LARISA Y.C. LOKE

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SUMMARY

Robotics researcher with 6+ years of experience designing and evaluating robot teleoperation, shared-control and assistive systems for people with motor impairments. Expertise in modeling how individuals actually operate control interfaces and building algorithms that infer user intent and provide real-time, user-customized assistance. Designs and runs the full research pipeline—from data collection and ML modeling through implementation on real hardware and longitudinal human-subjects evaluation—with a publication record across robotics, HRI and rehabilitation engineering venues.

EDUCATION

PhD in Mechanical Engineering, Northwestern University, Evanston, IL — Sep 2020 – Jul 2026

- **Thesis:** Assistive Robotics for the Individual: Challenging Assumptions from Signal Interpretation to Shared Control; Thesis Advisor: Dr. Brenna Argall
- **Awards:** Walter P. Murphy Fellowship (2020–2021)

BEng in Mechanical Engineering, Nanyang Technological University (NTU), Singapore — Aug 2016 – Jul 2020

- Honours with Highest Distinction, Robotics and Mechatronics Specialization
- **Awards:** Nanyang Scholarship, CN Yang Scholars Programme, Mechanical Engineering Dean's List

WORK EXPERIENCE

Research Intern, General Motors Research & Development, Warren, MI — Jun – Sep 2025

- Led system-level design and implementation of an accessible in-vehicle interaction system; scoped candidate interfaces and defined the control taxonomy for passengers with a range of disabilities.
- Integrated augmentative and alternative communication (AAC) devices and standard HID inputs; designed a safety-driven state machine (ROS 2) governing the full interaction sequence.
- Proposed a framework for arbitrating control between human and automated agents, which contributed to a patent application, and set up its software architecture.
- Surveyed emerging assistive technologies and presented integration recommendations to the R&D team; authored the scheme of work for external partners.

RESEARCH EXPERIENCE

Postdoctoral Researcher, Northwestern University & Shirley Ryan AbilityLab, Chicago, IL — Jul 2026 – Present
Graduate Researcher — Sep 2020 – Jul 2026

Design, build and evaluate assistive robotic systems end-to-end. Lead human-subjects research operations (IRB applications, protocol design, recruitment, study sessions, de-identified data management), collaborate with clinicians and industry partners to translate research into usable tools. Disseminate contributions through peer-reviewed publications.

- **Intelligent Powered Wheelchair** *(Current work, Published in RSS 2026)*
  - Developed REACT, a minimal, deterministic runtime safety layer for shared control that intervenes only when safety constraints are violated and otherwise preserves full user control, making no assumptions about intent, trajectory or task. Took it through two redesigns and a Python-to-C++ port.
  - Co-led the architecture of a modular ROS 2 (C++/Python) stack on a commercial powered wheelchair with LUCI assistive driving technology: real-time input interfacing, human/autonomy command arbitration, sensor processing and fusion, odometry and Nav2 navigation.
  - Extended the platform for autonomous navigation within commercial hardware limits: added Raspberry Pis to offload cameras and computation, increased streaming bandwidth, tuned Nav2 for a non-circular robot in narrow corridors, and wrote a custom Regulated Pure Pursuit controller plugin.
  - Built a ceiling-mounted AprilTag ground-truth pose system to verify odometry and controller-driven paths.
  - Designed and ran a 12-participant longitudinal study (over 90 sessions) across diverse impairments and control interfaces in indoor and outdoor driving tasks; assistance helped most in precision maneuvers for users of low-bandwidth interfaces (sip/puff).
  - Reviewed and developed robotic wheelchair evaluation metrics spanning user, clinical and engineering perspectives *(survey paper, co-first author, under review)*.
  - Co-developed the LUCI Dev Kit, turning the research prototype into an open R&D platform for the wheelchair-robotics community *(co-first author, under review)*.
- **Interface-aware Assistive Control Framework** *(Published in ISER 2023, RSS 2025, IJRR 2025, HRI 2026)*
  - Developed real-time, user-specific intent estimation methods using time-series ML models (LSTM/GRU), assisting people using a low-dimensional sip/puff interface to control a high-DoF robot arm (Kinova Jaco).

  - Designed a structured data collection task that captures each user's interface interaction behavior, feeding into an end-to-end data collection → model-training → rollout pipeline.
  - Evaluated in two human-subjects studies (3 and 8 participants with spinal cord injury), reformulating and iterating on the method between studies to work agnostic of task and environment.
  - The assistance outperformed standard teleoperation mappings and environment-aware collision avoidance on safety and workload, and was participants' most preferred condition.
  - Reused the framework as both an assisted control and training interface, enabling users to provide high-quality robot demonstration data for downstream robot-learning research.
- **Eye Gaze Tracking and Mental Workload Estimation for Wearable Interfaces** *(Published in ICoRR 2023, Wearable Technologies 2025)*
  - Designed and built a multimodal data collection and analysis pipeline for wearable eye tracking (Tobii Pro Glasses 3), synchronizing egocentric scene video with gaze, pupillometry, and heart-rate streams, with fiducial tracking for head pose relative to the screen; studied 11 participants with ALS and SCI.
  - Identified gaze metrics that distinguish intentional from reactionary gaze and inform per-user interface customization; showed pupil diameter can estimate cognitive workload during concurrent eye-based control.
- **Bias-aware Control Interface Remapping** *(Published in ICoRR 2022)*
  - Modeled individual users' joystick bias from motor impairment and remapped control space to compensate; with 8 participants (stroke or SCI), improved task efficiency on screen-based and robot arm pick-and-place tasks.

Visiting Student Researcher, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA Jun – Dec 2019

- Trained CNN-based computer vision models (Faster R-CNN, PyTorch) for rare-object detection, including a synthetic data generation pipeline (image compositing, augmentation) to address limited training data for underrepresented classes.

SELECTED PUBLICATIONS

- **Larisa Y.C. Loke***, Joel X. Goh*, Jered Dean, Brenna D. Argall. "A Robotic Wheelchair Research & Development Platform: LUCI Dev Kit." *Under review. *Equal contribution.*
- **Larisa Y.C. Loke**, Joel X. Goh, Kyle S. P. Puckett, Michelle H. Zhang, Nicole L. Zaino, Brenna D. Argall. "A Minimal, Deterministic Approach to Shared Control for Safe Powered Wheelchair Driving." *In Proceedings of the Robotics: Science and Systems (RSS) conference, 2026.*
- Demiana R. Barsoum, Mahdieh Nejati Javaremi, **Larisa Y.C. Loke**, and Brenna D. Argall. "Interface-Aware Trajectory Reconstruction for Robot Learning." *In Proceedings of the ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2026.*
- **Larisa Y.C. Loke** and Brenna D. Argall. "Interface-Level Intent Inference for Environment-Agnostic Robot Teleoperation Assistance." *In Proceedings of the Robotics: Science and Systems (RSS) conference, 2025.*
- Mahdieh Nejati Javaremi, **Larisa Y.C. Loke**, Brenna D. Argall. "Task-agnostic and interface-aware handling of unintended interface operation for robot arm teleoperation: Insights and case study evaluations by persons with spinal cord injury." *The International Journal of Robotics Research (IJRR) Special Issue: ISER 2023, 2025.*
- Demiana R. Barsoum, Michelle H. Zhang, **Larisa Y.C. Loke**, and Brenna D. Argall. "Curating Interface Maps for Robot Teleoperation." *In Proceedings of the International Conference on Rehabilitation Robotics (ICoRR), 2025.*
- **Larisa Y.C. Loke**, Demiana R. Barsoum, Todd D. Murphey, and Brenna D. Argall. "Characterizing Eye Gaze and Mental Workload for Assistive Device Control." *Wearable Technologies 6, e13. Cambridge University Press, 2025.*
- Andrew Thompson*, **Larisa Y.C. Loke***, and Brenna D. Argall. "Control Interface Remapping for Bias-aware Assistive Teleoperation." *In Proceedings of the International Conference on Rehabilitation Robotics (ICoRR), 2022. *Equal contribution.*

SERVICE, TEACHING & LEADERSHIP

- **Reviewer:** HRI, THRI, WAFR, ICoRR, T-BME, T-ASE.
- **Workshop Co-organizer:** Human-Robot Contact and Manipulation Workshop, at RSS 2025: website management, abstract submissions and reviews, on-site facilitation.
- **Teaching Assistant at Northwestern:** ML & AI for Robotics, Intro to Robotics Lab, Robotic Manipulation.
- **Outreach:** Lab demos at RehabWeek 2025, National Robotics Week (Chicago Museum of Science and Industry), and National Biomechanics Day (Shirley Ryan AbilityLab).

SKILLS

Programming Languages	Python, C++, Arduino, MATLAB, C# (Unity)
Tools	Robot Operating System (ROS & ROS 2) and associated packages (Nav2, MoveIt), PyTorch, scikit-learn, Pandas, Docker (development), Linux, Git/GitHub, LaTeX
Robot Platforms	Kinova JACO Gen2, Kinova MICO, UFactory xArm 7, LUCI smart wheelchair
Control Interfaces	Eye gaze tracking, Sip/Puff, Joysticks, Head Array, Head Mouse
Languages	English (Native), Mandarin Chinese (Proficient)