Nathan L. Butler

Graduate Research Assistant

(+1) 319-330-6155 | nathanbutler.nlb@gmail.com | linkedin.com/in/nlbutler | natbut.github.io

ABOUT ME

Motivated roboticist with a background in AI and mechanical design, seeking to develop scalable, generalizable autonomy solutions for real-world environments. Experienced in reinforcement learning, multi-robot systems, and rapid prototyping for field-deployable platforms.

EDUCATION

Oregon State University   **Sep. 2023 - Present**
M.S. in Robotics; minor in Artificial Intelligence

Iowa State University   **Aug. 2018 - May 2023**
B.S. in Mechanical Engineering; minors in Computer Science and Cyber-Physical Systems
GPA: 3.94/4.00; Awarded Outstanding Senior in Mechanical Engineering

RELEVANT COURSEWORK

Deep Learning; Sequential Decision Making; Multiagent Systems; Learning-Based Control; Intelligent Agents and Decision Making; Kinematics, Dynamics, and Controls; Machine Learning for Cyber-Physical Systems; Principles of Artificial Intelligence

EXPERIENCE

Graduate Research Assistant, Robotic Decision Making Lab, Oregon State Univ.   **Sep. 2023 – Present**
Machine Learning & Robotics Research
- Developed a hybrid decentralized planning algorithm enabling multi-robot teams to integrate local and global information for improved coordination in dynamic environments, with research contributions published at ICRA 2025.
- Implemented and trained a transformer-based model for multi-robot behavioral coordination in communication-constrained environments, providing scalable action guidance for robotic systems.
- Collaborated with multi-university teams on a grant-funded project to develop coordination algorithms for underwater robots, leveraging reinforcement learning for autonomous decision-making.
- Designed and integrated a modular hardware package that supports onboard autonomy in autonomous surface vehicles, with applications in marine environments.
- Applied reinforcement learning to improve robot task execution through action guidance, focusing on real-world robotic autonomy and multi-agent systems.

Undergraduate Research Assistant, ABE Automation and Robotics Lab, Iowa State Univ.   **Jan. 2022 - Jul. 2023**
Machine Learning & Autonomous Systems
- Led the mechanical, electrical, and software integration of a robotic arm into a mobile field robot system, enabling dexterous crop data sampling in agricultural environments.
- Developed and implemented a modular manipulator design to decouple the robotic arm from the mobile base, reducing recharging downtime and enhancing system operational efficiency.
- Designed custom mechanical components for heat dispersion and weatherproofing of stereo cameras, integrating 12 units into field robots for improved environmental robustness.
- Integrated ROS-based hardware for plant-probing robots, optimizing robotic autonomy in precision agriculture and advancing robotic field data collection.

Intern, Intelligent Control & Autonomy Group, NASA Glenn Research Center   **Jan. 2021 - May 2021**
- Modeled physical responses of electrical hardware components in Simulink for NASA's Electrical Modeling and Thermal Analysis Toolbox for use in physics-based digital twins of electric aircraft propulsion systems
- Modeled physical responses of electrical hardware components in Simulink for NASA's Electrical Modeling and Thermal Analysis Toolbox, supporting the development of digital twin models for electric aircraft propulsion systems.
- Developed control models and tutorial documentation to assist NASA engineers in using the Electrical Modeling and Thermal Analysis Toolbox for simulation and analysis tasks.
- Developed multiple example control models with accompanying tutorial documentation to reduce learning curve for new toolbox users.

Additional Projects:

- **MERL for Constrained Coordination:** Developed a Multiagent Evolutionary Reinforcement Learning (RL) framework to train agents in tightly coupled tasks with sparse rewards, enhancing coordination for multi-robot systems.
- **Bravo MPC:** Implemented Model Predictive Control (MPC) strategies for robotic arm task scheduling, optimizing task efficiency and real-time performance in robotic operations.
- **DQN for Task Scheduling:** Created a Deep Q-Network (DQN) for efficient multi-robot task scheduling, optimizing resource allocation and task execution across robotic systems.
- Robot Moisture Sensor: Developed a ROS-based hardware implementation for a plant-probing robot, improving environmental sensing and precision agriculture automation.
- **Crop Row Robot Steering:** Applied Autoencoder (AE) + Convolutional Neural Network (CNN) for visual-based steering commands, enhancing autonomous navigation within crop rows.
- **Lunar Mining Robot:** Led the systems design and material handling components for an award-winning lunar mining robot, focusing on autonomous mining capabilities and robotic interaction with lunar terrain.

SKILLS & TOOLS

Software: Python (PyTorch, TorchRL, TensorFlow), ROS/ROS2, Linux, SolidWorks, MATLAB/Simulink, GitHub, Docker
Mechanical: Rapid Prototyping, 3D Printing, Metal Fabrication, Wood Fabrication, Electronics Assembly
Algorithms & Control: Learning-Based Methods (DL, RL), Multiagent Systems, Evolutionary Algorithms, Path Planning, MPC, PID, IK
Soft Skills: Research & Analysis, Robotic Frameworks, Systems Engineering, Project Management, Technical Communication