Nathan L. Butler

Graduate Research Assistant

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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

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; Cyber-Physical Systems Applications; System Dynamics and Control; Linear Algebra

EXPERIENCE

Graduate Research Assistant, Robotic Decision Making Lab, Oregon State Univ. **Sep. 2023 – Present**

- Published work on hybrid decentralized planning algorithm that enables multi-robot team to integrate local and global information at ICRA 2025
- Using reinforcement learning with transformer models to enhance distributed multi-robot coordination in communication-restricted environments
- Collaborating on multi-university grant to develop coordination algorithms for teams of underwater robots

Undergraduate Research Assistant, ABE Automation and Robotics Lab, Iowa State Univ. **Jan. 2022 - Jul. 2023**

- Updated design of data collection robot by introducing modular components to eliminate downtime during recharging
- Developed weather-resistant casing for custom stereo camera with LED array, integrated 12 units into field robots
- Integrated robotic arm into existing field robot system to support dexterous data sampling techniques

Systems Director, Cardinal Space Mining Club **Aug. 2018 - May 2023**

- Oversaw systems engineering activities including requirements development, interface tracking, trade-off studies, and verification testing, leading to 1st place performance at NASA Lunabotics 2023
- Led development of new regolith storage and offload subsystems for 2022 robot, resulting in TRL 9 system
- Designed, implemented, and deployed mining control loop to achieve 1st place mining competition performance
- Communicated systems engineering activities to NASA Lunabotics competition judges in written technical reports that placed 2nd (2021, 2022) and 1st (2023) nationally

Mechanical Engineering Co-Op, Seed Tech. and Innovation Team, Corteva Agriscience **May 2021 - Dec. 2021**

- Upgraded capabilities of product verification station with faster indexing and computer vision to process 8X more units
- Utilized CAD and 3D-printing skills to develop solutions for grasping and manipulating components of irregular geometry
- Collaborated with innovation and safety teams to test and refine ergonomic product packaging machine

Intern, Intelligent Control & Autonomy Group, NASA Glenn Research Center **Jan. 2021 - May 2021**

- Modeled physical responses of electrical hardware components as Simulink blocks and added components to NASA's Electrical Modeling and Thermal Analysis Toolbox for use in realistic digital twins of electric aircraft propulsion systems
- Developed multiple example Simulink models with accompanying tutorial documentation to reduce learning curve for new toolbox users

ADDITIONAL PROJECTS

MERL for Constrained Coordination: Multiagent Evolutionary RL for training agents in tightly coupled tasks with sparse rewards
Bravo MPC: Model Predictive Control for Reach Bravo robotic arm
Multiagent Routing as COP: Constraint Optimization Problem formulation with solver for multiagent orienteering
Robot Moisture Sensor: ROS-based hardware implementation of plant-probing robot
DQN for Task Scheduling: Deep Q-Network for multi-robot task scheduling
Crop Row Robot Steering: AE+CNN approach for robot steering commands from visual data within crop rows
Danfoss Lettuce Harvester: Robotic lettuce harvester concept developed in collaboration with national multidisciplinary team

VOLUNTEERING

FIRST Robotics Programs **Fall 2018 - Present**

- Mentoring multiple middle/high school-level FIRST Tech Challenge robotics teams in topics such as mechanical and software design, research and engineering processes, and team business strategy
- Advised >20 FIRST Lego League teams in potential research projects for 2024 competition through online webinar

MATE ROV Competition **Apr. 2024**

- Provided engineering and presentation feedback to high school underwater robot teams as engineering project judge

SKILLS & TOOLS

Algorithms & Control: Deep Learning, Transformer Architectures, Reinforcement Learning, Genetic Algorithms, Path Planning, MPC, PID, Inverse Kinematics
Software: Python, PyTorch, ROS/ROS2, Linux, Java, SolidWorks, MATLAB/Simulink, GitHub, Docker
Mechanical: Rapid Prototyping, 3D Printing, Metal Fabrication, Wood Fabrication
Soft Skills: Research & Analysis, Algorithm Design, Software Design, Mechanical Design, Systems Engineering, Project Management, Technical Communication