Pawel Kudzia

Ph.D., MASc., B.Eng.

Engineering Leader · Applied Sports Science · Technology

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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 Cripton

- 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 Cripton

- 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. 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

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., Sloot 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., Sloot 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., Siviy 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., *Siviy 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., Siviy 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: $175,300 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

Teaching Experience

Instructor — 8 courses taught

Winter 2024 **Course Instructor**
BMEG 330: Biomechanics II (1 term, 3 credits)
3D kinematics, gait, balance control, and biomechanical engineering concepts. Developed original content and organized 4 hands-on labs.

Winter 2024 **Co-Instructor**
BMEG 350: Human Structure & Function (1 term, 3 credits)

Winter 2024 **Course Instructor**
BMEG 490: Introduction to Academic Research (2 terms, 6 credits)
Course organizer and supervisor for student research projects.

Winter 2024 **Co-Instructor**
BMEG 457: Biomedical Engineering Design Project (2 terms, 6 credits)
Supervised engineering design groups through fourth-year capstone projects.

Fall 2023–2024 **Course Instructor**
BMEG 230: Biomechanics I (2 terms, 4 credits)
2D kinematics, gait, walking control, and mechanics theory. Developed original content and organized 5 hands-on labs.

Fall 2023 **Course Instructor**
BMEG 490: Introduction to Academic Research (2 terms, 6 credits)
Administered research course, supervising one student and a TA.

Fall 2023 **Co-Instructor**
BMEG 457: Biomedical Engineering Design Project (2 terms, 6 credits)
Supervised engineering design groups through fourth-year capstone projects.

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 870: Experimental Methods in Physiology (1 term), Simon Fraser University. Supervisor: Dr. Maxwell Donelan

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

Engineering: Computer vision, neural networks, inertial measurement units (IMUs), biomechanical modelling

Agentic AI: Agentic system design, Claude Code, Claude Agent SDK, OpenClaw, LLM-driven workflow automation

Research Methods: Human subject studies, optical motion capture, markerless pose estimation, field research

Tools: OpenCV, MediaPipe, PyTorch, scikit-learn, Git, LaTeX

References

Dr. Maxwell Donelan
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Dr. Peter Cripton
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University of British Columbia
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Dr. Sandra Hundza
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UVic Supervisor, 2025–Present
University of Victoria
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