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Education

- Ph.D. in Mechanical Engineering, Northwestern University, Evanston, IL — Ongoing
- Master of Science in Robotics, Northwestern University, Evanston, IL — Dec 2019
- BS in Physics, BA in Folklore/Ethnomusicology, Indiana University, Bloomington, IN — May 2017

Relevant Skills

- Languages: C/C++/C#, Python, Mathematica, Matlab, JavaScript, React, LaTeX
- Software: ROS/ROS2, OpenGL, OpenCV, PyTorch, Matlab, rviz, Autodesk, Ubuntu/Linux Systems
- Hardware: 3D Printing, Prototyping, Precision Measurements and Drafting, Machining

Experience

PhD Candidate (*Sept 2020 – Ongoing; scheduled to graduate in November 2025)*

Northwestern University and Shirley Ryan AbilityLab (argallab), Chicago, IL

Body-Machine Interface (BoMI) Project

- Deployed generative BoMI system enabling real-time 6-DOF robotic arm teleoperation for individuals with cervical-level SCI (N=10), using wearable IMUs and ROS2.
- Wrote ROS2 wrapper (C++) for x-io x-IMU3 sensors; working with x-io to make this an officially supported package.
- Built participant-specific motion encoders and control-space mappings using motion statistics and optimization routines in Python/C++.
- Led IRB-approved longitudinal human-subject study (12 sessions per participant); designed protocols, collected data, and coordinated with clinicians. Conducted 120 sessions from full study, 190+ sessions including scoping and vetting sessions.
- Analyzed skill acquisition and control adaptation using Python, Seaborn, and custom signal processing pipelines.

Bias-Aware Interface Remapping

- Built algorithm to remap sparse joystick input into full-rank control signals using convex hull expansion and statistical analysis of user behavior (Python).
- Deployed with assistive joystick in IRB-approved study (N=8: SCI, stroke); improved interface access without mode switching.

Information-Theoretic Nudging

- Developed mutual information-based shared autonomy controller to resolve intent ambiguity in real time using ROS and Python.
- Deployed on Kinova Jaco Gen2 arm; system adaptively nudged users toward high-certainty control states using automatic mode switching.

Meta-Participation and End-User Interviews

- Conducted structured interviews with motor-impaired robotics researchers/creators (N=3); extracted qualitative barriers to participation in research and proposed design guidelines.

Post-Baccalaureate Researcher (*Jan 2020 – Sept 2020)*

Northwestern University and Shirley Ryan AbilityLab (argallab), Chicago, IL

- Collected virtual wheelchair driving behavior data (N=12) for control model development; virtual tasks designed using OpenGL, React, JavaScript.
- Built and trained LSTM-based predictor to classify driving maneuvers from user input and kinematic trajectories (Python/PyTorch).
- Analyzed and compared predicted motion primitives against motor-impaired datasets from prior studies.

Graduate Researcher, MSR Program Projects (*Sept 2018 – Dec 2019)*

Northwestern University, Evanston, IL

- Designed and fabricated a cable-driven SEA with spring-based compliance for back-drivable actuation.
- Built Bluetooth-controlled hexapod robot and designed a bio-inspired gait controller using embedded firmware.
- Developed ECG acquisition device and validated signal fidelity via analog signal processing and filtering.
- Programmed a motor encoder PID controller using a PIC32 microcontroller in C.
- Simulated bipedal rappelling robot with environmental constraints using Mathematica physics engine.
- Co-developed a hybrid fluidic actuator combining McKibben muscle and MMVS elements; implemented switching manifold for pressure control.
- Programmed Baxter robot to play interactive Pong using ROS and ultrasonic range sensors.
- Developed feedback-based motion planning for KUKA robotic arm on mecanum base in simulation.

Summer Research Intern, Robotics and Embedded Systems (REMS) (*June 2019 – Aug 2019)*

BlueHalo (formerly Intelligent Automation, Inc.), Rockville, MD

- Contributed to haptics and dynamics research projects in REMS group; focused on multimodal sensor fusion and real-time signal processing.
- Participated in daily agile development meetings and weekly technical presentations.

Lab Resource Manager and Research Assistant, de Ruyter Biophysics Lab (*May 2016 – Aug 2018)*

Indiana University, Bloomington, IN

- Maintained C. Vicina colonies and supported neurophysiology research targeting insect visual systems.
- Used C++ and Matlab to generate experimental stimuli and automate statistical analysis workflows.
- Updated and digitized internal training materials for onboarding and procedural consistency.

Selected Publication(s) and Patent(s)

- USPTO Patent: SYSTEM AND METHOD FOR PROVIDING TACTILE FEEDBACK FOR PREVENTING ROLLOVER OF A VEHICLE, 2024, 18/804804
- HRI '24 Companion: An Evolution of Assistive Robot Control to Meet End-User Ability (1st Author)
- ICRA Rehab Robotics 2022: Control Interface Remapping for Bias-Aware Assistive Teleoperation (1st Author)
- RSS 2023 Workshop: Identifying Accessibility Barriers to Robotics Research (1st Author)
- Algorithmic Foundations of Robotics 2022: Information Theoretic Intent Disambiguation via Contextual Nudges for Assistive Shared Control (2nd Author)
- HRI '24 A3DE Workshop: Navigating Adaptive Design: Advancing the Body-Machine Interface for 6d Control (2nd Author)
- HRI '24 A3DE Workshop: Principal Component Analysis in Accessible Control (2nd Author)