Hudson Kortus

hudsonwkortus@gmail.com (919) 309-6629 linkedin.com/in/hudsonkortus hudsonkortus.github.io/

Robotic systems engineer with 4+ years of experience designing, building, and deploying hardware-software systems spanning embedded firmware, perception, and machine learning. Proven ability to onboard quickly, take ownership of ambiguous problems, and deliver production ready results in hard-tech environments.

Education

BS Robotics Engineering *05/2026*
Worcester Polytechnic Institute GPA 3.9/4.0
Coursework: *On Device Deep Learning, Software Engineering, Aerial Robotics, Deep Learning for Perception*

Work Experience

Deep Learning and Perception Researcher, *PeAR Group (WPI)* *08/2025 – Present*
- Designed and built a palm-sized drone (Ardupilot) enabling 20 m/s flight within limited space constraints.
- Deployed deep learning model on a drone for high speed navigation, integrating hardware (Jetson Orin Nano) and software (Python, Ardupilot) stack to achieve real time performance (>30Hz).
- Built a differentiable optical design pipeline (Python) simulating real camera intrinsics to train micron-scale phase mask for monocular depth sensing (based on PhaseCam3D).
- Implemented and trained a monocular depth estimation CNN (PyTorch), incorporating uncertainty-aware loss to improve convergence and quantify model confidence.

Computer Vision Engineer Co-op, *Untill ag* *05/2025 – 08/2025*
- Designed and deployed an ultra-low-cost, camera system for monitoring vertical farm, owning mechanical design (Onshape), embedded hardware (KiCad), firmware (C), and backend integration (Python, MongoDB).
- Prototyped and shipped 2-axis gantry-mounted vision system for autonomous plant monitoring in 4 weeks.
- Designed and shipped mass production-ready sensor mesh network for plant monitoring featuring cameras and environmental sensors at <$8 per node.
- Designed and manufactured ESP32 camera PCB (KiCad) with integrated power regulation and RS-485 bus.
- Wrote firmware (FreeRTOS, ESP-IDF) for motor control, camera capture, and data transmission across RS-485, ESP-Mesh WiFi, and TCP.
- Deployed backend (Python) on Raspberry Pi to coordinate cameras and store imagery (MongoDB) for downstream ML workflows.

Advanced Manufacturing and Automation Co-Op, *TTM Technologies* *06/2023 – 08/2024*
- Designed and executed a detailed tooling study using statistical process control and ANOVA analysis (Minitab), resulting in a re-evaluation of machine design that saved the company $25,000 per unit.
- Developed a robotic workcell with integrated vision (Teledyne Sherlock) to pick, place, and solder 0505 electronic components, within a precision of less than 0.001 in, improving process throughput by 8x.

Full-Stack Web Intern, *Shodor Education Foundation* *02/2021 – 05/2022*
- Applied Java, PHP, and JavaScript skills to develop and maintain a LAMP website accumulating 3 million views per month to provide award winning, free educational tools for students and educators in STEM.

Skills

Languages: Python, C/C++, MATLAB, Java/TypeScript, Java, MongoDB, PostgreSQL
Packages: PyTorch, TensorFlow, Numpy, Scipy, OpenCV, Blender API, React
Software: ROS2, Docker, Git, Blender, MATLAB, Linux, Bash, High Performance Compute (HPC) Clusters
Hardware: NVIDIA Jetson, ESP32, ESP-CAM, ESP-IDF, Raspberry Pi, Arduino, Arducam, Realsense D435, Ardupilot, PX4, Solidworks, Onshape, FusionCAM, KiCad, Manual Machining, Soldering

Projects

Optical Flow Based Autonomous Navigation *12/2025*

- Built an end-to-end UAV autonomy stack for navigating unknown gaps using only a single RGB camera.
- Combined RAFT optical flow and Temporally Stacked Spatial Parallax (TS2P) for gap detection, with Perspective-n-Point (PnP) used to estimate relative pose for control and navigation.

Unscented Kalman Filter for Attitude Estimation *09/2025*

- Implemented an Unscented Kalman Filter for attitude estimation using quaternions, including sigma-point generation and iterative quaternion mean computation.
- Addressed unit-norm constraints, 6D/7D state transitions, and sequential measurement updates to improve numerical stability.

Lead Software Engineer *04/2025*

- Led a team of 11 peers in the rapid 5-week Agile development of a full-stack PERN web application for Mass General Brigham hospitals, enabling patients to navigate from home to specific hospital departments.
- Organized work using Scrum methodology, Git for version control, and Jira for task tracking.
- Architected and integrated pathfinding algorithms (DFS, A*) with animated routes, text-to-speech directions, multi-floor support, and real-time map updates.

Sim2Real CNN Model *09/2024*

- Developed a U-Net style Convolutional Neural Network (CNN) to identify and segment drone racing windows.
- Generated 50,000 synthetic images in Blender to train the model and achieved 95% accuracy in real-world deployment.

Pathfinding Autonomous Robot *05/2024*

- Programmed mobile robot to navigate and map unknown maze using A* and SLAM using ROS with Python.
- Integrated a Monte Carlo Particle filter for localization using generated map.
- Filtered noise with Kalman filter to implement reactive obstacle avoidance and pure pursuit path finding.

Payload Division Lead *05/2024*

- Led the design and manufacturing of an autonomous rocket payload that ejects mid-flight and steers via a novel circular parachute to a self-selected landing site.
- Managed a 46 member team to design and manufacture an autonomous payload to be launched to 10,000 ft.
- Integrated 7 subsystems, and collaborated with Rocket and Programming teams to meet system requirements.

Vision-Based Color Sorting Robot Arm *01/2024*

- Programmed vision-based object detection with real-time trajectory planning to pick and place objects.
- Calculated inverse, forward, and velocity kinematics for a 4-DOF robot arm using MATLAB.
- Built a custom simulator for data collection, singularity detection, and collision detection.