

Pawel Kudzia

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Ph.D., M.A.Sc., B.Eng.

Biomechanical Engineering · Human Motion Analysis · Machine Learning

Education

- 2023 **Ph.D. — Engineering Science — Locomotion Laboratory**
Simon Fraser University, BC, Canada. Supervisor: Dr. Maxwell Donelan
Thesis: *Characterizing, modeling, and predicting the external ground reaction forces of legged movement*
- 2015 **M.A.Sc. — Mechanical Engineering — Spinal Research Group**
Queen's University, ON, Canada. Supervisor: Dr. Geneviève Dumas
Thesis: *Estimating 3D inertial parameters of the human body*
- 2022 **Certificate in University Teaching**
Simon Fraser University, BC, Canada
- 2013 **B.Eng. — Mechanical Engineering**
Queen's University, ON, Canada

Academic Appointments

- 2025–Present **Adjunct Professor**
University of British Columbia, School of Biomedical Engineering. Supervisor: Dr. Peter Crompton
- Mentoring undergraduate honours thesis students in computer vision, biomechanics, and wearable sensing
 - Current students (2025–2026): Ali Hawkins (LiDAR body scanning, 30 participants, ethics approved) and Madison Lang (Core Motion wearable evaluation, ACL clinic data collection, ethics approved)
- 2025–Present **Post Doctoral Scientist (Part-Time) — Aging and Falls**
University of Victoria, School of Exercise Science. Supervisor: Dr. Sandra Hundza
- Developing wearable IMU systems for monitoring aging and fall risk
- 2024–2025 **Post Doctoral Scientist — Sports and Injury**
University of British Columbia, ICORD. Supervisor: Dr. Peter Crompton
- Managed a research team of 5 direct reports and co-supervised 20+ students
 - Developed algorithms to quantify movement patterns in athletes
 - Built machine learning models for real-time motion analysis achieving 95% accuracy
- 2023–2025 **Assistant Professor of Teaching**
University of British Columbia, School of Biomedical Engineering
- Taught 8 courses in Biomechanics, 2D&3D Dynamics, and Research Methods to 150+ students
 - Received teaching evaluations averaging 4.7/5

2015–2017

Biomechanics Research Engineer

Harvard University, Cambridge, USA — Biodesign Laboratory & Wyss Institute. Supervisor: Dr. Conor Walsh

- Supervised undergraduates in exoskeleton validation studies
- Co-authored findings published in *Science Translational Medicine* and presented at IEEE ICRA (Best Paper Award)
- Collaborated with clinicians to translate research into a clinical product

Industry Appointments

2025–Present

Research Scientist, UXR Researcher

Meta Inc.

- Led human subject studies on the Advanced Concepts team
- Designed and executed motion capture protocols for wearable device validation

2024–2025

Research Engineer (Contractor) — Product Innovation

Lululemon Athletica

- Conducted biomechanical testing and analysis to inform sports bra design
- Integrated motion capture and pressure mapping data to evaluate garment performance during high-impact activity

2020–2023

Biomechanist (Contractor) — Golf Performance

Paramana Biomedical Corp., Burnaby, BC

- Developed video-based methods and machine learning pipelines to quantify golf putting kinematics

Entrepreneurship

2024–Present

Co-Founder & CTO — Core Motion (trackyourcore.com)

Built a wearable biofeedback device for ACL rehabilitation using LiDAR and IMU sensors. Provides real-time biomechanics analysis and center of mass tracking for return-to-sport decisions. Secured \$65,000 in funding.

2025

Founder in Residence — Lab2Market MITACS Program

Conducted 3 months of market research. Awarded \$15,000 grant.

2023–2024

Co-Founder — DuoMove

Designed an athletic tether focused on social connections. Pivoted to new concept.

Publications

7 published articles · 1000+ citations · 1 in review · 2 in preparation · [Google Scholar](#)

Journal Articles — Published

J7 **Kudzia P.**, Wakeling J.M., Robinovitch S.N., Donelan J.M., Neuromuscular fatigue reduces force responsiveness when controlling leg external forces. *Physiological Reports*, 13(16), e70498. **2025**

J6 Awad L., Knarr B., **Kudzia P.**, Buchanan T., The Interplay Between Walking Speed, Economy, and Stability After Stroke. *Neurological Physical Therapy* **2023**

J5 **Kudzia P.**, Robinovich S., Donelan M., Characterizing the performance of human leg external force control. *Nature Scientific Reports* **2022**

- J4 **Kudzia P.**, Jackson E., Dumas G., Estimating subject-specific body segment parameters from three-dimensional scans. *PLoS ONE* 17(1): e0262296. **2022**
- J3 Awad L., **Kudzia P.**, Revi D., Ellis T., Walsh C., Walking faster and farther with a soft robotic exosuit: Implications for post-stroke gait assistance and rehabilitation. *IEEE Open Journal of Engineering in Medicine and Biology*, 1, 108–115. **2020**
- J2 Awad L., ***Kudzia P.**, *Bae J., Long A., Hendron K., Holt K., O'Donnell K., Walsh C., Reducing post-stroke gait compensations through targeted assistance of paretic ankle function using a soft wearable robot. *American Journal of Physical Medicine & Rehabilitation*, 96(10). **2017** (*shared first authorship)
- J1 Awad L., Bae J., O'Donnell K., De Rossi S.M.M., Hendron K., Sloop L.H., **Kudzia P.**, Allen S., Holt K.G., Ellis T., Walsh C.J., A soft robotic exosuit improves walking after stroke. *Science Translational Medicine* 9(400). **2017**

Journal Articles — In Peer Review

- J8 **Kudzia P.**, Booth G.R., Reynier K., Panzer M., Cripton P.A., Video-based analysis of head-torso coupling during lateral impacts under passive and co-contracted conditions. *Journal of Biomechanical Engineering* **2025**

Journal Articles — In Preparation

- J10 **Kudzia P.**, Bajic I., Donelan M., A generalized machine learning approach to estimating ground reaction forces from video during human locomotive tasks including walking, running, jumping, and hopping. *IEEE Engineering in Medicine and Biology*
- J9 **Kudzia P.**, Mehdizadeh S., Donelan M., A simple mathematical model that well predicts external ground reaction forces can help understand the limits of vertical jumping. *PLOS Computational Biology*

Peer-Reviewed Conference Paper

- CFP 1 Bae J., Siviy C., Rouleau M., Menard N., O'Donnell K., Galiana I., Athanassiu M., Ryan D., Bibeau C., Sloop L., **Kudzia P.**, Ellis T., Awad L., Walsh C., A lightweight and efficient portable soft exosuit for paretic ankle assistance in walking after stroke. *IEEE International Conference on Robotics and Automation (ICRA)*, Brisbane, Australia. **2018** — **Best Paper Award in Medical Robotics**

Conference Presentations

12 oral presentations · 19 posters · 15 symposium presentations

* Presenting author † Mentee

Oral Presentations

- O12 ***Kudzia P.**, Clements N., Cripton P., Field-based biomechanical analysis of ski mountaineering using smartphone video and open-source pose estimation. World Congress of Biomechanics, Vancouver, Canada. **July 2026.**
- O11 ***Kudzia P.**, Booth G.R., Reynier K., Panzer M., Cripton P., Video analysis of human lateral head impacts reveals muscle co-contraction reduces head excursion relative to torso. World Congress of Biomechanics, Vancouver, Canada. **July 2026.**
- O10 **Kudzia P.**, Wu K., Cripton P., Estimating ground reaction forces of gait at various walking speeds from video data. ISB 2025, Stockholm, Sweden. **July 2025.**
- O9 Clements N., **Kudzia P.**, Advancing biomechanical estimation techniques for ski mountaineers in natural mountain environments. West Coast Biomechanics Conference, Vancouver, Canada. **May 2025.**
- O8 **Kudzia P.**, Bajic I., Donelan M. AI in biomechanics. IncreaseBC, BC Children's Hospital, Vancouver, Canada. **April 2024. Best Oral Presentation.**
- O7 ***Kudzia P.**, Robinovitch S., Donelan M., Characterizing the control of human leg external forces. Canadian Society of Biomechanics. *Virtual Conference* **2021.**
- O6 ***Kudzia P.**, Robinovitch S., Donelan M., The limits of controlling external force vectors. Westcoast Neuromechanics Mini-Conference, Salmon Arm, BC, Canada. **2020.**

- O5 ***Kudzia P.**, Robinovitch S., Donelan M., Characterizing the performance of human leg force control. Canadian Society of Biomechanics, Montreal, Canada. *Postponed 2020*.
- O4 ***Kudzia P.**, Donelan M., Using mathematical models and vertical jumping to study the limits to human agility. 13th Annual Dynamic Walking, Pensacola, Florida, USA. **2018**.
- O3 *Bae J., Siviyy C., Rouleau M., Menard N., O'Donnell K., Galiana I., Athanassiu M., Ryan D., Sloot L., **Kudzia P.**, Ellis T.D., Awad L.N., Walsh C.J. Portable soft exosuit for paretic ankle assistance in overground walking after stroke. Dynamic Walking, Pensacola, Florida, USA. **2018**.
- O2 Bae J., *Siviyy C., Rouleau M., Menard N., O'Donnell K., Galiana I., Athanassiu M., Ryan D., Bibeau C., Sloot L., **Kudzia P.**, Ellis T.D., Awad L.N., Walsh C.J. A lightweight and efficient portable soft exosuit for paretic ankle assistance in walking after stroke. IEEE ICRA, Brisbane, Australia. **2018**.
- O1 ***Kudzia P.**, Bae J., Sloot L., Long A., Hendron K., Holt K., O'Donnell K., Ellis T., Awad L., Walsh C., A uni-lateral soft exosuit for the paretic ankle can reduce compensations related to post-stroke gait. American Society of Biomechanics, 41st Meeting, Boulder, Colorado, USA. **2017**.

Poster Presentations

- P19 **Kudzia P.**, Pham P., Cripton P., Developing a video-based power meter using a transformer neural network. ISB 2025, Stockholm, Sweden. **July 2025**.
- P18 Wu K., **Kudzia P.**, Estimating ground reaction forces of gait at various walking speeds from video data. West Coast Biomechanics Conference, Vancouver, Canada. **May 2025**.
- P17 Pham P., **Kudzia P.**, Development of a video-based power estimation system for stationary cycling. West Coast Biomechanics Conference, Vancouver, Canada. **May 2025**.
- P16 Kurup S., **Kudzia P.**, Benchmarking kinematic predictions across open-source pose estimation models. West Coast Biomechanics Conference, Vancouver, Canada. **May 2025**.
- P15 Lee K., **Kudzia P.**, Estimating cycling effort from video using computer vision and machine learning. IncreaseBC, BC Children's Hospital, Vancouver, Canada. **April 2024**.
- P14 **Kudzia P.**, Wakeling J., Donelan M. Neuromuscular fatigue reduces the nervous system's ability to control leg external ground reaction forces. IncreaseBC, BC Children's Hospital, Vancouver, Canada. **April 2023**.
- P13 **Kudzia P.**, Wakeling J., Donelan M. Neuromuscular fatigue reduces the nervous system's ability to control leg external ground reaction forces. Neural Control of Movement, Victoria, BC, Canada. **April 2023**.
- P12 **Kudzia P.**, Wakeling J., Donelan M. The control of leg external forces after fatigue. North American Congress on Biomechanics. **August 2022**.
- P11 **Kudzia P.**, Robinovitch S., Donelan M. Characterizing the nervous system's control of human leg external forces. 30th Annual Meeting of the Neural Control of Movement. *Virtual Conference 2021*.
- P10 **Kudzia P.**, Robinovitch S., Donelan M. Characterizing the control of leg external control. IEEE BioRob Workshop: Robot-Aided Neuromechanics. *Virtual Conference 2020*.
- P9 **Kudzia P.**, Robinovitch S., Donelan M. Simple mathematical models are insufficient in explaining vertical jumping. XXVII Congress of the International Society of Biomechanics, Calgary, Canada. **2019**. **Shortlisted for the David Winter Young Investigator Award**.
- P8 Azocar F.A., Leestma K.J., **Kudzia P.**, Lazzaroni M., Liu Y., Bayón C., Rampeltshammer W., Van Asseldonk E., Passive knee exoskeleton reduces quadriceps muscle activation during downhill skiing: a pilot study. IEEE Engineering in Medicine and Biology, Berlin, Germany. **2019**.
- P7 **Kudzia P.**, Robinovitch S., Donelan M., Characterizing human leg force control. 14th Annual Dynamic Walking, Canmore, Canada. **2019**.
- P6 Awad L., Knarr B., **Kudzia P.**, Buchanan T., Speed-based changes to walking stability and economy may explain preferred walking speed after stroke. World Congress in Biomechanics, Dublin, Ireland. **2018**.
- P5 Awad L., Bae J., O'Donnell K., Hendron K., Sloot L., Siviyy C., **Kudzia P.**, Ellis T., Walsh C., Soft exosuits increase walking speed and distance after stroke. International Symposium on Wearable & Rehabilitation Robotics (WeRob), Houston, Texas, USA. **2017**. **Best Poster Finalist**.
- P4 **Kudzia P.**, Jackson E., Dumas G., Feasibility and reliability of estimating body segment inertial parameters with a Kinect. American Society of Biomechanics, 41st Meeting, Boulder, Colorado, USA. **2017**.

- P3 Sloot L., Hejrati B., **Kudzia P.**, Bae J., Hendron K., Holt K., O'Donnell K., Ellis T., Awad L., Walsh C., A uni-lateral ankle assisting soft robotic exosuit can improve post-stroke gait during overground walking. American Society of Biomechanics, 41st Meeting, Boulder, Colorado, USA. **2017**.
- P2 Awad L., Bae J., O'Donnell K., Hendron K., **Kudzia P.**, Zurawski E., Holt K., Ellis T., Walsh C., Soft wearable robots can increase walking speed and distance after stroke: proof-of-concept. American Physical Therapy Association Combined Sections Meeting, San Antonio, TX, USA. **2017**.
- P1 **Kudzia P.**, Dumas G., Estimating body segment inertial parameters using a Microsoft Kinect. Ontario Biomechanics Conference, Barrie, ON, Canada. **2015**.

Symposium Presentations

- S15 **Kudzia P.**, Wakeling J., Donelan M. How does fatigue affect the control of leg external forces? 10th Annual BPK Research Day, Simon Fraser University, Burnaby, BC, Canada. **2022. Best PhD Poster.**
- S14 *[†]Leung E., **Kudzia P.**, Hoffer A., Markerless motion analysis of standard and arm-lock putting styles by golfers with focal dystonia. 10th Annual BPK Research Day, Simon Fraser University, Burnaby, BC, Canada. **2022.**
- S13 *[†]Nelson T., **Kudzia P.**, Hoffer A., Alternative methods for chipping in golf: hybrid club and armlock grip. 10th Annual BPK Research Day, Simon Fraser University, Burnaby, BC, Canada. **2022. Best BSc Poster.**
- S12 *[†]Leung E., **Kudzia P.**, Hoffer A., Markerless motion analysis of standard and arm-lock putting styles by golfers with focal dystonia. Undergraduate Research Symposium, Simon Fraser University, Burnaby, BC, Canada. **2022.**
- S11 *[†]Nelson T., **Kudzia P.**, Hoffer A., Alternative methods for chipping in golf: hybrid club and armlock grip. Undergraduate Research Symposium, Simon Fraser University, Burnaby, BC, Canada. **2022.**
- S10 ***Kudzia P.** The insufficiency of simple mathematical models to explain vertical jumping. Neuromechanics Meetings, Faculty of Biomedical Physiology, Simon Fraser University, Burnaby, BC, Canada. **2020.**
- S9 ***Kudzia P.**, Robinovitch S., Donelan M., Characterizing the nervous system's control of human leg external forces. Faculty of Biomedical Physiology Student Symposium, Simon Fraser University, Burnaby, BC, Canada. **2019.**
- S8 ***Kudzia P.**, Robinovitch S., Donelan M., Simple mathematical models are insufficient in explaining vertical jumping. Neuromechanics Satellite Meeting ISB, Calgary, Canada. **2019.**
- S7 ***Kudzia P.**, Robinovitch S., Donelan M., Characterizing the force and position control performance of the human leg. Faculty of Biomedical Physiology Student Symposium, Simon Fraser University, Burnaby, BC, Canada. **2019.**
- S6 *Leestma J., Azocar A., Lazzaroni M., Liu Y., ***Kudzia P.**, Reduction of muscle activity while skiing with the Againer ski exoskeleton. Wearable Robotics Winter School, Kranjska Gora, Slovenia. **2019.**
- S5 ***Kudzia P.**, Donelan M., Using mathematical models and vertical jumping to study the limits to human agility. Nike Global Research Symposium XV, Portland, Oregon, USA. **2018.**
- S4 ***Kudzia P.**, Donelan M., Using mathematical models, vertical jumping, and exoskeleton assistance to understand the limits to human agility. 14th Annual Northwest Biomechanics Symposium, Bellingham, Washington, USA. **2018.**
- S3 ***Kudzia P.**, Donelan M., Using mathematical models, vertical jumping, and exoskeleton assistance to understand the limits to human agility. Faculty of Biomedical Physiology Student Symposium, Simon Fraser University, Burnaby, BC, Canada. **2018.**
- S2 Bae J., Awad L., O'Donnell K., ***Kudzia P.**, Long A., Sloot L., Hejrati B., Holt K., Ellis T., Walsh C., Soft exosuit for gait recovery after stroke: feasibility study with chronic post-stroke patients. Spaulding Hospital Stroke Symposium, Cambridge, MA, USA. **2016.**
- S1 *Bae J., Awad L., O'Donnell K., **Kudzia P.**, Long A., Sloot L., Hejrati B., Holt K., Ellis T., Walsh C., Soft exosuit for poststroke gait assistance. Wyss Institute for Bio-inspired Engineering Symposium, Harvard University, Cambridge, MA, USA. **2016.**

Grants & Awards

Total Funding: \$240,300 CDN · \$1,500 USD · €500 EUR

Scholarships & Fellowships

2018–2022	NSERC Doctoral Scholarship — \$63,000 CDN
2017–2021	Dean’s Scholarship, Simon Fraser University — \$84,000 CDN
2021	Graduate Excellence Award Fellowship — \$6,000 CDN
2009–2010	Queen Elizabeth II Aiming for the Top Scholarship — \$3,500 CDN

Research & Conference Awards

2025	International Society of Biomechanics Post-Doctoral Award — \$500 USD
2025	MITACS Lab2Market Award — \$15,000 CDN
2025	Best Oral Presentation (supervisee Naomi Clements), West Coast Biomechanics Conference — \$100 CDN
2025	Best Poster Presentation (supervisee Kainan Wu), West Coast Biomechanics Conference — \$100 CDN
2024	Best Oral Presentation — AI in Biomechanics, BC Children’s Hospital — \$100 CDN
2019	European Union COST Action Network in Robotics Travel Award — €500
2018	Best Paper Award in Medical Robotics, IEEE ICRA, Brisbane, Australia — \$1,000 USD
2017	Best Poster Finalist, International Symposium on Wearable & Rehabilitation Robotics
2014	Department of Mechanical Engineering Fellowship — \$3,500 CDN

Entrepreneurial Funding

2024–Present	Core Motion (Co-Founder & CTO) — \$65,000 CDN
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Teaching Experience

Instructor

Winter 2024	Course Instructor <i>BMEG 330: Biomechanics II (1 term, 3 credits)</i> 3D kinematics, gait, balance control, and biomechanical engineering concepts. Developed original content and organized 4 hands-on labs.
Winter 2024	Co-Instructor <i>BMEG 350: Human Structure & Function (1 term, 3 credits)</i>
Fall 2023–2024	Course Instructor <i>BMEG 230: Biomechanics I (2 terms, 4 credits)</i> 2D kinematics, gait, walking control, and mechanics theory. Developed original content and organized 5 hands-on labs.
2023–2025	Course Instructor <i>BMEG 490: Introduction to Academic Research (4 terms, 6 credits)</i> Course organizer and supervisor for undergraduate research projects.
2023–2024	Co-Instructor <i>BMEG 457: Biomedical Engineering Design Project (4 terms, 6 credits)</i> Supervised engineering design groups through fourth-year capstone projects.
2019	Laboratory Instructor <i>BPK 308/870: Experimental Methods in Physiology (1 term, 3 credits), Simon Fraser University</i> Led two weekly 3-hour laboratory sessions for 32 students from biomedical engineering and kinesiology. Entirely project-based, with students collecting, analyzing, and modelling physiological data.

Teaching Assistant

- 2018–2023 **Teaching Assistant** — BPK 448: Rehabilitation of Movement Control (11 terms), Simon Fraser University. Supervisor: Dr. Andy Hoffer
- 2018 **Laboratory Instructor** — BPK 303: Kinanthropometry (1 term), Simon Fraser University. Supervisor: Dr. Maxwell Donelan
- 2013–2015 **Capstone Facilitator** — ENSC 100S: Engineering Design (4 terms), Queen’s University. Supervisor: Aphra Rogers
- 2013–2014 **Tutorial Instructor** — ENSC 100W: Programming for Engineers (2 terms), Queen’s University. Supervisor: Aphra Rogers

Mentorship & Outreach

Student Mentorship

- 2025–2026 **Ali Hawkins** (UBC) — Automating body segment parameter estimation using computer vision and phone LiDAR scanning
- 2025–2026 **Madison Lang** (UBC) — Developing a research platform to evaluate the Core Motion wearable for ACL rehabilitation
- 2024–2025 **Naomi Clements** (UBC) — Ski touring biomechanics
- 2024–2025 **Kainan (William) Wu** (UBC) — Estimating ground reaction forces from video
- 2024–2025 **Saatvik Kurup** (UBC) — Comparing kinematic predictions from open-source pose estimation models
- 2024–2025 **Peter Pham** (UBC) — Estimating effort from video of people cycling
- 2023–2024 **Kelvin Lee** (UBC) — Estimating effort from video of people cycling
- 2023–2025 **Chelsea Holte** (SFU) — 3D kinematics of golf chipping using open-source computer vision
- 2022–2024 **Estee Leung** (SFU) — 3D kinematics of golf chipping using open-source computer vision
- 2021–2025 **Todd Nelson** (SFU) — Comparative biomechanics of alternative golf chipping methods
- 2021 **Serena Skinner** (SFU) — Comparative biomechanics of alternative golf chipping methods
- Summer 2017 **Sohaila Aboutaleb** (Harvard) — Stability metrics while walking with an exosuit
- Summer 2016 **Christopher Schenck** (Harvard) — Biomechanics of exosuit gait

Scientific Outreach

- 2018, 2023 **Community Scientist** — Science World, BC, Canada
- 2013–2015 **High School Outreach Teacher** — Queen’s University, ON, Canada
- 2009–2013 **Science Educator** — Ontario Science Centre, ON, Canada
- 2013 **Outdoor Educator and Leader** — Camp Outlook, ON, Canada

Technical Skills

Programming: Python, MATLAB

Biomechanical Engineering: Musculoskeletal modelling, computer vision, neural networks, IMU-based wearable sensing, electromyography

Machine Learning & AI: Deep learning for pose estimation and force prediction, hybrid physics-ML architectures, transfer learning, agentic AI system design, large language model integration for research workflows

Research Methods: Human subject studies, optical motion capture, markerless pose estimation, force plate instrumentation, field-based biomechanical data collection

Tools: PyTorch, OpenCV, MediaPipe, DeepLabCut, OpenPose, scikit-learn, Git, \LaTeX

Licensure: Pursuing professional engineering licensure in Canada (P.Eng.)

References

Dr. Maxwell Donelan

Professor

PhD Supervisor, 2017–2023

Simon Fraser University

mdonelan@sfu.ca

Dr. Peter Crompton

Professor

UBC Supervisor, 2023–Present

University of British Columbia

peter.crompton@ubc.ca

Dr. Sandra Hundza

Associate Professor

UVic Supervisor, 2025–Present

University of Victoria

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