Jan Lau

Motion Capture Lab Manager and Doctoral Student in KIT BioRobotics Lab
jan.lau@kit.edu | LinkedIn | Website

RESEARCH FOCUS

- Doctoral: Analysis of stability and robustness of karate motions to develop a new criterion related to system modelling of humanoid robots and/or robotic lower-limb exoskeletons

- Master's: Towards improving human-exoskeleton interaction in the geriatric population with a novel tutorial and optimal control

EDUCATION

PhD in Computer Science **Karlsruhe, Germany**
Karlsruhe Institute of Technology (KIT), Oct. 2023 to Present
Started as PhD in Systems Design Engineering at University of Waterloo from May 2023 to Sep. 2023

MASc in Systems Design Engineering, Specialization in Biomedical Engineering **Waterloo, Canada**
University of Waterloo, 2023

BASc in Biomedical Engineering **Waterloo, Canada**
University of Waterloo, 2020

AWARDS

Provost's Doctoral Entrance Award for Women
University of Waterloo, 2023

NSERC Undergraduate Student Research Award
University of Waterloo, 2017

RESEARCH EXPERIENCES

Motion Capture Lab Manager and Doctoral Student Researcher **Karlsruhe, Germany**
BioRobotics Lab, Institute of Anthropomatics and Robotics, KIT: Oct. 2023 to Present

- Investigating a novel martial arts-inspired stability criterion for anthropomorphic systems
- Set up and managing the Motion Capture Lab of the KIT BioRobotics Lab
- Supervising and mentoring undergraduate and master's students in the design, facilitation, analysis, and dissemination of research projects and theses
- Designed and conducted martial arts-related motion capture experiments involving the Theia Markerless System

MASc Researcher **Waterloo, Canada**
HCRMI Lab, University of Waterloo: Sep. 2020 to Apr. 2023

- Generated a new sit-to-stand trajectory with optimal control as a method to modify an existing lower-limb exoskeleton towards geriatric users
- Developed a novel protocol intended to improve exoskeleton usage familiarity and conducted a preliminary study with able-bodied, first-time users (study was limited by COVID-19 restrictions)
- Connected with psychologists and researchers from Germany on improving geriatric mobility in the interdisciplinary consortium HeiAge
- Analyzed, processed, and collected human motion capture data using the Vicon Nexus System

Undergraduate Research Assistantship Student **Waterloo, Canada**
Engineering Bionics Lab, University of Waterloo: Jan. 2018 to Apr. 2018

- Calculated identification rate from experimental data to evaluate biometrics algorithm
- Conducted literature research on behavioral biometrics
- Analyzed EMG data from signal processing MATLAB code to identify noise

Research Assistant **Waterloo, Canada**
Engineering Bionics Lab, University of Waterloo: Jan. 2017 to Apr. 2017

- Designed and 3D-printed a modular exoskeleton prototype to help people with Parkinson's Disease initiate gait
- Applied anthropometric data, engineering design methods, and mechanics calculations to exoskeleton design
- Performed Finite Element Analysis on Fusion 360 to determine stress profile

STARTUP EXPERIENCE / CAPSTONE PROJECT

Co-Founder **Toronto, Canada**
Cadera Inc.: Sep. 2018 to Jul. 2021

- Co-developed a physical simulator to train physicians to better detect and diagnose developmental dysplasia of the hip (DDH) in infants
- Awarded CAD60k and completed the Accelerator Centre Jumpstart program in 2021
- Designed and 3D-printed mechanical components for prototypes
- Developed business plan and managed budget

WORK EXPERIENCES

Assistant Pricing Analyst **Stuttgart, Germany**
Global Pricing, Philips Healthcare: Jan. 2019 to Aug. 2019

- Co-developed a competition tool for pricing intelligence, which became an official program for Philips Health Systems
- Applied mathematical model to observe product sales trend as a foundation for determining price elasticity, customer segment identification, and product sales forecast
- Developed code to optimize product portfolio using the Extract-Transform-Load process

Marketing Communications Assistant **Hong Kong**
Marketing & Communication Department, IDS Medical Systems (HK) Co. Ltd.: Sep. 2017 to Dec. 2017

- Supported sales team in crafting medical devices product catalogue for Hong Kong market
- Collaborated with seven Asia offices to launch artefacts and internal programs to promote the company branding
- Trained Hong Kong sales team to operate promotional materials for marketing events
- Crafted internal monthly newsletters for the Hong Kong office

EXTRACURRICULAR LEADERSHIP EXPERIENCES

Social Media Co-Chair **(Remote)**
IEEE Robotics and Automation Society (RAS) Student Activities Committee (SAC): Jan. 2024 to Present

- Managed a new online event "RAS Day"
- Promoting RAS opportunities that led to an increase in student engagement
- Creating content and addressing inquiries on Facebook, Instagram, LinkedIn, and X/Twitter
- Co-managing student conference activities with other Chairs and Co-Chairs to ensure smooth flow of events

Marketing and Social Media Executive **Waterloo, Canada**
Karate & Jujitsu Club, University of Waterloo: May 2022 to Aug. 2023

- Created original content and promptly addressed club inquiries on Facebook and Instagram, leading to a 51% year-over-year increase in total followings
- Orchestrated club fair and open house arrangements to promote karate and Japanese jujitsu within UWaterloo
- Coordinated logistics with other executives for an Ontario Inter-University tournament and hosting seminars

Orientation Leader **Waterloo, Canada**
Engineering Orientation Week, University of Waterloo: Sep. 2016 to Sep. 2019
- Co-managed 8 front-line leaders and over 100 first-year students
- Ensured smooth logistic flow from one event to another
- Prepared engineering activities and team-building events with other student volunteers

Team Lead **Waterloo, Canada**
Biomechatronics Club, University of Waterloo: Jan. 2018 to Dec. 2018
- Delegated tasks amongst sub-team leaders to ensure sub-teams work towards their goal
- Gained a profit of over CAD550 in six hours through fundraising event
- Organized workshops to teach team members technical skills
- Facilitated a sub-team on deciding project scope with the Priority Criteria Matrix and Best-of-Class Chart

Chapter Lead **Waterloo, Canada**
eNable Waterloo, University of Waterloo: Sep. 2016 to Aug. 2017
- 3D-printed prosthetic hands to help children to perform daily tasks as part of the "Enabling The Future" initiative
- Promoted to Chapter Lead within 3 months due to outstanding leadership skills and teamwork
- Delegated tasks amongst team members to obtain optimal work efficiency
- Experimented with Fusion 360 to customize prosthetic hands for children depending on their needs

PUBLICATIONS

Jan C. L. Lau and Katja Mombaur. "Can lower-limb exoskeletons support sit-to-stand motions in frail elderly without crutches? A study combining optimal control and motion capture." *Front. Neurorobot.* 18:1348029, April 2024. doi: 10.3389/fnbot.2024.1348029

Jan C. L. Lau and Katja Mombaur. "Preliminary Study on a Novel Protocol for Improving Familiarity with a Lower-Limb Robotic Exoskeleton in Able-Bodied, First-Time Users." *Front. Robot. AI* 8:785251, January 2022. doi: 10.3389/frobt.2021.785251

CONFERENCE PRESENTATIONS

Jan C. L. Lau and Katja Mombaur, "Understanding stability when humans perform Karate motions." *Oral Presentation at Dynamic Walking 2025*. Aachen, Germany. July 2025.

Jan C. L. Lau and Katja Mombaur. "Towards crutch-less exoskeleton-assisted geriatric sit-to-stand motions – an experimental and optimization-based study." *Poster presentation at the International Society of Biomechanics-Japanese Society of Biomechanics Conference (ISB-JSB 2023)*. Fukuoka, Japan. August 2023.

Jan C. L. Lau and Katja Mombaur. "Motion analysis and motion synthesis on crutch-less sit-to-stand for geriatric users with an exoskeleton using optimal control." *Oral presentation at the TGCS Symposium on Computer Simulation in Biomechanics (ISB TGCS 2023)*. Kyoto, Japan. July 2023.

Jan C. L. Lau and Katja Mombaur. "How can we make exoskeletons less intimidating for geriatric users?". *Poster presentation at the Internationales Wissenschaftsforum Heidelberg Hengstberger Symposium on Aging and Technology*. Heidelberg, Germany. May 2022.

Jan C. L. Lau and Katja Mombaur. "Protocol for improving familiarity with a lower-limb robotic exoskeleton in able-bodied, first-time users." *Poster presentation at the ISB 2021 Conference*. Virtual. July 2021.

SKILLS AND INTERESTS

- Programming skills: Python, MATLAB, C++, R
- Language skills: Cantonese (native proficiency), Mandarin (native proficiency), German (CEFR B1), Spanish (elementary proficiency)
- Athletic interests: Karate (brown belt in goju-ryu) and Muay Thai
- Artistic interest: Drawing cartoons