Jan Lau

Doctoral Student in Human-Centred Robotics
jan.lau@uwaterloo.ca | LinkedIn | UWaterloo Scholar | Website

RESEARCH FOCUS

- Doctoral: Analysis of stability and robustness of karate motions to develop 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

Doctoral Student in Systems Design Engineering **Waterloo, Canada**
University of Waterloo, May 2023 to Present
Specialization in Biomedical Engineering

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

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

Doctoral Student Researcher **Waterloo, Canada**
HCRMI Lab, University of Waterloo: May 2023 to Present

- Conducting literature review on existing stability criteria, human stability, and biomechanics of martial arts
- Designing motion capture experiments involving the Theia motion capture system (marker-less)

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 (markered)

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
- Conducted literature research on infant hip anatomy and DDH
- 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

- Designed a competition tool for pricing intelligence on Qlik Sense
- 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

EXTRACURRICULAR LEADERSHIP EXPERIENCES

Marketing and Social Media Executive **Waterloo, Canada**

Karate & Jujitsu Club, University of Waterloo: May 2022 to Present

- Managing and creating social media content on Facebook and Instagram
- Communicating with target audience on social platforms and increased total followings by 51% year-over-year
- Orchestrating club fair and open house arrangements to promote karate (goju-ryu) and Japanese jujitsu (shindo-ryu) in the UWaterloo community
- Coordinated logistics with the Chief Instructor and Club Manager for an Ontario Inter-University tournament

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

PUBLICATION

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. "Towards crutch-less exoskeleton-assisted geriatric sit-to-stand motions – an experimental and optimization-based study." *Accepted to 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." *Accepted to 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 presented 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 presented 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 (A2 proficiency), Spanish (elementary proficiency)
- Athletic interests: Karate (brown belt in goju-ryu) and Muay Thai
- Artistic interest: Drawing cartoons and comics