Luis Mesias

XR Robotics Research Engineer
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Summary

Research engineer focused on XR systems for teleoperation, haptics, and human-subject research. Experience building real-time Unity/C# applications, integrating robotics and sensing stacks, and translating research prototypes into study-ready tools, including VA-affiliated XR projects.

Research Experience

Research Assistant, Human Fusions Institute Oct 2020–Feb 2026

- Served as one of two lead engineers on a multidisciplinary avatar teleoperation system, jointly responsible for system architecture, design decisions, and long-term technical direction.
- Led operator-side VR and haptic subsystems, integrating Unity with ROS 2 for real-time teleoperation and feedback.
- Implemented low-latency stereo video streaming using WebRTC and established long-distance tunneled communication links using Husarnet; achieved sub-second closed-loop latency across distances exceeding 2,000 miles.
- Unified heterogeneous tracking and haptics systems (Meta Quest 3, Ultraleap, Polhemus, and custom electrical stimulation hardware) into a portable, field-deployable operator stack.
- Designed and implemented a serial-to-analog interface bridging robotic sensing data to a medical-grade electrical stimulator; transformed contact/pressure data into low-latency electrical haptic feedback using digital nerve stimulation.
- Designed and developed a low-profile wearable surface electrical nerve stimulation interface compatible with optical hand tracking; improved fingertip-localized sensation accuracy from 70% to 92% and reduced unintended sensation locations from 27% to 4%.
- Led human-subject stimulation studies (13 participants) achieving targeted fingertip sensation in approximately 84% of trials; contributed as lead inventor to patent WO2023244529A1 (licensed to Afference Inc.).
- Built a cross-platform open-source stimulator interfacing library (C#, Unity, Python) with strongly-typed APIs, documentation, and a simulated transport for test scenarios.
- Contributions supported an ANA Avatar XPRIZE semifinalist entry and were featured in national media outlets.

VR Software Contractor (Independent), VA Portland Health Care System Oct 2025–Dec 2025

- Designed and delivered a Unity-based VR application for Magic Leap under contract with defined milestones and deadlines.
- Built a research-grade projection environment with switchable head-centric and world-centric modes, plus configurable rotation locking to support controlled experimental manipulation.
- Enabled extensibility via assets imported from Blender; provided documentation and knowledge transfer to support ongoing research use beyond the contract period.

Research Assistant, VA Northeast Ohio Health Care System Aug 2020–Oct 2024

- Supported VR-based clinical research on eye-tracking diagnostics and rehabilitation, contributing to validated outcomes and dissemination through related publications.
- Developed eye-tracking VR diagnostic applications using Varjo head-mounted displays; built a Python-to-Unity bridge for high-rate head and eye tracking data ingestion.

- Designed and implemented a gamified VR rehabilitation task that improved visual convergence by approximately 40% over an 8-week intervention period in veterans with traumatic brain injury (TBI).
- Recruited and conducted IRB-approved studies involving 27 participants, including vulnerable clinical populations; collaborated with clinicians to align technical implementation with outcome measures.
- Engineered systems for robustness and reproducibility to enable adoption by external research labs; provided remote technical support and transitioned primary maintenance responsibilities to a new engineer.
- Partnered with XRtistry to translate research-grade VR applications into polished, take-home-ready Meta Quest standalone workflows; managed deployment via MDM and implemented logging plus remote data extraction.

Research Assistant, Interfaces & Interventions Research Group Aug 2020–Feb 2022

- Supported VR research initiatives focused on immersive health applications, contributing to study-ready prototypes and dissemination through targeted presentations.
- Delivered workshops introducing EMG and stimulation concepts using Backyard Brains kits, including an EMG-controlled game demonstration.

Research Assistant, Dr. Philip Feng Research Group Jan 2019–Aug 2019

- Programmed and designed wireless low-power long-range sensors; measured power output of EnOcean energy harvesters and low-power transceiver consumption.

Selected Projects

XR Teleoperation and Wearable Haptics

Project, An Operator-centric Design of an Avatar System using Digital Nerve Stimulation Jun 2020–Feb 2026

- Designed an operator-centric VR interface enabling intuitive remote robot manipulation and locomotion across distances exceeding 2,000 miles.
- Achieved sub-second end-to-end system latency for synchronized visual and tactile feedback; engineered robustness for operation outside controlled lab networks.

Project, Design of a Haptic Interface Based on Surface Electrical Nerve Stimulation Feb 2024–Feb 2026

- Led the complete IRB process and experimental methodology for a human-subject study (5 participants) on surface electrical nerve stimulation.
- Developed a low-profile wearable haptic interface compatible with optical hand tracking; iteratively refined electrode layout and stimulation protocols.

Project, Artificial Touch Feedback Through Skin-Surface Electrical Stimulation Jun 2019–Dec 2023

- Designed and executed human-subject studies (13 participants) establishing foundational stimulation protocols; achieved targeted fingertip sensation in approximately 84% of trials.
- Contributed as lead inventor to patent WO2023244529A1, subsequently licensed to Afference Inc.

Clinical XR and Eye Tracking

Project, Vestibulo-Ocular Reflex (VOR) Diagnosis and Evaluation Using VR Aug 2020–Oct 2023

- Built eye-tracking VR diagnostic applications and supporting software infrastructure to enable reproducible deployment across collaborating labs.
- Led experimental design, data collection, and analysis for VR-based diagnostic and rehabilitation studies; provided remote support for external deployments.

Project, VRcade Home Therapy App Oct 2023–Oct 2024

- Ported Varjo-based applications to Meta Quest standalone; managed deployment and implemented remote logging and configuration for take-home therapy workflows.

Research Software Tooling and XR Platforms

Project, Open-Source Stimulator Interfacing Library Aug 2025–Feb 2026

- Built a cross-platform serial communication library abstracting byte-level protocols into strongly-typed APIs, with event-driven serial support and a simulated test transport.
- Delivered end-to-end examples (C#, Unity, Python) plus API documentation covering hardware, protocol, and software layers.

Project, Research-Grade VR Projection Environment (Unity / Magic Leap) Oct 2025–Dec 2025

- Built a Unity-based environment for Magic Leap with switchable projection modes and rotation locking for controlled experimental manipulation.
- Delivered researcher-focused documentation and training to enable continued extension.

Publications

Jianfeng Zhou, Luis Mesias, Mingyu Pan, Samuel Yang, Michael Fu, Kathryn Daltorio. "Feeling through Sand Using a Hexapod Robot as a Remote Hand." *The International Journal of Robotics Research*, under preparation.

Luis Mesias, Tyler Tevis, Michael J. Fu, Mark F. Walker. "Virtual-Reality Assessment of Impaired Convergence in Veterans with Traumatic Brain Injury." *Neurology*, under review.

Rachel S. Jakes, Luis Mesias, Veronica J. Santos, Michael J. Fu, Dustin J. Tyler. "Design and Evaluation of a Low-profile Haptic Interface Based on Surface Electrical Nerve Stimulation." *2024 IEEE Conference on Telepresence*, 2024. doi: 10.1109/Telepresence63209.2024.10841536

Luis Mesias, M. Akif Gormez, Dustin J. Tyler, Nathaniel S. Makowski, Emily L. Graczyk, Michael J. Fu. "Distally-referred surface electrical nerve stimulation (DR-SENS) for haptic feedback." *Journal of Neural Engineering*, 2023. doi: 10.1088/1741-2552/ad0563

Presentations and Workshops

Design and Evaluation of a Low-profile Haptic Interface, IEEE Conference on Telepresence Nov 2024

An Operator-centric Design of an Avatar System using Digital Nerve Stimulation, RSS Conference 2022

E-Stim for Educators, E-Stim for Educators 2021–2025

Immersive virtual reality health games (narrative review of game design), MetroHealth Rehabilitation Institute Journal Club Jun 2021

Teaching

Teaching Assistant, Introduction to Computer Game Design and Implementation Jan 2023–May 2023

Teaching Assistant, Advanced Game Development Project Aug 2022–Dec 2022

Teaching Assistant, Semiconductor Electronic Devices Jan 2022–May 2022

Service

Journal Reviewer, Journal of NeuroEngineering and Rehabilitation; Virtual Reality; IEEE TBioCAS May 2023–Feb 2026

- Reviewed 6 journal papers.

Conference Paper Reviewer, IEEE Telepresence; IEEE EMBC Jan 2022–Feb 2026

- Reviewed 2 conference papers.

Honors and Awards

ANA Avatar XPRIZE, Avatar XPRIZE Jan 2020–Sep 2021

- Developed an operator-centered teleoperation system with tactile feedback; semifinalist.

Innovation for Tomorrow Award, Innovation for Tomorrow 2017–2018

- Developed a VR mobile application to teach vectors and projectile motion.

Education

Ph.D. Electrical Engineering, Case Western Reserve University Aug 2020–Feb 2026

GPA: 3.82

Bachelor of Science in Engineering in Electrical Engineering, Case Western Reserve University Aug 2018–Aug 2020

GPA: 3.96; Honors: Summa Cum Laude; Minor: Biomedical Engineering

Associate of Arts, Hillsborough Community College Jan 2016–May 2018

GPA: 3.95; Honors Institute

Skills

Programming: C#, Dart, Java, Python, R, C++, MATLAB, Swift, Assembly

Tools: Unity, ROS 2, .NET Standard 2.0, Flutter, Android, iOS, Arduino, Android Studio, Simulink, MongoDB, Firebase, Xcode, Azure

Research and Engineering: Haptics, eye tracking, human-subject research, experimental design, statistical analysis, IRB experience, systems integration, networking, serial communication, protocol engineering