Joshua Cox

joshua.cox.school@gmail.com | 815-543-7082 | cox-joshua.github.io

Education

University of Illinois Urbana-Champaign (UIUC)

M.S. in Mechanical Engineering — *GPA: 3.83 / 4.00* — *December 2025*

B.S. in Mechanical Engineering with Honors | Minor in Computer Science — *GPA: 3.61 / 4.00* — *December 2022*

Research Experience

Lunar Autonomy Challenge | Human-Centered Autonomy Lab *November 2024 – December 2025*

- Founded and led a student robotics team to compete in NASA simulation challenge, managing a full autonomy stack for virtual lunar navigation and mapping with a digital twin of the IPEx rover
- Engineered the perception to mapping pipeline through utilizing ROS, visual inertial odometry solutions, and a custom computer vision algorithm to convert stereo pairs to accurate point clouds
- Processed elevation data by developing visualization tools, exploring filtering approaches, and experimenting with grid map accumulation, inpainting, and smoothing techniques
- Implemented navigation strategy using both a high-level waypoint generator and a low-level obstacle avoidance planner
- Developed 2D exploration simulator from scratch with Python and PyGame to test team's navigation algorithm
- Created modular Dockerfile to incorporate competition and solution environment requirements enabling swift software development in a Docker container
- Culminated in master's thesis "Towards Autonomous Lunar Navigation for In-Situ Resource Utilization"

Wayfinding with Handle Haptics | Human-Centered Autonomy Lab *February 2024 – December 2025*

- Designed, created CAD for, and 3D-printed parts for a novel haptic handle that is attached onto a wayfinding robot in order to communicate signals and provide feedback to guided users
- Rapidly prototyped designs to test mounting strategies, vibration magnitude, and user comfort

Reinforcement Learning Autonomous Agent | Human-Centered Autonomy Lab *August 2023 – December 2025*

- Utilized CARLA simulator for testing autonomous control and gathering data on a mobile robot (self-driving car)
- Implemented reinforcement learning-based controller for an autonomous agent to successfully navigate a circular track
- Programmed a modular codebase to enable future deployment of an anomaly detection module for failure prediction
- Collaborated with lab members to build upon prior work in robot failure detection using machine learning

Work Experience

Controls Lab Teaching Assistant | UIUC | Urbana, IL *January 2023 – December 2025*

- Directly TA'd the lab section of numerous engineering classes related to controls, signals, and embedded systems
- Took on a managerial role at times to teach other TAs material and their responsibilities, develop course work, redesign documentation, prepare class resources, and fix equipment as needed

Embedded Systems Engineer Intern | Engineering System Design Lab | Urbana, IL *May 2024 – August 2024*

- Completed hardware and software tasks to develop a new testing setup for a hinge-integrated multifunctional structures for attitude control (MSAC) scheme for satellites utilizing piezoelectric strain actuators
- Programmed software in C++ for STM32 microcontroller Nucleo-H755ZI-Q for the purpose of enabling advanced PWM signals, logging SD card data, and communicating with multiple accelerometers
- Tested types of signal filters to produce sin signals from period-changing PWM signals as inputs for the actuators
- Created various MATLAB scripts that analyzed signal frequency response and ensured proper signal generation

Systems Engineer Intern | Quartus Engineering | San Diego, CA *January 2022 – May 2022*

- Tested flamethrower robot to find its most efficient parameters by discussing an in-house experimental setup with customer to ensure monetary, timeline, and tangible goals were met
- Built and calibrated camera assemblies in a cleanroom by preparing future materials, adhering to a strict construction schedule, troubleshooting software issues as needed, and observing customer requests
- Costed and designed a customer's heavy lifter assembly and corresponding lift test tooling. Documented, assembled, organized, and cleanroom-tested the physical end product using an overhead crane

Skills

Programming Languages: Python, C/C++, MATLAB, Java, C#, Microsoft VBA, Bash Scripting

Software & Tools: Simulink, PyTorch, Docker, Git, ROS, STM Studio, Godot, PyGame, Unity, CARLA Simulation, Gazebo Simulation, LaTeX, OpenCV

Hardware & Microcontrollers: STM32 (Nucleo), TI C2000 (specifically the LAUNCHXL-F28379D board), Stretch3 mobile robot, UR3 robot arms, CRS robot arm, TurtleBot mobile robots, Arduino, Raspberry Pi, ESP32, IMUs, stereo cameras

CAD Software: Solidworks, Creo Parametric, Fusion

Other: 3D printing, design, rapid prototyping, oscilloscope use, technical writing, signal filtering, cleanroom operation