Mason Kadem

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education

McMaster University, Faculty of Engineering, Computing and Software 2024 – 2027
Doctor of Philosophy (Ph.D.), Computer Science. Research in opening the black box of AI, with a focus on medicine. Advised by Rong Zheng, Canada Research Chair. Canadian Institutes of Health Research Doctoral Scholar.

McMaster University, Faculty of Engineering, School of Biomedical Engineering 2021 – 2023
Master of Applied Science (M.A.Sc.), Biomedical Engineering. Research in interpretable AI for clinical decision support. Ranked in the top five percent of students in first year; NSERC Vanier nominee. Thesis, *Interpretable Machine Learning in Alzheimer's Disease Dementia*.

Western University, Schulich School of Medicine and Dentistry 2017 – 2019
Master of Science (M.Sc.), Neuroscience. Research in signal processing and eye tracking. Thesis, *Pupil Size Tracks Semantic Ambiguity as Well as Noise*.

Western University, Brain and Mind Institute 2013 – 2017
Honors Bachelor of Science (H.B.Sc.), Psychology. Research in remote cognitive testing and infant brain networks. Dissertation, *Pearls and Perils of Pupillometry Using a Webcam*.

research interests

Artificial intelligence, machine learning, mechanistic interpretability, computational neuroscience, hemodynamics, cognition, computer science education, spaceflight. Google Scholar ResearchGate

experience

Chief Technology Officer 2022 –
Ro (Research Online)
Technology leadership for a biophotonics company conducting large-scale physiological testing online. Responsible for research and development, AI product development, bioinstrumentation, edge computing, data engineering, security and compliance, ethics, and funding. Incubated at Hamilton's Innovation Factory and The Clinic, McMaster University.

Head of AI 2019 – 2024
Vascular AI
Led machine learning development and data science for brain health and translational vascular applications, including commercialization and research team leadership.

Professor of Computer Science 2022 – 2025
Mohawk College, Faculty of Engineering Technology
Part-time from December 2022, full-time from August 2024. Taught across computer science, cybersecurity, and digital health. Developed artificial intelligence and machine learning curriculum, and supervised capstone projects. Began work with Ideaworks, the Canadian Space Agency, and a McMaster research professor to draft a joint project.

Consultant, Course Development and Coaching Summer 2024
Vector Institute
Machine learning course development and instruction within the institute's machine learning program.

Professor of Machine Learning 2022 – 2023
Fanshawe College
Developed artificial intelligence and machine learning curriculum; taught machine learning for cybersecurity.

Various Research and Software Roles 2019 – 2022
McMaster University
Neuroplasticity, multiscale hemodynamic modelling, medical imaging, surgical interventions, multi-omics biomarkers, and explainable AI. Supervised software teams and directed statistical methods for graduate researchers in mechanical engineering.

Machine Learning Scientist Summer 2021
KardioSmart, Stanford University and McMaster University
Biophotonics, research design, and statistics for a central venous pressure medical device, including catheterization studies.

Math Teacher 2020 – 2021
Beyond the Classroom, Burlington, Ontario
Mathematics and science instruction across the grade 10 to 12 curriculum.

Scientific Writer Summer 2014
Schulich School of Medicine and Dentistry, Western University
Project lead for the dental clinics' procedural manual, written to support accreditation.

Treatment Coordinator 2008 – 2011
Children's Dentistry, London, Ontario
Patient management, treatment planning, and education for patients from birth to eighteen, including patients with a range of disabilities.

books

Pearls and Perils of Machine Learning↗. Textbook developing machine learning from first principles, working the underlying matrix operations by hand so that students understand the mechanics rather than treating models as black boxes. Adopted in five courses, including a graduate course at McMaster University.

research and business funding

Over $210,000 secured in independent research and business funding, including the Canadian Institutes of Health Research Doctoral Award ($120,000) and the MITACS Entrepreneur Award ($90,000) listed under awards.

Queen Elizabeth II Graduate Scholarship in Science and Technology. $10,000. 2021.

E. M. Dalley Fellowship. $5,000. 2021.

LSBSC Business Grant. $3,000. 2017.

awards

Canadian Institutes of Health Research Doctoral Award ($120,000). 2023.

MITACS Entrepreneur Award ($90,000). 2023.

People's Choice Award. NSERC CREATE sMAP Symposium. 2026. For cross-attention for multi-site PPG fusion.

First Place. McMaster Computing and Software Technical Research Competition. 2025. For mechanistically interpretable wearable-based sleep staging.

NSERC Vanier Scholarship Nominee, federal competition. 2022.

Ontario Graduate Scholarship, awarded twice.

patents

System and Method for Motion-Robust Physiological Measurement from Multi-Site Wearable Sensors Using Cross-Attention Signal Fusion. United States provisional patent application. Filed through the McMaster Industry Liaison Office. July 2026.

publications

Hemodynamic Modeling, Medical Imaging, and Machine Learning and Their Applications to Cardiovascular Interventions↗. Mason Kadem, L. Garber, M. Abdelkhalek, B. K. Al-Khazraji, and others. IEEE Reviews in Biomedical Engineering 16. 2022. Pages 403–423. (>100 citations, featured paper)

Mechanistically Interpretable Wearable-Based Sleep Staging. Mason Kadem and Rong Zheng. IEEE Annual Congress on Artificial Intelligence of Things (AIoT). Osaka, Japan. December 2025. Pages 327–334. (First Place, McMaster Computing and Software Technical Research Competition)

Cross-Attention for Multi-Site PPG Fusion. Mason Kadem and Rong Zheng. Association for the Advancement of Artificial Intelligence. 2027. (Under review) (People's Choice Award, NSERC CREATE sMAP Symposium; United States provisional patent, McMaster Industry Liaison Office)

Interpreting Transformers Through Attention Head Intervention↗. Mason Kadem and Rong Zheng. arXiv:2601.04398. 2026. (Preprint)

Human-Centered Ambient and Wearable Sensing for Automated Monitoring in Dementia Care, A Scoping Review. Mason Kadem, S. Masri, A. Innes, and Rong Zheng. IEEE Internet of Things Journal. 2026.

An Ultrasound-Exclusive Non-Invasive Computational Diagnostic Framework for Personalized Cardiology of Aortic Valve Stenosis. N. Bahadormanesh, B. Tomka, Mason Kadem, S. Khodaei, and others. Medical Image Analysis 87, 102795. 2023.

Human-Clinical AI Agent Collaboration. Mason Kadem and B. Al-Khazraji. Proceedings of the Association for the Advancement of Artificial Intelligence Symposium Series 6 (1). Dubai, United Arab Emirates. 2025. Pages 255–264.

XGBoost for Interpretable Alzheimer's Decision Support↗. Mason Kadem, M. Noseworthy, and T. Doyle. Proceedings of the Association for the Advancement of Artificial Intelligence Symposium Series 1 (1). Singapore. 2023. Pages 135–141.

Towards Interpretable Sleep Staging from Wearable Signals. Mason Kadem and Rong Zheng. IEEE Internet of Things Journal. (Under review)

Protocol-Dependence of Middle Cerebral Artery Dilation to Modest Hypercapnia↗. B. K. Al-Khazraji, S. Buch, Mason Kadem, B. J. Matushewski, K. Norozi, R. S. Menon, and others. Applied Physiology, Nutrition, and Metabolism 46 (9). 2021. Pages 1038–1046.

Pupil Dilation Is Sensitive to Semantic Ambiguity and Acoustic Degradation↗. Mason Kadem, B. Herrmann, J. M. Rodd, and I. S. Johnsrude. Trends in Hearing 24. 2020.

An Auditory-Perceptual and Pupillometric Study of Vocal Strain and Listening Effort in Adductor Spasmodic Dysphonia↗. M. Farahani, V. Parsa, B. Herrmann, Mason Kadem, I. Johnsrude, and P. C. Doyle. Applied Sciences 10 (17), 5907. 2020.

Examining Cardiovascular Risk Metrics in Osteoarthritic and Non-Osteoarthritic Populations Using CLSA Data. Y. Mei, Mason Kadem, D. Kobsar, and B. K. Al-Khazraji. Applied Physiology, Nutrition, and Metabolism. Canadian Society for Exercise Physiology. 2021.

Exploring Cerebrovascular Function in Osteoarthritis, Heads-Up. B. K. Al-Khazraji, M. B. Badrov, Mason Kadem, N. R. Lingum, T. B. Birmingham, and others. Physiological Reports 7 (20), e14212. 2019.

Perception Is All You Need, A Neuroscience Framework for Low-Cost Sensorless Gaze in Human-Robot Interaction. Mason Kadem. arXiv:2604.09829. 2026. (Preprint)

The Etiology of Spaceflight-Associated Hearing Loss↗. Mason Kadem. University of Western Ontario Medical Journal 87 (1). 2018. Pages 31–33.

Positive Reinforcement as a Function of Lipopolysaccharide Administration. Mason Kadem and S. Cross-Mellor. Western Undergraduate Psychology Journal 4 (1). April 2016.

unrefereed publications

Student Handbook and Dental Clinics' Procedural Manual. Mason Kadem and J. Jean. Dental Clinics, Schulich School of Medicine and Dentistry, Western University. 2016.

invited talks

Mechanistically Interpretable Wearable-Based Sleep Staging. IEEE Annual Congress on Artificial Intelligence of Things. Osaka, Japan. December 2025.

Human-Clinical AI Agent Collaboration↗. Association for the Advancement of Artificial Intelligence Symposium Series. Dubai, United Arab Emirates. 2025.

XGBoost for Interpretable Alzheimer's Decision Support. Association for the Advancement of Artificial Intelligence Symposium Series. Singapore. 2023.

Health Beyond Summit↗. Canadian Space Agency. 2022. Presented on behalf of Ro.

Canadian Space Agency. Presented on behalf of Ro.

Next AI. Invited to pitch.

AI Health Rounds↗. McMaster University. December 2023.

Digital health seminar↗.

FHIR North↗. 2024.

Ro (Research Online), the World's First AI-Powered Web Platform to Run Experiments Online↗. Live interview, Michael G. DeGroote Health Innovation, Commercialization and Entrepreneurship, Marnix E. Heersink School of Biomedical Innovation and Entrepreneurship, and The Clinic, McMaster University. October 2023.

Expert panellist on communication. Presentation Tricks and Tips, Health Sciences Graduate Students' Association, McMaster University.

Panel speaker. Graduate Student Seminar, McMaster University.

academic service, affiliations

Reviewer. Association for the Advancement of Artificial Intelligence. 2026 – .

Reviewer. IEEE Internet of Things Journal. 2025 – .

Reviewer. Journal of the American College of Cardiology.

Reviewer. MEDTEQ+, grant applications. 2025.

Member. IEEE.

Workshop instructor. *Data Science for the Modern Exercise Physiologist Symposium*, Canadian Society for Exercise Physiology. 2021.

Host. sMAP Podcast↗, NSERC CREATE sMAP. 2026.

Mentor. The Clinic, health startup incubator, McMaster University.

President. Health Sciences Graduate Students' Association, McMaster University. 2023.

Editor. University of Western Ontario Medical Journal. 2016.

Editor. Western Undergraduate Psychology Journal.

Council Member. Society of Graduate Students (SOGS), Western University.

Departmental Steward. Neuroscience, Western University.

Ad-hoc Committee Member. Ontario-wide research conference. 2017 – 2018.

Departmental Representative. Open House, Mohawk College.

Departmental Representative. Psychology Undergraduate Open House, Western University. 2015 – 2016.

community service

Consultation Panel Member. Canadian Space Agency.

Sustainable Development Policy Advocate. United Nations. 2017.

President, School Council. Jack Chambers Public School.

Member and Vice-President, Sponsorship. Operation Smile, Western University. 2014 – 2015.

Committee Member. Strong Bones, Strong Minds, Strong Muscles, a graduate student programme in the Schulich School of Medicine and Dentistry, Western University, delivering science and research awareness to the community. 2018 – 2019.

Volunteer. Dental Outreach Community Service (D.O.C.S.), Schulich School of Medicine and Dentistry, Western University. 2016 – 2017.

Judge and Speaker. Thames Valley District School Board.

Instructor. Neuroscience and robotics lectures, Engineering for Kids.

Developer. Neuroscience demonstrations for elementary schools. 2012 – 2013, 2017.

student supervision

Advisor to forty undergraduate students on research methods projects. Western University.

Capstone supervisor, computer science. Mohawk College.

Statistical and machine learning advisor to doctoral students in mechanical engineering. McMaster University.

Software team supervisor. McMaster University.

teaching

Above all, I want my students to enjoy learning the topic. As long as the learning process leaves a long-lasting and positive impression on the topic and the department, then they will continue to learn. I firmly believe my enthusiasm for the topics I teach relays that message. Teaching dossier available on request.

curriculum development

Developed artificial intelligence and machine learning curriculum. Mohawk College.

Developed artificial intelligence and machine learning curriculum. Fanshawe College. 2022 – 2023.

Developed machine learning curriculum. Vector Institute. Summer 2024.

Developed neuroscience and robotics curriculum. Engineering for Kids.

Developed artificial intelligence curriculum. STEM Montessori Academy of Canada. 2020 – 2021.

Authored *Pearls and Perils of Machine Learning*, adopted as the text in five courses, including a graduate course at McMaster University.

courses

COMP10261: Introduction to Intelligent Systems
Mohawk College Fall 2024

An introduction to the practice, theory, philosophy, and social impact of artificial intelligence, examining what it means for a system to know, think, learn, speak, and evolve. Students design and implement prototypes including artificial experts, problem solvers, learners, chat bots, and multi-agent systems.

KINESIOL 731: Supervised Machine Learning for the Physiologist
McMaster University 2023 – 2025

A graduate course introducing supervised machine learning to students trained in physiology rather than computing. Students build, validate, and interpret models on physiological data, working through the underlying mathematics so that model behaviour is understood mechanically rather than accepted on trust. Emphasis throughout on when a result can be believed and how to establish that it can.

SRTY-3009: Computational Intelligence for Security
Fanshawe College 2022 – 2023

Machine learning applied to security problems, including anomaly and intrusion detection, and the adversarial failure modes specific to models deployed in security contexts.

Machine Learning Fundamentals
Vector Institute Summer 2024

An introduction to machine learning for a non-technical adult audience, developed and delivered for the institute. Emphasis on building accurate intuitions about what these systems do and where they fail.

Artificial Intelligence
STEM Montessori Academy of Canada 2020 – 2021

An introduction to artificial intelligence developed and delivered for a younger audience, building working intuitions for how these systems learn and what they can and cannot do.

COMP10001: Programming Fundamentals
Mohawk College Fall 2021, Fall 2023

A foundation in software engineering practice and the tools and methods used to produce and maintain quality software. Students develop the skills to build software structures and logic, and the discipline to transfer those skills to any computer-based problem.

COMP10259: Client Side Web Programming
Mohawk College Fall 2024

JavaScript for dynamic web pages that respond to user interaction. Students build object-oriented client-side applications handling mouse, keyboard, and form input, with real-time graphics and animation, local data storage, and persistence across sessions. Uses the jQuery API for economical code and cross-browser compatibility.

COMP10219: Digital Forensics
Mohawk College Fall 2023

Investigation of digital evidence, covering acquisition, preservation, and analysis of data from storage media and devices, and the chain-of-custody and reporting standards that make findings admissible.

CYBR10011: Cyber Security Evaluation Project Management
Mohawk College Winter 2023, Winter 2024

Planning, analysis, design, and execution of a security management process. Students initiate, monitor, and resolve a project to manage an organization's security, and build and control a project plan to implement cyber security infrastructure.

COMPCO710: HTML and CSS
Mohawk College Winter 2024

Web page construction with HyperText Markup Language and styling with Cascading Style Sheets. Topics include lists, links, images, tables, and forms, with accessibility compliance under Web Accessibility Initiative guidelines.

Capstone
Mohawk College Summer 2024
Supervised team projects in which students design, implement, and defend a system of their own choosing, often drawn from their own work experience. Structured around milestone reviews, design discussions, and code review.

INFO10302: Data Analytics and Reporting for Healthcare
Mohawk College Fall 2024, Summer 2025
Programming, database reporting, and decision support tools applied to healthcare data. Students write programs that produce summary statistics, visualizations, and predictive models using machine learning and data mining techniques, developing a working understanding of how data representation shapes what a model can conclude.

INFO10300: Digital Health Devices
Mohawk College Fall 2024
Electronic and mobile health devices for self-care and remote care. Design considerations for wearable sensors, mobile communication devices, Internet of Things systems, and machine-to-machine architectures. Students address the practical challenges of wireless networking in clinical settings and examine how analytics are used to improve treatment.

INFO10298: Telehealth, Virtual Hospitals and Remote Patient Monitoring
Mohawk College Summer 2024, Fall 2025
Telemedical technology in healthcare systems, including telecare devices, telesurgery, and telehomecare platforms. Topics include communication networks and services, patient monitoring, information processing, and virtual hospital models. Students design a telemetry system using medical sensors, evaluate its performance, and critically assess real clinical telehealth deployments.

ENGINEER 1PA3: Introduction to Engineering Design and Practice
McMaster University Fall 2021
An introduction to professional engineering practice, covering ethics, health and safety, and technical communication. Students develop design skills and complete a term design project, working with graphical visualization, technical sketching, and two- and three-dimensional computer-aided design.

MGMT10180: Change Management and Process Modelling
Mohawk College Winter 2024, Summer 2025
Change management and process control in contemporary organizations. Students combine theoretical models with practical exercises and develop a change plan for organizations of differing scale.

MECHENG 4BF3: Biofluid Mechanics Systems
McMaster University Winter 2021, Winter 2022
Fluid mechanics applied to physiological systems, covering blood flow, vessel mechanics, and the modelling assumptions behind cardiovascular measurement.

KIN 4B03: Cardiovascular Disease, Pathophysiology and Rehabilitation
McMaster University Fall 2020, Winter 2022
Mechanisms of cardiovascular disease and the evidence base for rehabilitation, linking pathophysiology to measurement and to clinical decision making.

Research Methods and Statistics 2820E
Western University 2017 – 2019
A full-year undergraduate course in research methods and statistics. Course material was structured around clear learning outcomes and framed as problems to be worked rather than results to be memorized, with student understanding assessed at each stage.

certification

MITACS. Project management. 2021.

University of Oxford. Machine learning theory. Summer 2021.

Western University. Certificate in University Teaching. 2019. Ten workshops, three microteaching sessions, and two full guest lecture evaluations.

Compute Ontario. High-performance computing. 2018.

Healing Arts Radiation Protection (HARP). Radiology certification. 2010.