Nathaniel Kim

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Education

University of Pennsylvania Philadelphia, PA
MSE (Robotics: 4.0) *Aug 2022 – May 2026*

Master's Thesis: EMG-based Musculoskeletal Modeling and Motion Prediction

University of Pennsylvania Philadelphia, PA
BSE (Bioengineering: 4.0) *Aug 2022 – May 2026*

Objective

I want to develop biomedical devices and robotics systems that enhance physical rehabilitation and improve quality of life for individuals with motor impairments. My dream is to extend this work into human augmentation.

Work Experience

UPenn GRASP Lab: Graduate Research Assistant Philadelphia, PA; Aug 2023 – Present
Figueroa Robotics Lab

- Designed and performed studies with human patients working with robotic systems
- Developed a data processing algorithm and Recurrent Neural Network (RNN) model pipeline to classify upper limb kinematics and predict activity completion (4% error)
- Implemented an inverse dynamic control PD control method with MuJoCo to simulate musculoskeletal movement
- Designed data collection process with 3D printed custom hardware and laser cut MMX/silicon fabric electrodes

Summer Community Advisor Philadelphia, PA; May 2024 – Aug 2024, May 2025 – Aug 2025

- Provided professional mentorship and academic support to undergraduate students in STEM fields
- Organized large-scale community events and networking programs to foster inclusive residential engagement

Teaching Assistant for BE Modeling, Analysis, and Design Philadelphia, PA; Aug 2025 – Dec 2025

- Supported instruction for core bioengineering design and systems modeling course
- Led weekly recitations and provided individualized guidance on MATLAB-based modeling assignments

Projects

PENN Assistive Devices and Prosthetic Technologies (ADAPT) Philadelphia, PA; Jan 2023 – Present

- Led an undergraduate team in designing of upper limb prosthetics with EEG and EMG control
- Designed a prosthetic arm and hand connected to an Arduino & Raspberry Pi system for real-time brain signal control
- Implemented multiple machine learning models to classify grasping user grasping mechanisms

Cockroach Interface Philadelphia, PA; Oct 2024

- Created a physical game inspired by the "Hole in the Wall" show, controlling cockroach movement via EMG signals
- Implemented real-time EMG feature extraction and hardware filtering using custom circuit design

Rehabilitative Driving Simulator Kingston, Jamaica; Jan 2023 – May 2023

- Collaborated with a Jamaican rehabilitation center to create a low-cost driving simulator for a hemiplegic patient
- Created a responsive driving simulation game using Unity
- Fabricated mechanical and electrical components, including 3D-printed, wooden, and sensor-integrated parts

Social DinoBot Philadelphia, PA; Aug 2024 – Dec 2024

- Designed a mobile dinosaur social robot to aid gait rehabilitation for a ischemic stroke patient
- Fabricated wooden chassis for lightweight frame and modular assembly
- Implemented various modes of communication for assistance with aphasia and speech rehabilitation

AI Image to GPS Localization Philadelphia, PA; Jan 2025 – May 2025

- Developed a deep learning pipeline to infer geographic location from a hand-collected dataset of images
- Implemented the Image2GPS algorithm using a ResNet-18 backbone and custom layers

PENN Tikkun Olam Makers Philadelphia, PA; Aug 2023 – Present

- Designed a laser-cuttable, adaptable wheelchair for children with physical disabilities
- Developed assistive toothbrush mechanisms in collaboration with Penn Dental

KUKA Arm Competition Philadelphia, PA; Aug 2023 – Dec 2023

- Worked in a team to develop an inverse dynamics control algorithm for building towers with a KUKA robotic arm
- Made a custom inverse kinematics algorithm for obstructing other teams' building process
- Implemented velocity control linked with AprilTag object recognition to grab materials in dynamic environments

AI Human Content Generator Philadelphia, PA; Aug 2024 – Dec 2024

- Created an OpenPose to Stable Diffusion machine learning pipeline for art generation for social media users
- Deployed a GUI using Gradio for online user image uploads

HVAC Monitoring and Surveillance System Ithaca, NY; Mar 2024

- Modeled affordable devices for detecting airborne bacteria and fungi utilizing hospital HVAC systems
- Created front-end GUI to monitor the spread of airborne diseases in monitored spaces

Technical Skills

Certified for IRB patient studies and data collection,
Motion Capture, Computer Vision, Biosignal Processing, Machine Learning Architecture Design

Programming Languages: Python, MicroPython, Scikit-learn, PyTorch, MATLAB, C#, Arduino

Design Software: SolidWorks, Onshape, Rhino, DraftSight, Adobe Illustrator

Data Visualization Tools: PowerPoint, Excel, Canva, Adobe Suite, VideoPad, Ableton