Sami Kaab

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0009-0008-0054-0513 • French (Fluent/Citizen) • English (Fluent)

Professional & Research Experience

NLT Digital **Caboolture, Australia**
Embedded Software Engineer *Oct 2024–Jul 2025*

Designing and deploying IoT systems and automated testing frameworks for industrial battery monitoring

- **Delivered an IoT system to monitor 300+ industrial batteries**, enabling predictive maintenance through multi-threaded MQTT telemetry, real-time analytics, and web dashboard to reduce unplanned downtime and gain insight into battery health
- **Accelerated product validation cycles** by designing a Python test framework to coordinate multi-day testing across hardware and software systems, eliminating manual intervention and improving data quality
- **Eliminated hardware development bottlenecks** by creating a virtual peripheral emulator with protocol simulation, custom PCB, and GUI, enabling firmware development to continue independently of physical hardware availability
- **Developed complete embedded power-monitoring solution** (ESP8266/FreeRTOS) with web configuration, reliable telemetry, custom PCB design, and CI/CD deployment tools for field-ready use

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The University of Queensland **Brisbane, Australia**
Biomedical Research Engineer *Aug 2022–Oct 2024*

Led and participated in the creation of multiple devices and clinical research systems combining robotics, human and environmental sensor technologies, virtual reality, and stroke rehabilitation science

- **Delivered a complete sensor system for a clinical lower back pain study**. Owned full development lifecycle from firmware to cloud pipeline, real-time monitoring, hardware design, and documentation. System deployed in multi-site study (published *Applied Ergonomics* 2025)
- **Advanced open-source IMU system for research community** through device enclosure design, robot controlled performance benchmarking, UI software development, and modernized CI/CD workflow (dev containers). Authored comprehensive documentation
- **Created a VR rehabilitation assessment tool** by integrating a robotic arm (Franka Panda) with a VR headset and developed Unity serious game to evaluate upper body mobility and generate personalized training programs for impairment recovery
- **Designed and executed a clinical research study** with physiotherapists aimed at analyzing upper body movement in stroke survivors using multi-modal sensing (motion capture, IMUs, depth cameras, EMG) to validate novel smoothness metrics
- **Contributed to setup and data collection of multi-institutional research project evaluating novel rehabilitation technologies** (robotic gait trainer, wearable sensors, motion analysis) in hospital setting to improve physiotherapy outcomes in collaboration with Princess Alexandria Hospital, UQ, and Griffith University (published ICORR 2025)

Surgical, Treatment and Rehabilitation Service **Brisbane, Australia**
Mechatronics Rehabilitation Engineer (Consulting) *Jul–Aug 2024*

- Designed and developed a force sensing system for ankle flexion/extension measurement with ESP32 firmware and real-time web interface (Dash Plotly, BLE)
- Collaborated with mechanical engineers on device interface manufacturing and electronics housing

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Gelomics **Brisbane, Australia**
Mechatronics Engineer (Consulting) *Jul–Aug 2024*

- Assessed feasibility and developed a prototype for automated LED spectroscopy measurements
- Delivered technical reports and roadmaping for future development

Teaching Experience

The University of Queensland **Brisbane, Australia**
Casual Academic – Medical Device Engineering Graduate Course *2022–2024*

- Developed course material and ran workshops on ISO 14971 risk management and ISO 13485 design controls
- Supervised multidisciplinary student teams through full device development lifecycle from concept to regulatory compliant prototype
- Assessed technical presentations, design reports, and risk analysis documentation for graduate-level medical device projects
- Assisted course coordinator with course administration and student support

Education

The University of Queensland **Brisbane, Australia**
Bachelor of Electrical and Biomedical Engineering (Honours) *2022*

1 Year Thesis Project *2021*

- Development a Raspberry Pi based synchronization protocol for sub 10ms recording latency between commercial IMU sensors and Optitrack motion capture system.

NeuroRehack Hackathon
1st Place *Jun–Jul 2021*

- Participated in two week hackathon organised by UQ in collaboration with CMC Vellore and the University of Rome. Attended a series of lectures on neuroscience and rehabilitation engineering
- Collaborated with a multidisciplinary team to develop an HTC Vive–based serious game featuring bidirectional ROS communication with a Panda robot for isometric learning assessment

HES-SO **Sion, Switzerland**
Electrical Engineer Intern *Dec 2019–Feb 2020*

- Developed Python automation interface for optometry instrument, significantly reducing measurement time; performed data analysis in R

Publications

- Healy, G. N., Melendez-Calderon, A., Kaab, S., Bongers, N., Heseltine, K. A., Yue, C. H., Thomas, G., & Clark, B. K. (2025). Development, validation, acceptability and usability of a device-based system to measure sit-stand desk usage. Applied Ergonomics, 126, 104490. https://doi.org/10.1016/j.apergo.2025.104490
- Shirota, C., Donovan, J., Cave, C., Kaab, S. A., & Melendez-Calderon, A. (2025). EPIC-Tech - Engineering and Physiotherapy Interdisciplinary Collaboration with Technology: A Case Study. PubMed, 2025, 1750–1754. https://doi.org/10.1109/icorr66766.2025.11063109

Technical Skills

Programming: Python • C/C++ • C# • MATLAB • JavaScript

Data Analysis: NumPy/Pandas • Signal Processing • Statistical Analysis • Motion/Biomechanical Analysis • Data Visualization

Embedded Systems: FreeRTOS • Embedded Linux • ESP32/ESP8266 • Arduino • Raspberry Pi • PCB Design

Robotics & Vision: ROS (Noetic) • Franka Panda • Unity VR • YOLO • OpenPose • Optitrack • Kinect • IMU/EMG sensors

Development Tools: Flask • MQTT • Docker • Git • CI/CD • Dash Plotly • Autodesk Inventor • Fusion 360

Professional: Cross-functional Collaboration • Technical Mentorship • Project Management • Scientific Writing • Stakeholder Management

Referees

Dr. Alejandro Melendez-Calderon Senior Lecturer, The University of Queensland
✉ alej.melendez@health.qld.gov.au
Dr. Camila Shirota Senior Rehabilitation Engineer ✉ Camila.Shirota@health.qld.gov.au
Additional referees available upon request.