- Simulated **Heron** USV in **ROS–Gazebo** to perform opportunistic trash collection without disrupting a boustrophedon-based scientific survey.
- Designed logic for opportunistic collection during survey missions, preparing pipeline for future real-world deployment.
- Integrated a color-based proxy detector in simulation and fine-tuned **YOLOv8n** model for real-world trash object detection.
- Detour logic prioritizing scientific integrity: triggering collection if object within scan bounds & within 25% lateral offset from planned path.
- **Validated survey coverage** (avg. **108.47%**) and **lateral deviation** (avg. 0.34 m) while achieving a **54% target interception rate**.
- Contributed to pipeline design in **ROS2**, project report; co-authored an **IEEE-ICRA 2025** workshop paper on the developed framework.

Intelligent TurtleBot4 – Voice-Guided Navigation & Object Detection (Final project) **January 2025 – April 2025**

Arizona State University | RAS 598 – Experimentation and Deployment of Robots **(A)** **Tempe, AZ**

- Developed and deployed an **ROS2**-based system on **TurtleBot4** integrating a **MyCobot** Robotic Arm, transforming it into a mobile manipulator platform. Conducted system testing in simulation (**Gazebo**) and on real hardware, addressing **Sim2Real** challenges in **perception**, sensor data analysis, and motion execution.
- Implemented **YOLOv8** object detection, **LiDAR/IMU live data**, and **PyQt5 GUI** with real-time feedback and control via voice commands transcribed using **Whisper.cpp**.
- Maintained and updated the complete **GitHub** repository and **project website**, documenting system architecture, visuals, and deployment progress.

Autonomous 4x4 Maze Navigation Using MyCobot Pro 600 (Final Project) **November 2024 – December 2024**

Arizona State University | RAS 546 – Robotic Systems I **(A)** **Tempe, AZ**

- Designed and implemented a **computer vision algorithm** to solve 4x4 mazes by detecting entrance, exit, and solution path using the AI Kit's camera in **Python**.
- Simulated and validated the robot's **path planning** in a **digital twin** in **MATLAB** before deploying it for execution.
- **Programmed** MyCobot Pro 600 to **autonomously navigate** the maze using straight-line paths for rapid, precise execution. Ensured compatibility with mazes generated by a maze generation tool for **real-time execution**.

Design & Prototyping of Robotic Arm for Waste Sorting **September 2022 - November 2022**

MIT World Peace University | Final Year Project **(100/100)** **Pune, India**

- Utilized engineering expertise to build a **functional prototype** of a 4-DOF robotic arm with vacuum gripper and payload of 200 grams.
- Deployed **computer vision** system using **YOLOv7 deep learning** to classify waste into recyclable items- glass, paper, metal, and plastic.

CO-CURRICULAR ACTIVITIES

- Completed Biomechanics Course at SRM IST, Kattankulathur for **National Student Exchange program** during Bachelors.
- As a part time robotics instructor, led **online hands-on robotics sessions** for children aged 7 to 15, training fundamental concepts of robotics, and provided personalized summaries and feedback through interactions with parents.
- Volunteered for **ASU Robotics Southwest Robotics Symposium** and conducted guest tours across various ASU robotics labs.
- Won **2nd Place** (Qruil Track, $300) **and 1st Prize** for "Best Use of MATLAB" at ***InnovationHacks 2025***, organized by The Software Developers Association, AI Society, and GDSC at ASU, as part of Team ***vAIKings***.
- Presented **"Intelligent Voice-Guided Mobile Manipulator"** at ASU's ***Innovation Showcase*** as the final project for **RAS 598: Experimentation and Deployment of Robots**, guided by Prof. Dan Aukes.