NIKHIL GANGARAM

Roboticist ~ Computer Scientist ~ Researcher

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SUMMARY

Hey there, I'm Nikhil! I'm currently deep into researching decentralized learning and complexity theory. Beyond that, I'm exploring how generative AI can be applied in robotics education. In my downtime, you'll catch me binging math youtube videos, diving into esoteric topics like Quantum Information, or trying to learn Japanese!

SKILLS

Languages: C++, C, Python, Java, MATLAB, Javascript, Wolfram Mathematica, Markdown, RST.

Softwares: ROS, Gazebo, Drake, Solidworks, Onshape, Git, Github, Jira, Agile, Trello.

Adobe: Animate, After Effects, Photoshop, Illustrator, Premiere Pro.

EDUCATION

8/2022 - 5/2026 — Worcester Polytechnic Institute (GPA: 4.0 / 4.0) — ROBOTICS ENGINEERING & COMPUTER SCIENCE
Relevant Coursework: Robotic SLAM, Robotic Manipulation, Algorithms, Quantum Information.

EXPERIENCE

6/2024 – 10/2024 — Research Intern — MIT Lincoln Laboratory
- Working as a decentralized machine learning research intern focusing on transferring deep reinforcement learning models from simulated to real-world, swarm robotics environments.

9/2023 – Present — Swarm Robotics Researcher — Novel Swarm Technologies (NEST) Lab
- Currently working with Prof. Carlo Pinciroli to research novel methods for decentralized machine learning in multi-agent robotic systems, specifically using pointer networks, in the field of task allocation.

10/2023 – Present — Theoretical Computer Science Researcher — Worcester Polytechnic Institute
- Working with Prof. Daniel Reichman in a novel intersection between generative AI and complexity theory.
- Currently exploring other research directions, specifically DNC's and Meta Learning.

8/2023 – Present — R&D Software Lead — WPI HPRC
- Currently developing an LSTM model in C++ to extend an MPC for trajectory optimization
- Led the development of an Extended Kalman Filter (EKF) in C++ for state estimation and a Model Predictive Control (MPC) algorithm in C++ for trajectory optimization.

6/2021 – 6/2022 — Team President — FRC Team 254
- Led both FRC and VEX programs to a dual World Championship in 2022
- Wrote a book detailing leadership, "Pursuits of Passion as Perceived by a Poofy President".
- Founded the 254 Alumni Network and the "Introduction to Competitive Robotics" video series.

PROJECTS

Python
Markdown
RST

Experiental Robotics Project (XRP)
Currently developing a generative AI model to act as an interactive platform for students and teachers. Also, developing robotics curriculum to teach middle school students how to integrate OOP and Robotics.

Python
MATLAB
ROS
Drake

HURON
Developed inverse kinematic scripts in python for a bipedal robot to achieve desired locomotion
Startd the implementation of a Nonlinear Model Predictive Control (NPMC) algorithm in python and MATLAB to realize dynamically stable locomotion. The bipedal robot was simulated using ROS and Drake.

Python
ROS

SLAM Maze-Exploring Robot
Developed and implemented a real-time, simultaneous localization and mapping (SLAM) algorithm using a plethora of sub-algorithms like A*, a particle filter, and pure pursuit. All of this code was developed in Python to interface with ROS and was implemented on the TurtleBot3 and simulated using Gazebo.

Lua
C++ / C
Solidworks

Project Capricornus - 2022 WPI High Powered Rocketry Club (HPRC)
Implemented scripts for an autonomous drone in Lua.
sensor libraries for weather-station cubes in embedded C.
Designed and fabricated an arm folding mechanism for a cube-sat form factor drone in Solidworks.

MATLAB

Vision-Based Color Sorting Robot Arm
Calculated inverse, forward, and velocity kinematics for a 4-DOF robot arm using MATLAB. Then, implemented vision-based object detection, real-time quintic trajectory planning, and a custom simulator for the arm. All of the code was developed in MATLAB and implemented on a custom 3d-printed 4-DOF robot arm using Dynamixel SDK actuators.