James Wade

NSF Graduate Research Fellow

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EDUCATION

BACHELOR OF MECHANICAL ENGINEERING; MINORS IN COMP SCI & MATH *2019 – 2020, 2022 – 2026*
Brigham Young University – Ira A. Fulton College of Engineering
GPA: 4.0/4.0 (Rank #1 of 485 in class) | Emphasis in controls & robotic systems | **GRE**: Quant 170/170, Verbal 166/170
Russell M. Nelson Scholar: Most prestigious scholarship at BYU awarded to <1% of students (four-year, full-ride)
Groups: Mars Rover Team Lead, Rocketry Club, Spacecraft Club, Mechatronics Club, Global Engineering Outreach
Note: I took a hiatus from my studies from 2020-2022 to serve a voluntary service mission in Mongolia

RESEARCH, INTERNSHIPS & TECHNICAL LEADERSHIP

AUTONOMY INTERN *May 2025 – present*
Sandia National Labs, AutonomyNM Division – Albuquerque, NM

- Designed RAM-Stack, a ROS-based autonomous multi-agent software stack for SLAM and navigation, integrating SLAM Toolbox, SwarmSLAM, Navigation2, and ROS 2 Control to enable coordinated mapping and path planning
- Leveraged theoretical understanding of Behavior Tree control flow (reactive sequences, fallbacks, and decorators) to diagnose and optimize Navigation2 logic
- Integrated Zenoh as an interface filter to limit inter-robot communication pipelines to essential data, reducing bandwidth usage and improving scalability
- Selected to present research to division leadership via a poster session and a comprehensive final technical review

SAFE CONTROL RESEARCH ASSISTANT *Aug 2024 – present*
Brigham Young University, MAGICC Lab – Provo, UT

- Developing a real-time Control Barrier Function (CBF) framework for bipedal robots using LiDAR projections
- Computing invariant sets from 3D point cloud data to guarantee collision-free trajectories with CBFs without the need for computationally expensive environment classification

ROBOTICS RESEARCH ASSISTANT – Team Lead, Founding Member *Aug 2023 – present*
(One of Six National Finalists, NASA BIG Idea Challenge)
Brigham Young University, CMR Lab – Provo, UT

- Founding member of the lab; established technical infrastructure and led an undergraduate team to develop a lunar-deployable soft robot
- Architected the redesign of a modular inflatable robot, implementing a custom multi-node radio network with error-checking protocols
- Developing kinematic reconfiguration algorithms to maximize workspace and ensure fault tolerance under actuator failures (manuscript in prep for *IEEE RA-L*)
- Secured follow-on funding from the Utah NASA Space Grant Consortium through submitted proposal

BYU MARS ROVER TEAM LEAD *August 2025 – present*
Brigham Young University – Provo, UT

- Elected by peers to lead 34-person team competing in 2025-2026 University Rover Challenge; manage technical subsystem leads across mechanical, electrical, and software divisions
- Oversee system-level integration testing and serve as primary technical resource for cross-subsystem debugging, leveraging comprehensive knowledge of the full robotics stack
- Architected migration from ROS 1 to ROS 2; developed training curriculum and led technical workshops to upskill team members in modern robotics software architecture
- Implementing visual servoing for autonomous typing using ViSP—new competition capability requiring integration of computer vision, manipulation planning, and real-time control

EMBEDDED SYSTEMS INTERN *May 2024 – May 2025*

Lawrence Livermore National Laboratory (LLNL) – Livermore, CA

- Engineered a custom, full-stack handheld controller (mechanical housing, circuit design, firmware) to teleoperate a fleet of autonomous marine rafts, replacing a cumbersome laptop-based system
- Programmed FreeRTOS task management and developed a custom LVGL-based control UI
- Delivered end-to-end mechanical, electrical, and software systems as the sole developer across the project lifecycle

COMPLIANT MECHANISMS RESEARCH ASSISTANT *June 2023 – Aug 2023*

Mark Rober / Brigham Young University, CMR Lab – Provo, UT

- Contributed to development of miniaturized compliant mechanisms for The World's Smallest Nerf Gun project (75M+ views on YouTube) across five size scales
- Conducted 100+ design iterations to identify failure modes and optimize mechanical performance
- Collaborated in weekly technical meetings to drive design refinements based on experimental data

MICROFLUIDICS RESEARCH ASSISTANT *March 2023 – Aug 2023*

Brigham Young University, TEMP Lab – Provo, UT

- Co-authored paper in *International Journal of Heat and Mass Transfer* on lab-on-a-chip thermal sensing using quantum dot fluorescence
- Conducted fluorescence characterization experiments and analyzed thermal response data to validate temperature measurement accuracy across operating conditions

TEACHING EXPERIENCES

ROBOTICS TEACHING ASSISTANT *Aug 2025 – present*

Brigham Young University – Provo, UT

- Selected as a TA for a 60-student graduate-level course on manipulators, kinematics, and dynamics
- Mentored students through theoretical derivations and ROS/Python implementations during weekly office hours

SERVICE VOLUNTEER & ENGLISH TEACHER *June 2020 – June 2022*

The Church of Jesus Christ of Latter-day Saints – Ulaanbaatar, Mongolia

- Completed two-year full-time service mission, teaching English 12+ hours/week in immigration offices, hospitals, and community centers while developing cross-cultural communication and adaptability skills
- Achieved conversational fluency in Mongolian

PUBLICATIONS & PRESENTATIONS

Publications

1. **James Wade**, Isaac Weaver, and Nathan Usevitch, "Rigidity-Preserving Control of Multiply-Redundant Inflatable Robots Under Actuator Failures", *IEEE Robotics and Automation Letters* [In Preparation for Submission, April 2026]
2. Mihai Stanciu, Isaac Weaver, Adam Rose, **James Wade**, Kaden Paxton, Chris Paul, Spencer Stowell, and Nathan Usevitch, "Modular Isoperimetric Soft Robotic Truss for Lunar Applications", *IEEE Transactions on Mechatronics* [Submitted, February 2026]
3. Derek Sanchez, Robert Macdonald, Brendan Mitchell, **James Wade**, McKay Wilkerson, Hunter Hinnen, Marshall Rawlins, Gregory P. Nordin, Adam T. Woolley, Troy R. Munro, "Advancing the applications of 3D printed microfluidics: Utilizing quantum dots to measure internal temperature", *International Journal of Heat and Mass Transfer,* 2025.

Conference Proceedings and Presentations: Podium

1. **James Wade,** Chris Paul, Mihai Stanciu, Spencer Stowell, Isaac Weaver, Adam Rose, Ashleigh Cerven, Annie O'Bryan, Brian Bodily, Logan Yang, and Nathan Usevitch, "Untethered and Modular Inflatable Robot for Lunar

Applications", *Finalists in the 2024 NASA BIG Idea Challenge — Inflatable Systems for Lunar Operations. Technical paper presented at the NASA BIG Idea Symposium*, November 2024.

2. **James Wade,** Chris Paul, "Constant-Pressure Untethered Soft Robotics: An Adaptable Solution to the Limitations of Soft Robots", *Utah Conference on Undergraduate Research,* 2024. Announcement of our NASA grant.

Conference Proceedings and Presentations: Poster

1. **James Wade**, "ROS 2 Autonomy Stack for Multi-Agent SLAM and Navigation", presented at *Sandia New Mexico SIP Intern Symposium*, August 2025.
2. **James Wade,** Chris Paul, "Untethered and Modular Inflatable Robot for Lunar Applications", *Lunar Surface Innovation Consortium (LSIC)*, November 2024.

SCHOLARSHIPS & GRANTS

2026 **NSF Graduate Research Fellowship**, $137,000 in research funding over three years

2025 **Utah NASA Space Grant Consortium Fellowship**, $2,000 research stipend for work on multiply-redundant soft robots in space environments; received one of 17 available awards at BYU (14 graduates, 3 undergraduates)

2024 **NASA BIG Idea Competition Funding**, secured $140,000 as head grant writer and team lead; one of six national finalists in 2024-2025 intercollegiate competition

2019 **President Russell M. Nelson Scholar**, 4-year full-ride scholarship for 150% of tuition, awarded to fewer than 1% of the student body (the highest scholarship available at BYU)

HONORS & AWARDS

2026 **Awarded the NSF Graduate Research Fellowship**

2025 **Ranked 1st in Mechanical Engineering Class of 485**

2025 **Dean's List (all eight completed semesters)**, top 5% of BYU Engineering department

2023 **Phi Kappa Phi (honor society initiation)**, top 7.5% of BYU Engineering juniors

SELECT TECHNICAL PROJECTS

Medical Pressure Mat – BYU Global Engineering Outreach

- Led electrical and software design for an Arduino-based pressure mat using conductive fabric sensors to monitor pressure distribution for at-risk wheelchair users
- Developed the system from concept to working prototype, integrating real-time visualization of pressure zones across the mat
- Presented prototype and system functionality to clinical stakeholders at a self-funded wheelchair clinic in South America as part of junior-year capstone project

Trebuchet Numerical Simulator – Graduate Dynamics Class Project

- Derived unified equations of motion using Euler-Lagrange formulation with Lagrangian multipliers to compute constraint forces across three contact modes: ground sliding, pendulum swing, and ballistic flight
- Implemented a hybrid dynamics simulator with event-triggered mode transitions and constraint relaxation to extract normal/friction forces from variational mechanics

RELEVANT COURSEWORK & SKILLS

Robotics & Control: ROS 2 (Nav2, SLAM Toolbox, ROS 2 Control, MoveIt 2), ROS, Control Theory (PID, State-Space, Observers, MPC, LQR), State Estimation, Mechatronics, Dynamic System Modeling, Kinematics, Deep Learning

Mechanical Design & Analysis: SolidWorks (Certified Professional, Sheet Metal), Ansys FEA, Mechanical System Design, Thermodynamics, GD&T, 3D Printing

Electrical & Embedded Systems: Arduino, ESP32, STM32, FreeRTOS, Electrical Circuit Design, PCB Design

Programming: C/C++, Python, Rust, MATLAB, Julia, Qt, Git, LaTeX, Java