

NIKHIL GANGARAM

Robotacist ~ Computer Scientist ~ Researcher

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🌐 Personal Website

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

8/22 - 5/26 **Worcester Polytechnic Institute (GPA: 4.0 / 4.0)** (BS) Robotics Engineering & Computer Science
Relevant Coursework: Robotic SLAM, Robotic Manipulation, Algorithms, Quantum Information.

8/18 - 5/22 **Bellarmino College Preparatory** High School Diploma
Led both FRC and VEX programs for Team 254 (The Cheesy Poofs) to a dual World Championship in 2022

EXPERIENCE

10/24 - 12/24 **Visitng Scholar** Kyoto University of Advanced Science (KUAS)
• Fully-funded to perform research in Quantum Machine Learning using both learned and formal methods. Specifically, applying Density Functional Theory and Deep Learning to develop interatomic potentials.

6/24 - 10/24 **Research Intern** MIT Lincoln Laboratory
• Working on decentralized, deep reinforcement learning in the context of multi-aircraft systems. Specifically to protect civilians in the case of failure and humanitarian assistance in response to natural disasters.

9/23 - 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.

10/23 - 8/24 **Theoretical Computer Science Researcher** Worcester Polytechnic Institute
• Worked with Prof. Daniel Reichman in the intersection between Generative AI and Complexity Theory.

8/23 - Present **R&D Software Lead** WPI HPRC
• Led the development of an Extended Kalman Filter and a Model Predictive Controller for onboard, real-time trajectory optimization of a model rocket climbing to 10,000 feet.
• Developing an LSTM model and custom simulation environment to extend our previous work.

PROJECTS

Python
Markdown
RST **Experiental Robotics Project (XRP)**
Currently developing a Retrieval Augmented Generation (RAG) agent to provide 24/7 educational support. 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 using Lua and ArduPilot.
Developed 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.