

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. Fueled by a desire to invent, simplify, and deliver results, I design impactful solutions, learning daily to make robots agile and impactful.

Education

Masters in Robotics and Autonomous Systems (AI)

August 2024 to May 2026

Arizona State University, Tempe, AZ **Achievements:** CGPA: 4/4, NAMU Scholarship Holder (\$10,000), Engineering Graduate Fellowship Holder (\$1,000)

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

Bachelor of Technology in Robotics and Automation

August 2019 to July 2023

MIT World Peace University, Pune, India

Achievements: CGPA: 9.7/10, Silver Medalist, Second Rank Holder, Merit

Scholarship Holder 2019, 2020-21, 2021-22 (\$3,000)

Publications and Presentations

Towards Robotic Trash Removal with Autonomous Surface Vessels

May 2025

IEEE ICRA 2025, Robots in the Wild Workshop Track, Atlanta, Georgia, USA.

- Paper accepted for the “Robots in the Wild” Track at IEEE ICRA 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).

- Investigated robotic systems’ transformative potential in waste management through a comprehensive literature survey.

Overview of Autonomous Vehicles and its Challenges

December 2022

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

Experience

Research Volunteer

December 2025 to Present

Robotics and Dynamical Systems Group Lab, Arizona State University, AZ, USA

- Conducting applied research on sensor fusion for mobile robots, implementing and comparing Kalman Filter, EKF, and UKF for state estimation on TurtleBot4.
- Developing an EKF-based pipeline fusing wheel odometry, IMU, and LiDAR data in ROS2; validating in simulation with planned deployment on physical hardware.

Research Volunteer

January 2025 to 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 to 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 to 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, and post-processing for Top Load Analysis on MSC Apex using Nastran, reducing model creation time by 90% (from 20 to under 2 minutes).

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.

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, Git/GitHub, Docker

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

Projects

Sensor Fusion for Mobile Robots (TurtleBot4) *[Applied Project, Robotics and Dynamical Systems Group Lab]* Sept 2025 to Ongoing

Arizona State University, Tempe, AZ

- Studying and implementing Kalman Filter, EKF, and UKF for mobile robot state estimation.
- Developing an EKF-based sensor fusion pipeline fusing wheel odometry, IMU, and LiDAR data in ROS2.
- Validating filter performance in simulation and preparing for deployment on physical hardware.

Autonomous Surface Vessel: Vision-Guided Trash Detection and Scientific Survey March 2025 to 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 and 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 and project report; co-authored an IEEE-ICRA 2025 workshop paper on the developed framework.

Intelligent TurtleBot4: Voice-Guided Navigation and Object Detection January 2025 to 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 Drone: Rock Detection, Mapping and Landing in PX4 Gazebo March 2025 to 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.

Real-Time Embedded Keyword Spotting on Arduino Nano 33 BLE Sense

Sept 2025 to Dec 2025

Arizona State University | BMI/CES 598: Embedded Machine Learning (A+), Tempe, AZ

- Designed and deployed a real-time keyword spotting system on a resource-constrained microcontroller using TensorFlow Lite Micro.
- Trained a 7-class CNN achieving 95% test accuracy; applied int8 quantization, reducing model size by 74% (116 KB to 29.5 KB) with no accuracy loss.
- Implemented spectrogram-based feature extraction (MFCCs) and tuned inference thresholds for real-world robustness.

Food Image Classification using CNNs and ShuffleNet

Sept 2025 to Dec 2025

Arizona State University | BMI/CES 598: Embedded Machine Learning (A+), Tempe, AZ

- Evaluated multiple CNN architectures on the Food-11 dataset (16K images, 11 classes) to analyze generalization and overfitting.
- Improved test accuracy from 52.7% (baseline CNN) to 80.3% using ShuffleNet V2 transfer learning, exceeding course benchmarks.
- Achieved strong generalization with only ~11K trainable parameters; studied impact of dropout, pooling, and parameter efficiency.
- Implemented training and evaluation pipelines in PyTorch, including confusion matrices and performance diagnostics.

Context Engineering for LLM-Based Game Agents

July 2025 to Dec 2025

Arizona State University | CSE 576: Natural Language Processing (A+), Tempe, AZ

- Designed context-engineering strategies enabling Vision-Language Models to act as autonomous agents in multimodal benchmark games.
- Implemented prompt structuring, semantic action reformulation, memory retrieval, and embedding-based loop detection.
- Benchmarked agent performance across multiple games, demonstrating reduced action loops and improved navigation.
- Used Gemini 2.5 Pro and embedding similarity analysis to study agent robustness and failure modes.

Motor Velocity Control using PI/PID Controllers

July 2025 to Dec 2025

Arizona State University | RAS 550: Mechatronics Course Project (A+), Tempe, AZ

- Designed and compared PI and PID controllers for DC motor velocity control using MATLAB/Simulink.
- Demonstrated why PI controllers are preferred in industrial motor control, offering stable performance with reduced tuning complexity.
- Implemented position, velocity, and thermal (heater) control systems, reinforcing classical control principles.
- Combined hardware experimentation and simulation-based validation.

PitchPerfect: Real-Time AI Feedback for Mock Interviews

April 2025

Arizona State University | Innovation Hackathon 2025 (24-Hour, 2nd Prize Winner, \$300 Award), 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.
- Designed a dynamic UI supporting video input, practice/interview modes, performance score, and visual reports with color-coded insights.
- Delivered a fully functional prototype within 24 hours, demonstrating rapid development, AI integration, and teamwork.

Parrot Minidrone: Autonomous Visual Tracking and Target Landing

March 2025 to April 2025

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

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

Autonomous 4×4 Maze Navigation Using MyCobot Pro 600

November 2024 to December 2024

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

- Designed and implemented a computer vision algorithm to solve 4×4 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 for physical execution.
- Programmed MyCobot Pro 600 to autonomously navigate the maze using straight-line paths for rapid, precise execution.

Parrot Minidrone: Red Line Following and Precision Landing

March 2025 to 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 for smooth trajectory and accurate landing.

Design and Prototyping of Robotic Arm for Waste Sorting

September 2022 to November 2022

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

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

Other Projects (details on portfolio/GitHub): Parrot Minidrone: Autonomous Visual Tracking and Target Landing; Parrot Minidrone: Red Line Following and Precision Landing; Autonomous 4×4 Maze Navigation using MyCobot Pro 600; Waste Sorting Robotic Arm using YOLOv7 (B.Tech. Capstone Project); Heater Temperature Control using PID (Mechatronics Lab).

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 (Quil 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.