

Mackenzie Collins (she/her)

BASc, MD/PhD Candidate

Vanier Scholar & Schulich Leader

CURRICULUM VITAE



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EDUCATION

Queen's University | Department of Mechanical and Materials Engineering | School of Medicine

Sept. 2021 – May 2028
Kingston, Canada

MD/PhD Candidate

- PhD in Collaborative Biomedical Engineering, within the Mechanical and Materials Department, Faculty of Engineering
- Vanier Canada Graduate Scholarship, Seanix Graduate Award

University of Waterloo | Faculty of Engineering

Sept. 2016 – June 2021
Waterloo, Canada

Hon. BASc in Biomedical Engineering

- 5-year co-operative education program with an honors team design project.
- Schulich Leader Scholarship

LEADERSHIP / PROFESSIONAL DEVELOPMENT

Innovation In Medicine Interest Group | Queen's University
Executive Team Member, Queen's Medicine

September 2023 – Present
Kingston, Canada

- Medical interest group which organizes talks and workshops relating to new innovations in the field of medicine.

Junior Medics | Queen's University
Course Instructor, Queen's University

September 2023 – Present
Kingston, Canada

- Volunteer instructor for basic first aid for grade school students.

Course Representative, Class of 2027 | Queen's University
Student Representative for the Fundamentals of Therapeutics Course

January 2023 – April 2023
Kingston, Canada

- As course representative, I communicate to the course instructors on behalf of the class regarding any issues or concerns they might have.

Research Implementation Committee | Queen's University
Graduate Student Member

January 2023 – April 2023
Kingston, Canada

- The research implementation committee handles the implementation process of the research component of the new Strategic Plan of the Faculty of Engineering.

<p>MECH 393 Biomechanical Produce Development Queen's University <i>Teaching Assistant, Dr. Claire Davies</i></p> <ul style="list-style-type: none"> As teaching assistant for this course, I collaborated in the planning and 3D printing of a 'Switch Button Design' workshop. I also attended weekly lab sessions, communicated with clients for the course project and marked various assignments and exams. 	<p>January 2023 – April 2023 <i>Kingston, Canada</i></p>
<p>MECH 328 Dynamics and Vibrations Queen's University <i>Teaching Assistant, Dr. Michael Rainbow</i></p> <ul style="list-style-type: none"> As a TA for this course, I was responsible for attending weekly active learning sessions to respond to questions. I also marked assignments, midterms, and final exams. 	<p>September 2022 – December 2022 <i>Kingston, Canada</i></p>
<p>MECH 221 Statics and Solid Mechanics Queen's University <i>Teaching Assistant, Dr. Stephan Dobri</i></p> <ul style="list-style-type: none"> As a TA for this course, I was responsible for running weekly tutorials where I reviewed practice questions. I also marked assessments and exams throughout the semester. 	<p>May 2022 – August 2022 <i>Kingston, Canada</i></p>
<p>MECH 241 Fluid Mechanics Queen's University <i>Teaching Assistant, Dr. Mohsen Ferchichi</i></p> <ul style="list-style-type: none"> As a TA for this course, I was responsible for running weekly tutorials where I reviewed practice questions. I also proctored exams and marked assessments throughout the semester. 	<p>January 2022 – April 2022 <i>Kingston, Canada</i></p>
<p>MECH 221 Statics and Solid Mechanics Queen's University <i>Teaching Assistant, Dr. Keith Pilkey</i></p> <ul style="list-style-type: none"> As a TA for this course, I was responsible for running weekly tutorials where I reviewed practice questions. I also proctored exams and marked assessments throughout the semester. 	<p>September 2021 – December 2021 <i>Kingston, Canada</i></p>
<p>BioHackathon Technologie de Santé Université de Technologie de Compiègne <i>Participant</i></p> <ul style="list-style-type: none"> In collaboration with four other engineering students at the University de Technologie de Compiègne, we worked to identify a problem in current healthcare technology and address it over the course of three days. We created a new design for a device which aimed to improve independence in bathtub transfers. Much of this work was completed in my second language, French. 	<p>February 2020 <i>Compiègne, France</i></p>
<p>BME Class of 2021 University of Waterloo <i>Class Academic Representative</i></p> <ul style="list-style-type: none"> Each semester of my undergraduate degree I was re-elected as the academic representative to the department for my cohort. It was my responsibility to advocate on behalf of the class and express concerns to the professors and the department. 	<p>September 2016 – April 2021 <i>Waterloo, Canada</i></p>
<p>ProtoMD Design Team University of Waterloo <i>Co-Founder and President</i></p> <ul style="list-style-type: none"> Together with a group of classmates, we started and led a design team of biomedical engineers interested in using 3D printing to help address various challenges in developing countries. 	<p>October 2016 – December 2019 <i>Waterloo, Canada</i></p>

RESEARCH EXPERIENCE

NSERC CREATE READi Certification Program in Accessible Design | Queen's University, Carleton University

May 2020 – Dec. 2020
Kingston & Ottawa, Canada

Research and Education in Accessibility, Design, and Innovation (READi)

- Year-long program, culminating in a design project with a community partner focused on completing an accessibility audit with recommendations to improve their current program (Community partner: Being Studio, Ottawa).

Bioengineering | Université de Technologie de Compiègne

January 2020 – March 2020
Compiègne, France

Research Assistant

- Research project involved the co-culture of cells on biphasic scaffolds to reconstruct the myotendinous junction. This work term was scheduled for 8 months but ended early due to the COVID-19 pandemic.

Software Quality Assurance | Siemens Healthineers

May 2019 – August 2019
Ottawa, Canada

Software QA Engineer

- Responsible for both executing manual test cases and writing automated test case scripts for the Epc Blood Analysis Device.

Public Speaking Instructor | DeRin Edu

May 2018 – December 2019
Waterloo, Canada

Instructor

- Planned and instructed weekly public speaking classes for kids ages 6-14.

Toronto Rehabilitation Research Institute KITE - UHN | University Health Network

Sept. 2016 – May 2022
Toronto, Canada

Research Assistant

- Research assistant at the iDAPT Research Facility with the Home and Community Team; responsible for assisting graduate research.
- Data collection for study on grab bars and their efficacy in preventing falls during bathtub transfer.

Toronto Rehabilitation Research Institute KITE - UHN | University Health Network

May 2015 – July 2015
Toronto, Canada

Research Assistant

- Research assistant at the iDAPT Research Facility with the Home and Community Team; responsible for assisting graduate research.
- Data collection for study on handrails and their efficacy in fall prevention on stairs in older adults.

Department of Kinesiology | Memorial University of Newfoundland

May 2017 – August 2017
Newfoundland, Canada

Research Assistant

- Research assistant to Dr. Heather Carnahan; acquired technical skills in programming and signal processing by working with an underwater force/torque sensor.

PEER REVIEWED PUBLICATIONS

- **M. L. Collins, I. C. Levine, P. C. Gosine, R. E. Montgomery, K. Nirmalanathan, A. C. Novak**, "A comparison of minimum segment models for the estimation of centre of mass position and velocity for slip recovery during a bathtub transfer task," *Gait & Posture*, vol. 109, pp. 153–157, Jan. 2024. doi:10.1016/j.gaitpost.2024.01.025
- **M. L. Collins and T. C. Davies**, "Emotion differentiation through features of eye-tracking and pupil diameter for monitoring well-being," *2023 45th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Jul. 2023. doi:10.1109/embc40787.2023.10340178

PUBLICATIONS IN-REVIEW / IN PREPARATION

- **M. L. Collins, H. Cooke, N. Jawa, B. Laight, M. Japanwala and T. C. Davies**, “Effectiveness of the use of unimodal eye-tracking technology in human emotion differentiation. A systematic review.” Manuscript in Preparation.
- C. Vowles, **M. L. Collins**, T. C. Davies, “Assessing basic emotion viz machine learning comparative analysis of number of basic emotions and algorithms.” Submitted to the 2024 46th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), July 2024.

RECOGNITIONS / AWARDS (TOTAL \$274,900 CAD ACCEPTED; \$319,900 OFFERED)

Mitacs Globalink Research Award (\$6,000)	February 2024
Michael Smith Foreign Study Supplements NSERC (\$6,000)	December 2023
Dean’s Teaching Assistant Award (\$3,000)	May 2023
Vanier Canada Graduate Scholarship NSERC (\$150,000)	April 2022
The Seanix Graduate Award (\$24,000)	August 2021
Graduate Dean’s Honours List – Hon. BAsC, University of Waterloo	June 2021
Ontario Graduate Scholarship (\$15,000) - <i>Declined</i>	June 2021
Undergraduate Research Assistant Award (\$900)	January 2021
International Experience Award, Compiègne, France (\$1,500)	January 2020
International Experience Award, Cusco, Peru (\$1,500)	August 2019
President’s Scholarship of Distinction (\$2,000)	September 2016
Schulich Leader Scholarship, University of Waterloo (\$80,000)	April 2016
Warren and Catherine Ball Memorial Entrance Scholarship, MUN (\$30,000) - <i>Declined</i>	April 2016
Governor General’s Bronze Medal for Academic Achievement	June 2016
Best in Region Medal – Newfoundland, Skills Canada	June 2016
National Gold Medal – Public Speaking, Skills Canada	June 2016
National Bronze Medal – Public Speaking, Skills Canada	June 2015
National Bronze Medal – Public Speaking, Skills Canada	June 2014

PRESENTATIONS (10 TOTAL, 7 COMPLETED, 3 IN REVIEW)

<i>In review for Oral Presentation American Academy for Cerebral Palsy and Developmental Medicine (AACPDM)</i>	October 2024 <i>Quebec City, Quebec, CA</i>
<ul style="list-style-type: none">• Exploring relationships between emotion and features of eye-gaze in youth with cerebral palsy.	
<i>In review for Oral Presentation Australasian Academy of Cerebral Palsy and Developmental Medicine (AusACPDM)</i>	July 2024 <i>Cairns, NSW, Australia</i>
<ul style="list-style-type: none">• Effectiveness of the use of unimodal eye-tracking technology in human emotion differentiation. A systematic review.	
<i>In review for Poster Presentation ICAM Annual Meeting (CITAC)</i>	April 2024 <i>Vancouver, British Columbia, CA</i>
<ul style="list-style-type: none">• Features of eye gaze and their relationship with various emotions in youth with severe motor and communication impairment (SMCI) and typically developing (TD) individuals.	
<i>Oral Presentation Kids Brain Health Network Annual Conference</i>	November 2023 <i>Ottawa, Ontario, CA</i>
<ul style="list-style-type: none">• Exploring the relationship between emotion and features of eye-gaze in youth with severe motor and communication impairment (SMCI) and typically developing controls.	
<i>Poster Presentation, Full Paper International Engineering in Medicine and Biology Conference</i>	August 2023 <i>Sydney, Australia</i>
<ul style="list-style-type: none">• Emotion differentiation through features of eye-tracking and pupil diameter for monitoring well-being.	

Oral Presentation MD/PhD Research Day, Queen's University <ul style="list-style-type: none"> Progress Overview: Co-design of an eye-gaze based system for emotion identification in youth with severe motor and communication impairment (SMCI). 	July 2023 <i>Kingston, Ontario, CA</i>
Poster Presentation CSCI-CITAC Annual Joint Meeting (AJM) <ul style="list-style-type: none"> Eye-tracking based emotion identification in youth with cerebral palsy 	November 2022 <i>Montreal, Quebec, CA</i>
Poster Presentation International Engineering in Medicine and Biology Conference (EMBC) <ul style="list-style-type: none"> Optimization of a Multibody Dynamic Model of the Fouetté Turn 	August 2022 <i>Glasgow, Scotland, UK</i>
Poster Presentation Ontario Biomechanics Conference <ul style="list-style-type: none"> Determining a minimum segment model for quantifying centre of mass during complete balance recovery reactions 	May 2019 <i>Alliston, Ontario, CA</i>
Poster Presentation Bertha Rosenstadt National Undergraduate Research Conference <ul style="list-style-type: none"> Grasping reactions following induced balance loss for handrails of varying shapes and sizes 	March 2018 <i>Toronto, Ontario, CA</i>

PEER REVIEW/EDITORIAL ACTIVITIES

FLASF Science Fair Regional Judge	March 2024
FLASF Science Fair Regional Judge	March 2023
Oral Presentation Judge - Canadian Undergraduate Conference on Healthcare (CUCOH)	February 2023

INVITED SPEAKER

Waterloo Engineering Pin Ceremony – Alumni Speaker	March 2024
Queen's Women in Engineering (WiE) Tearoom Mentorship Event – Panelist	February 2024
Queen's Women in Engineering (WiE) Tearoom Mentorship Event – Panelist	February 2023
Waterloo BM-SHE Women in Engineering Event – Panelist	January 2022

ASSOCIATION MEMBERSHIPS

Member Australasian Academy of Cerebral Palsy and Developmental Medicine	2024 – Present
Member IEEE Student Member	2022 – Present
Member IEEE Engineering in Medicine and Biology Society (EMBS)	2022 – Present
Member Clinician Investigator Trainee Association of Canada (CITAC)	2022 – Present
Member Ontario Medical Association (OMA)	2023 – Present
Member Canadian Medical Association (CMA)	2023 – Present
Member Ontario Medical Student Association (OMSA)	2023 – Present
Member Canadian Federation of Medical Students (CFMS)	2023 – Present