

PRANAV SHUKLA

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EDUCATION

New York University (NYU) Tandon School of Engineering
M.S. in Mechatronics and Robotics

New York, NY
2024 – May 2026 (Est.)

Indian Institute of Technology (IIT) Kharagpur
B.Tech and M.Tech (Dual Degree) in Structural Engineering

Kharagpur, India
2017 – 2022

Minor: Computer Science and Engineering | Micro-Specialization: Embedded Control, Software and Design

SKILLS & EXPERTISE

- **Languages:** Python, C++, C, Bash, SQL, VBA, JavaScript, APL, XML
- **ML & AI:** PyTorch, TensorFlow, RL, Behavioral Cloning, Gemini, VLA, Moondream, OpenAI API, Ollama, CrewAI, ACT, GROOT, Diffusion, HPC, Generative AI.
- **Robotics & CV:** SLAM, VIO, MPPI, Path Planning, RANSAC, Kalman Filter, OpenCV, MAVROS
- **Development:** Git, Docker, VS Code, Jupyter, React, Selenium, FEniCS, GCP, ROS, LeRobot
- **Hardware/Platforms:** Mechatronics, Arduino, RPi, ESP32, Linux, Gazebo, MATLAB, Simulink, Solidworks, Propeller

PROFESSIONAL EXPERIENCE

Automatic Control Lab | NYU Tandon
Research Assistant

New York, NY
Aug 2025 – Present

- Developed Mobile Manipulation frameworks using VLM/LLM based planning, scheduling, and command interpretation.

Graduate Adjunct

Jan 2025 – Aug 2025

- Instructed ME-UY 3411: Experiments in data acquisition, PID & LQR controls, and system analysis on MATLAB/Simulink.

GRAIL Lab | NYU Center for Data Science (CDS) , NYU Courant

New York, NY

Researcher

Aug 2025 – Present

- Enhanced Behavioral Cloning model (VqBET) performance via Residual Reinforcement learning and Iterative finetuning and implementing action chunking.

Axis Bank | Business Intelligence Unit
Data Analyst

Mumbai, India
2022 – 2024

- Developed pre-qualified banking product strategies leveraging customer demographic and credit data using Big Data, SAS, and CICD frameworks; managed monthly releases and automation.

- Ran simulations to identify DB enhancements and coordinated implementation with Business, DE, DS, and Risk teams.

Data Science Intern

Summer 2021

- Implemented and validated 3 ML models (DT, MLP, Random Forest) for credit prediction, optimized for biased datasets.

Swarm Robotics Research Group | IIT Kharagpur
Embedded Team Head

Kharagpur, India
2019 – 2022

- Led the embedded team developing hardware stacks and control systems for vision-based swarm-bots (ROS, Arduino).
- Managed a budget of ~\$20,000 USD, overseeing procurement, logistics, and deployment.

KEY PROJECTS

Robotics & Embodied AI

- **VLA-Powered Agentic Framework:** Developed a modular robotics control framework with integrated LLM tool-calling, perception, planning, and control layers connected over a high-frequency RPC layer to create, schedule, and execute tasks based on user text input. (Gemini API, ZMQ, RRT*, Control-Systems)
- **Hybrid BC-RL Model:** Enhanced a VQBET (an Imitation Learning Policy) model with a residual RL layer to boost imitation accuracy and enable corrective behaviors at GRAIL Lab NYU Courant. Also implemented LoRA and rejection-sampling based Iterative finetuning.
- **Generalizable Imitation Learning (SO-100 Arm):** Built an HPC pipeline (LeRobot) to train imitation models (VQ-Bet, ACT (Action Chunking Transformers), Diffusion). Achieved generalization on complex tasks like 'making a sandwich', object-pickup and drop-off, cleaning, etc. from teleoperated data.
- **LLM-VLM Agent for Task Decomposition:** Engineered a multi-modal agent using LLM function calling and VLM scene understanding to execute long-horizon tasks like multi-object pick-and-place, and search and interact.
- **Heterogeneous Swarm Robotics (DRDO, India's premier defense agency – DRUSE Competition - Winner):** Developed a heterogeneous swarm with multi-terrain coverage, capable of semi-autonomous SLAM-based surveys.

- **Decentralized UAV Swarm (DRDO SASEs):** Developed an ad-hoc networked, decentralized swarm of 4 drones for autonomous vision-based search and rescue using MAVROS and OLSR mesh routing.

Sensing, Localization & Hardware

- **Low-Cost 3D LiDAR Design:** Engineered a novel low cost 3D-stabilized LiDAR by fusing a spinning 1D LiDAR, Kalman Filter-stabilized IMU, and rotary encoder for low-cost 3D point cloud mapping.
- **Autonomous Indoor Drone (Flipkart GRiD 2.0):** Implemented a VIO framework using fused stereo camera and IMU data for GPS-denied indoor localization and autonomous window traversal.
- **WiFi RSSI-Based Localization:** Designed an ESP-based system to triangulate a ground bot's position within a 10cm error margin.

ML, Control & Simulation

- **MPPI-Based Optimal Control:** Designed and simulated an MPPI controller for complex quadcopter maneuvers (flips) and 3-DOF robotic arm end-effector control.
- **Swerve Drive Simulator:** Designed and simulated a 4 wheel-swerve homonic drive framework with integrated kinematics, dynamics and simulation environment with a cascade adaptive+PID controller, pure pursuit path tracking, A* based path planning over a procedurally generated obstacle maze, dynamic obstacle avoidance and using continuous potential based obstacles.
- **Structural Damage Detection (ANN):** Developed an ANN to solve a 2D elliptic PDE (Inverse Cauchy problem) from partial boundary data to detect material inhomogeneity.
- **Vision-Based Gerontechnology:** Built a cv2-dnn based face-tracking Raspberry Pi module to detect falls and trigger fail-safes.

EXTRACURRICULAR LEADERSHIP

- **Instructor for Summer Program (NYU Tandon):** Instructed SPARC, Summer program for robotics and automation under the NYU Tandon K12 Stem Education Program.
- **Teaching Assistant (NYU Tandon):** TA for Advanced Mechatronics under Professor V. Kapila .
- **Teaching Assistant (IIT Kharagpur):** Monte Carlo Simulations; Construction Planning & Management.
- **Governor, Technology Literary Society:** Led a society of 80+ students; Editor of campus magazine *Alankar*.
- **Captain, Product Design Team:** Led hall team for the Technology General Championship (2019-20).
- **Volunteer, National Service Scheme:** Conducted village camps, surveys, and donation drives.