

PROFILE

Senior robotics systems engineer and technical lead with deep hands-on experience developing, integrating, and deploying autonomy, control, manipulation, locomotion, and embedded-compute capabilities on physical robotic systems. Group Lead for Robotic Manipulation & Sampling at NASA JPL, while remaining an active individual contributor across robot control, real-time systems, embedded computing, hardware interfaces, perception-guided manipulation, and robot-platform integration.

Experience spans high-DoF manipulation, continuous force control, teleoperation/guided autonomy, reinforcement-learning policies, embedded neural-network inference, ROS, EtherCAT, and heterogeneous x86/ARM/RISC-V computing. Recent work includes deploying PPO neural policies through ONNX onto NASA's RISC-V High Performance Spaceflight Computing platform and benchmarking inference performance against NVIDIA and x86 compute platforms.

LEADERSHIP & TECHNICAL EXPERTISE

Robotics & Control: Contact-rich manipulation • Continuous force/compliance control • Locomotion • Kinematics & analytical IK • Collision detection • Grasp planning • Motion planning • Perception-guided manipulation • Functional autonomy • Guided autonomy / teleoperation • Robot diagnostics

Robot Learning & Inference: Reinforcement learning • PPO • NVIDIA Isaac Lab • ONNX • Embedded neural-network inference • Model deployment & performance benchmarking • VLA research • Neural-network manipulation outcome assessment

Software / Frameworks: C++ • Python • C99 • Bash • CMake • ROS 1/2 • CASAH • F Prime • DDS • UR • KUKA

Embedded & Robot Hardware: EtherCAT driver development • CAN • RS-232/422/485 • Force/torque sensors • 4–20 mA • 0–10 V • Analog/digital I/O • Embedded electronics • Motor-control infrastructure

Compute & Infrastructure: RISC-V / HPSC • NVIDIA platforms • x86 • ARM / STM32 • Linux • Cross-compilation • Docker • GitLab/GitHub CI • Containerized development • TSN • Linux systems/network administration

WORK HISTORY

NASA Jet Propulsion Laboratory

Pasadena, CA, USA

Robotics Technologist, Group Lead - Robotic Manipulation & Sampling

March 2020 - Present

- **Embedded AI / HPSC deployment:** deployed robotic algorithms across heterogeneous spaceflight-compute architectures, including x86, NVIDIA, and NASA's RISC-V High Performance Spaceflight Computing platform. Cross-compiled and executed **PPO neural-network policy inference via ONNX on HPSC**, benchmarking inference performance against NVIDIA and x86 CPU platforms to characterize compute-platform tradeoffs for robotic edge deployment.
- **Learning-based locomotion:** technical mentor for development of PPO locomotion policies in **NVIDIA Isaac Lab** for an 18-DoF three-legged wheel-on-limb robot traversing terrain of varying complexity. Worked from policy-training architecture through model export and target-platform inference, connecting simulation-trained RL policies to embedded RISC-V deployment. Mentor a separate VLA research effort focused on dexterous manipulation.
- **Mars Sample Return force-controlled manipulation:** Cognizant Engineer for Wrench Estimation & In-Contact Manipulation, developing dexterous continuous force-controlled behaviors for a 7-DoF flight robotic arm. Led development of wrench estimation, gravity/temperature compensation, compliant contact behaviors, and [sample-tube insertion](#) into the Mars Ascent Vehicle; personally developed core control algorithms and flight-oriented implementation architecture. [Technical paper](#).
- **Mars Sample Return robotic docking:** after the 2024 rearchitecture, served as Cognizant Engineer adapting validated Perseverance 5-DoF arm self-docking capabilities for direct vehicle-to-vehicle sample transfer. Reworked kinematic frames and system parameters for the new geometry and supported an end-to-end Engineering Model demonstration in JPL's Mars Yard [\[video\]](#).
- **Europa Lander autonomous manipulation:** Task Manager and software lead for Sampling Autonomy, while contributing hands-on software integrating kinematics, control, perception, proprioception, science targeting, fault response, and autonomous execution into an end-to-end robotic sampling system. Demonstrated on representative hardware at Matanuska Glacier, Alaska; resulted in a first-author [Science Robotics paper](#).
- **Robotic control-stack development:** developed the motor-controller infrastructure underlying the highly articulated [EELS](#) snake robot [\[video\]](#), and develop/maintain reusable robot-control infrastructure spanning EtherCAT, force/torque sensing, CAN/serial devices, motor controllers, ROS, Linux compute, and real hardware.

- **ROS and distributed robotics software:** develop and maintain modules running under both **ROS 1 and ROS 2** from common source through CMake configuration; developed an autogenerator for a **ROS 2-F Prime DDS bridge** supporting integration between robotics and flight-software ecosystems.
- **Heterogeneous real-time robotics:** lead technical development demonstrating robotics algorithms and deterministic **Time-Sensitive Networking** across heterogeneous compute endpoints, including RISC-V systems; work spans cross-compilation, middleware, network configuration, timing, communications, and integrated hardware/software debugging.
- **Robot diagnostics and systems integration:** maintain and troubleshoot complex robotic systems across software, compute, communications, sensing, motor control, and hardware interfaces. Develop diagnostic tools and test procedures for EtherCAT and other low-level robot subsystems and build Linux workstations, compute nodes, CI environments, and network infrastructure supporting JPL robotics development.
- **Serve as Group Lead for Robotic Manipulation & Sampling,** providing technical mentorship and architectural guidance across manipulation, controls, autonomy, embedded systems, and robot integration while maintaining a substantial hands-on engineering role.

NASA Jet Propulsion Laboratory

Research Affiliate

Pasadena, CA, USA

April 2016 - February 2020

- **RoMan autonomous manipulation:** developed an end-to-end system combining RGB-D perception, object selection, grasp planning, proprioceptive control, and force/wrench-reactive extraction of previously unseen debris on a human-scale mobile manipulator; resulted in a first-author [Field Robotics paper \[video\]](#).
- **Autonomy and controls research:** applied reinforcement-learning multi-armed-bandit methods to manipulation-mode selection, investigated deep-learning manipulation outcome assessment, and developed MPC/input-shaping techniques for compliant manipulators.

PowerbyProxi Ltd

Embedded Electronics Engineer / Engineering Intern

Auckland, New Zealand

November 2011 - July 2014

- Developed embedded C software and electrical/mechanical hardware for commercial inductive-power products, including PIC32 controllers, PCBs, CAN, RS-232, Ethernet, and industrial test equipment.
- **Led an engineering-intern team** developing a novel RF pairing technique and worked directly with commercial customers including John Deere to define requirements, scope new products, and establish engineering schedules. Developing embedded S software with PIC32 controllers, PCBs, CAN, UART, others.

SELECTED PUBLICATIONS & DEMONSTRATIONS

Bowkett et al., [“Autonomous Surface Sampling for the Europa Lander Mission Concept,”](#) Science Robotics, 2025 - first-author integrated autonomy/manipulation field system.

Dolci, Bowkett et al., [“Robotics Capabilities Development for Mars Sample Return Transfer Activities,”](#) IEEE Aerospace Conference, 2025.

Bowkett et al., [“Challenges in Closed-loop Compliant Motion Control for Planetary Robotics,”](#) IEEE Aerospace Conference, 2024.

Vaquero et al., including Bowkett, [“EELS: Autonomous Snake-like Robot with Task and Motion Planning Capabilities for Ice World Exploration,”](#) Science Robotics, 2024.

Bowkett, Karumanchi & Detry, [“Grasping and Transport of Unstructured Collections of Massive Objects,”](#) Field Robotics, 2022 - first-author perception-guided, force-reactive manipulation.

Full publication list: [Google Scholar](#) • [JPL Robotics profile](#)

EDUCATION

California Institute of Technology - Burdick Robotics Group

Pasadena, CA, USA

Doctor of Philosophy in Mechanical Engineering

2020

Master of Science in Mechanical Engineering

2016

Sir William Pickering Fellowship

Doctoral research in functional autonomy for manipulation in uncertain environments, including reinforcement-learning-based mode selection, neural-network outcome assessment, visual grasp reasoning, force-aware manipulation, motion planning, and robot control.

University of Auckland

Auckland, New Zealand

Bachelor of Engineering (Honours) in Mechatronics Engineering

2013

GPA: 8/9 (A), 4.0/4.3 Caltech equivalent