

EDUCATION

Columbia University – School of Engineering & Applied Sciences

Bachelor of Engineering, Applied Physics

Expected: May 2027

GPA: 3.90

CUNY Queens College

Bachelor of Science, Physics (*Magna Cum Laude*)

Graduated: May 2025

GPA: 3.87

WORK EXPERIENCE

Columbia Plasma Fusion Research Center — Undergraduate Research Assistant

September 2025 - Present

- Conduct computational plasma fusion research under Dr. Elizabeth Paul, running stellarator optimization and equilibrium workflows on the NERSC Perlmutter HPC cluster.
- Implemented and benchmarked operator-splitting integrators (Trotter, Strang, Yoshida) for linear and nonlinear plasma growth simulations, with working code published on GitHub.

Curious Cardinals — Computer Science & Robotics Mentor

February 2026 - Present

- Mentor high school students in developing independent research projects spanning AI/ML, robotics, and applied physics, guiding them from initial concept to completed deliverables including research papers and conference-ready presentations.
- Provide technical guidance on research methodology, data analysis, and project execution while building student confidence in navigating complex technical challenges and developing consistent research practices.

PROJECTS

CHIRON — Cybernetic Hardware Interface for Robotic Operations & Networking

January 2026 - Present

Independent Technical Project

- Developed a geometry-driven robot motor cortex in MuJoCo (~500 Hz) with self-measuring gripper (finger offset, pad height, actuator range read from model), cross-section profiling for shape-generic optimal grasp selection, pad-aware clamping, and damped least-squares IK (1000 iter, 5mm tolerance) — zero hardcoded constants across any robot model.
- Implemented a scene-aware pick-and-place sequencer with gripper-envelope collision avoidance, path-specific corridor clearance, adaptive carrying height (IK-reachable search), grasp verification with auto-retry, safe mid-sequence recovery, and automatic task decomposition that clears stacked obstacles before executing the target command.

BROTEUS — Behavior Recognition, Object Tracking & Environmental Understanding System

January 2026 - Present

Independent Technical Project

- Built an open-vocabulary detection pipeline (YOLO-World, 87% confidence, 21 FPS on CPU) with user-defined object classes at runtime, IoU-based multi-object tracking, and monocular depth estimation (MiDaS) feeding a four-criteria grasp affordance heatmap.
- Engineered a learning-first dual-hand gesture and animation recognition system using MediaPipe (42 keypoints), 35-dim feature vectors with palm orientation encoding for rotation invariance, and Dynamic Time Warping for speed-invariant temporal motion matching, all persisted to disk per hand.

ATHENA — Autonomous Terrain & Hazard Exploration Navigation Agent

January 2026 - Present

Independent Technical Project

- Developed a browser-based 3D rover autonomy simulator (React, Three.js) with four interchangeable pathfinding algorithms (A*, Dijkstra, RRT, D* Lite) sharing a unified stepper interface, real-time step-by-step search visualization using pre-allocated 50K-point GPU buffers with cost heat mapping, and multi-waypoint mission planning with chained path execution.
- Architected an infinite chunk-based terrain system using seeded 3-layer fractal Brownian motion noise with deterministic crater placement via spatial cell hashing, supporting full planetary environment switching (Mars, Venus, Europa, Titan) that rebuilds terrain geometry, surface colors, rock distribution, sky dome, fog density, and lighting from per-planet parameter objects with zero code branching.

SKILLS

Languages: Python, C++, C, Java, MATLAB, JavaScript, HTML | **Frameworks:** ROS 2, MuJoCo, PyTorch, NumPy, SciPy, OpenCV, MediaPipe, YOLO, MiDaS, FastAPI, React, Three.js | **Tools:** Git, Linux, Conda, WebSocket | **Domains:** Robotics, Computer Vision, Machine Learning, Applied Physics, Signal Processing