LARISA Y.C. LOKE

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SUMMARY

Roboticist building assistive systems around how real people actually use them, with expertise in human input signal interpretation, ML-based intent inference, and minimal-assumption shared control, implemented in ROS 2, Python, and C++ on real hardware and validated in longitudinal studies with motor-impaired users. Currently a Postdoctoral Researcher at Northwestern University and Shirley Ryan AbilityLab, developing assisted driving paradigms for powered wheelchairs.

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
- **Research Areas:** Human-Robot Interaction (HRI), machine learning, human intent inference, personalization, accessible control systems
- **Awards:** Walter P. Murphy Fellowship (2020–2021)
- **Served as Reviewer:** HRI, THRI, WAFR, ICoRR, T-BME, T-ASE

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
Advisor: Dr Brenna D. Argall

Key Responsibilities

- Design and develop algorithms for intelligent robot control, teleoperation, and human-robot interaction.
- Design and conduct virtual and physical HRI experiments (screen-based tasks and ADL tasks on real robots) with motor-impaired populations to evaluate methods and algorithms.
- Lead human subjects research operations: IRB applications, study protocol design, ethical compliance, participant recruitment/scheduling, conducting study sessions, and secure data de-identification and management.
- Build data collection, processing, and analysis pipelines; analyze results and communicate findings through publications.
- Collaborate with lab members, clinicians, and industry partners on robot learning, user training, user-defined control maps, and robot navigation projects.
- Mentor junior PhD students, master's students and undergraduates on research projects.

Main Research Projects

- **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 (Python/C++) shared-control and teleoperation stack for a commercial powered wheelchair with LUCI assistive driving technology, handling real-time human control input interfacing, input source arbitration, sensor stream processing and fusion, odometry, and navigation.
  - Designed and ran a 12-participant longitudinal study (over 90 sessions) evaluating usability and effectiveness 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 existing and developed robotic wheelchair human-robot interaction evaluation metrics spanning user, clinical, and engineering perspectives.
  - Co-developed the LUCI Dev Kit, an open research-and-development platform that this work is built on, turning a research prototype into a reusable tool for the wheelchair-robotics research community *(manuscript under review).*
- **Interface-aware Assistive Control Framework** *(Published in ISER 2023, RSS 2025, IJRR 2025, HRI 2026)*
  - Developed algorithms for real-time user-intent estimation using time-series ML models (LSTM/GRU), enabling people using a low-dimensional sip/puff interface to control a high-DoF robot arm (Kinova Jaco) for activities of daily living.
  - Implemented end-to-end data collection → model-training → rollout pipeline to evaluate usability and performance of assisted teleoperation frameworks in two human-subjects studies (3 and 8 participants with spinal cord injury), and iterated the modeling approach based on evaluation findings.
  - 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 implemented a data collection and modeling framework for eye-gaze signals (using the Tobii Pro Glasses 3), studying 11 participants with ALS and SCI to develop methods distinguishing intentional from reactionary gaze, enabling its use in richer control schemes.
  - Analyzed gaze movement, pupillometry, and heart rate data; identified opportunities for customization of gaze-based control interfaces, and demonstrated the feasibility of using gaze signals to estimate cognitive workload during concurrent eye-based control.

Visiting Student Researcher, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA Jun – Dec 2019
Supervisors: Dr John M. Dolan, Dr Christoph Mertz

- 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.

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.*
- Kyle S. P. Puckett*, **Larisa Y.C. Loke***, Nicole L. Zaino, Brenna D. Argall. "A Survey of the Evaluation of Robotic Wheelchairs." *Under review. *Equal contribution.*
- 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.*
- Mahdieh Nejati Javaremi, **Larisa Y.C. Loke**, Brenna D. Argall. "Interface-Aware Assistance for 7-DoF Robot Arm Teleoperation: Case Studies on Feasibility." *In Proceedings of the International Symposium on Experimental Robotics (ISER), 2023.*
- **Larisa Y.C. Loke**, Demiana R. Barsoum, Todd D. Murphey, and Brenna D. Argall. "Characterizing Eye Gaze for Assistive Device Control." *In Proceedings of the International Conference on Rehabilitation Robotics (ICoRR), 2023.*
- 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.*

POSTER PRESENTATIONS & WORKSHOP TALKS

- **Larisa Y.C. Loke**, Joel Goh, Kyle Puckett, Nicole L. Zaino, Brenna D. Argall. "REACT + LUCI: Reactive Driver Assistance for Powered Wheelchairs." Late Breaking Abstract Poster presented at RehabWeek 2025.
- Andrew Thompson, Michele Lee, **Larisa Y.C. Loke**, Brian Martinez, Mahdieh Nejati Javaremi, and Brenna D. Argall. "Identifying Accessibility Barriers to Robotics Research." Presented at Robotics: Science and Systems (RSS) 2023 Workshop — Lowering Barriers for Robotics Research. *Randomized author order.*

WORKSHOP ORGANIZATION

Human-Robot Contact and Manipulation Workshop, at the 2025 Robotics: Science and Systems Conference

- Co-Organized with Ethan K. Gordon, Tianyu Li, Andrew Thompson, Vinitha Ranganeni, Nadia Figueroa, Tapomayukh Bhattacharjee.
- Responsibilities included website management, coordinating workshop abstract submissions and reviews, and assisting with in-person workshop facilitation.

VOLUNTEER ACTIVITIES

Student Volunteer, RehabWeek 2025, Chicago, IL May 2025

- Facilitating registration and check-in to workshop and conference sessions.
- Conducted Shirley Ryan AbilityLab tours and demoed lab projects.

Lab Demo Volunteer

- Demo and present robotic platforms to children.
- Robot Block Party, National Robotics Week, Museum of Science and Industry, Chicago, IL Apr 2022, 2023, 2025
- National Biomechanics Day, Shirley Ryan AbilityLab, Chicago, IL Apr 2023, 2024

TEACHING EXPERIENCE

Teaching Assistant, Northwestern University

- Hosted lab sessions and office hours to assist students with code and hardware. Graded student assignments and final exams, and provided written feedback on reports. Gave lectures.
- Courses:
  - CS/ME 469 Machine Learning and Artificial Intelligence for Robotics Sep 2023 – Dec 2023
  - CS/ME 301 Introduction To Robotics Laboratory Jan 2022 – Mar 2022, Jan 2023 – Mar 2023
  - ME 449 Robotic Manipulation Sep 2021 – Dec 2021

SKILLS

Programming Languages	Python, C++, Arduino, MATLAB, C# (Unity)
Tools	Robot Operating System (ROS & ROS 2) and associated packages, 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)