

# Melissa Greeff

Curriculum Vitae

✉ [melissa.greeff@queensu.ca](mailto:melissa.greeff@queensu.ca) 🌐 <https://www.robotalab.com/team> **in** [LinkedIn](#)

Tenure-Track Assistant Professor in Electrical and Computer Engineering at Queen's University in Canada. Ingenuity Labs Robotics Institute Member and Faculty Affiliate at Vector Institute for Artificial Intelligence. Research interests include aerial robots, vision-based navigation, and safe learning-based control. B.A.Sc in Engineering Science and Ph.D from the University of Toronto. Woman Grandmaster in chess. For more information on my research - visit the Robora Lab (<https://robotalab.com/>) webpage.

## EDUCATION

**PhD** | University of Toronto 2022

Fast Vision-Based Flight in Real-World Environments

- Dynamic Systems Lab under supervision of Prof. Angela Schoellig
- Fields: Aerial & Mobile Robotics, Control Systems, Machine Learning

**Bachelor of Applied Science** | Engineering Science, University of Toronto 2016

High Honors & Dean's List:

- Major: Aerospace Engineering
- Minors: Business & Robotics and Mechatronics

## AWARDS

**Golden Apple Award** | Queen's University Faculty of Applied Science 2023

Teaching award

- One of three recipients in the Faculty of Applied Science for 2023.
- This award is based on a professor's enthusiasm and interest in students and their engineering activities.
- Nominated (awarded) by the students in my Signals and Systems class Winter 2023.

**W.S. Wilson Medal** | Highest Academic Standing Award 2016

"awarded to the student in each engineering discipline who has achieved the highest academic standing in the final year of their program"

**Nelson Mandela Award** | University of Toronto 2015

Undergraduate students at the end of their 3rd year on the basis on academic excellence, demonstrated leadership and community involvement.

**Woman Grandmaster** | Chess 2009

Chess career highlights:

- Women's World Cup 2010, 2012
- Represented South Africa at the Chess Olympiad 2008, 2010, 2012

## EMPLOYMENT

**Tenure-Track Assistant Professor** | Queen's University 2022

Research at the rank of Assistant Professor with specialization in a field related to robotics and/or mechatronics engineering, including autonomous systems, machine learning and AI, intelligent systems engineering, human robot interaction, smart environments and computer vision. Teaching at the undergraduate-level primarily supporting a new degree program in Mechatronics and Robotics Engineering.

**Course Instructor** | University of Toronto 2019 - 2021

Lecturer for first year Linear Algebra (MAT188) at the University of Toronto. This course teaches fundamentals such as solving a linear systems of equations, linear independence, eigenvalues and eigenvectors, invertibility, e.t.c. My objectives have been 1) to highlight the connections between different topics in linear algebra and 2) to demonstrate relevant engineering applications.

**Lecturer** | University of Toronto 2021,2022

Lecture on multirotor dynamics and control for a graduate robotic course, AER 1217 Autonomy of UAVs, at the University of Toronto.

**Teaching Assistant** | University of Toronto 2016 - 2020  
Taught weekly robotic labs on mobile manipulation for ECE470 (Robotics Modelling and Control), Graded various assignments and tests for ROB313 (Learning for Robotics), Taught weekly tutorials and MATLAB labs for ESC103 (Engineering Mathematics), Taught weekly tutorials on multivariable calculus and fluid mechanics for AER210 (Vector Calculus and Fluid Mechanics), Taught weekly tutorials on critical reading and engineering ethics for ESC203 (Engineering Ethics).

**Chess Instructor** | Chess Institute of Canada 2012-2016  
Taught chess at junior schools in Toronto with the aim to develop essential life skills, such as sportsmanship and confidence, in children.

## PUBLICATIONS

**Differentially Flat Learning-Based Model Predictive Control Using a Stability, State, and Input Constraining Safety Filter** |

IEEE Control Systems Letters 2023  
A. W. Hall, M. Greeff, and A. P. Schoellig

**safe-control-gym: A Unified Benchmark Suite for Safe Learning-Based Control and Reinforcement Learning in Robotics** |

IEEE Robotics and Automation Letters 2022  
Z. Yuan, A. W. Hall, S. Zhou, L. Brunke, M. Greeff, J. Panerati, and A. P. Schoellig

**Fly Out The Window: Exploiting Discrete-Time Flatness for Fast Vision-Based Multirotor Flight** |

IEEE Robotics and Automation Letters 2022

M. Greeff, S. Zhou and A. P. Schoellig

**Safe Learning in Robotics: From Learning-Based Control to Safe Reinforcement Learning** |

Annual Review of Control, Robotics, and Autonomous Systems 2022  
L. Brunke, M. Greeff, A. W. Hall, Z. Yuan, S. Zhou, J. Panerati and A. P. Schoellig

**Learning a Stability Filter for Uncertain Differentially Flat Systems using Gaussian Processes** |

Conference on Decision and Control (CDC) 2021  
M. Greeff, A. W. Hall and A. P. Schoellig

**Exploiting differential flatness for robust learning-based tracking control using Gaussian Processes** |

IEEE Control Systems Letters 2020

M. Greeff and A. P. Schoellig

**A perception-aware flatness-based model predictive controller for fast vision-based multirotor flight** |

International Federation of Automatic Control (IFAC) World Congress 2020  
M. Greeff, T. D. Barfoot and A. P. Schoellig

**There's no place like home: visual teach and repeat for emergency return of multirotor UAVs during GPS failure** |

IEEE Robotics and Automation Letters 2019

M. Warren, M. Greeff, B. Patel, J. Collier, A. P. Schoellig and T. D. Barfoot

**Flatness-based model predictive control for quadrotor trajectory tracking** |

International Conference on Intelligent Robots and Systems (IROS) 2018  
M. Greeff and A. P. Schoellig

## AWARDED RESEARCH FUNDING

**Toward Resilient Multi-Robot Collaboration in Emergencies** | NSERC Discovery Grant 2023-2027  
Principal Investigator, Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant Award.

**Safe Autonomous Arctic Ship-To-Shore Transit with Zero GHG Emissions** | DND IDEaS 2023  
Principal Investigator, Department of National Defense Innovation for Defence Excellence and Security.

**Resilient Aerial Autonomous Navigation** | CFI 2023  
Principal Investigator, Canadian Foundation for Innovation.

**Multi-Unmanned Aerial Vehicle (UAV) Active Simultaneous Localization and Mapping in Unknown Indoor Environments** | NSERC/FRQNT 2023-2026

Co-Applicant, Natural Sciences and Engineering Research Council of Canada (NSERC) and Fonds de recherche du Quebec - Nature et technologies (FRQNT).

**Next Generation Building Envelope Inspection using Robotics and Artificial Intelligence** | MITACs  
2023-2025

Co-Applicant, MITACs Organization, Industry Partner: Drone Maintenance Co.

**Exploiting AI to Build Secure, Reliable, and Trusted Human-Autonomy Teaming for Attack Detection and Recognition** | DND IDEaS 2023

Co-Applicant, Department of National Defense Innovation for Defence Excellence and Security.

**Power, Network, and Sensor Management System with Machine Learning Analytics for 24/7 Arctic Infrastructure Monitoring** | DND IDEaS 2023

Co-Applicant, Department of National Defense Innovation for Defence Excellence and Security.

**Enhancing 5G and Beyond Infrastructure for Secure, Flexible, and Smart Military Communications** | DND IDEaS 2023

Co-Applicant, Department of National Defense Innovation for Defence Excellence and Security.

## PRESENTATIONS

**All System Go! A Systems Level Approach to You as an Engineer.** | Invited Lecture for MECH333  
Gender, Engineering and Technology, Queen's University. 2023

**Flying Flat Out: Fast Multirotor Flight Using Vision-Based Navigation in Real-World Environments.** | IEEE (Institute of Electrical and Electronics Engineers) Kingston Chapter Technical Talk 2022

**Flying Flat Out: Fast Multirotor Flight Using Vision-Based Navigation in Real-World Environments.** | The Daniel Guggenheim School of Aerospace Engineering Georgia Institute of Technology Aerospace Engineering (AE) Seminar 2022

**Toward Robots that Learn Efficiently, Navigate Robustly and Work as Teams.** | Queen's Engineering Research Networking Day 2022

**Flying Flat Out: Fast Multirotor Flight Using Vision-Based Navigation in Real-World Environments.** | Toronto AI Robotics Seminar University of Toronto 2022

**Safe Learning in Robotics: From Learning-Based Control to Safe Reinforcement Learning.** | University of California San Diego Safe Autonomous Systems Lab Guest Lecture 2022

**Using Data-driven Models to Achieve Reliable Outdoor Visual Navigation.** | International Conference on Intelligent Robots and Systems (IROS) Workshop on Perception, Learning, and Control for Autonomous Agile Vehicles 2020

## MEDIA INTERVIEWS

**"50 women in robotics you need to know about 2023,"**

| <https://www.womeninrobotics.org/2023/10/04/50-women-in-robotics-you-need-to-know-about-2023>

**"To rescue people and save time, Melissa Greeff wants to make aerial drones smarter."** | Queen's Engineering News 2023

**"This drone has a camera that can tell it where to fly - no GPS required."** | Canadian Broadcast Company (CBC) News 2019

## KNOWLEDGE AND TECHNOLOGY TRANSLATION

### **R&D Collaboration with Defence Research and Development Canada (DRDC)**

2018-2021

Demonstrated vision-based autonomous multirotor system in field experiments and transfer system and technology to team at DRDC. Demonstrated successful vision-based autonomous aerial vehicle flight at field trials at DRDC in Suffield, Alberta, Canada. Demonstrated successful vision-based autonomous aerial vehicle flight for inspection in downtown Montreal, Canada. Set-up multirotor unmanned aerial vehicle (UAV) with our vision-based system for team at DRDC which they are currently using in ongoing trials.

## RESEARCH SUPERVISION

### **Abdelrahman Ramadan** | PhD Candidate

2023-Present

Co-supervised with Dr Sidney Givigi, School of Computing

### **Babak Akbari** | Master of Applied Science Candidate

2023-Present

### **Jess Stephenson** | Master of Applied Science Candidate

2023-Present

### **Ryan Allen** | Master of Applied Science Candidate

2023-Present

Awarded NSERC Undergraduate Summer Research Award (USRA) for summer 2023.

### **Nick Chodura** | Master of Applied Science Candidate

2023-Present

Co-supervised with Dr. Joshua Woods, Civil Engineering

### **Desiree Fisker** | Master of Applied Science Candidate

2023-Present

Co-supervised with Dr. Tim Barfoot, University of Toronto

### **Tony Yang** | Undergraduate Research Assistant

2023-Present

Awarded Charles Allan Thompson Undergraduate Student Research Award.

### **Daniel Poon** | Undergraduate Research Assistant

2023-Present

Awarded NSERC Undergraduate Student Summer Research Fellowship (USSRF).

### **Nathan Duncan** | Undergraduate Research Assistant

2023-Present

## MENTORSHIP

### **"Autonomous Building Guide"** | Undergraduate Capstone Project

2022-2023

Co-supervised a fourth-year capstone project with Dr Joshua Marshall on an Autonomous Building Guide where the team was awarded 2nd place in the annual Electrical and Computer Engineering Open House and 2nd place in the IEEE Capstone Projects.

### **Queen's AutoDrive Team** | Faculty Mentor

2022-Present

Faculty mentor for Queen's Autonomous Driving Team participating in GM and SAE AutoDrive Challenge.

## EDITORIAL SERVICE

### **Associate Editor** | IEEE Robotics and Automation Letters (RA-L)

2023-Current

## EVENT ADMINISTRATION

### **Summer Tutorial Series** | Ingenuity Labs Research Institute

2023

Organizer, Weekly summer tutorial series aimed at undergraduate and early career researchers at Ingenuity Labs on fundamental topics in robotics.

### **Women in Robotics Ontario Chapter** | Kick-Off Event

2022

Organizer, Started the Women in Robotics Ontario Chapter with a few other women in Ontario and organized our kick-off event in Toronto with 30-40 members.

### **Safe Robot Learning Competition** |

#### International Conference on Intelligent Robots and Systems (IROS)

2022

Organizer, This competition is designed to test the capabilities of learning-based robot decision-making algorithms to safely cope with events or uncertainties that are not known at design time. The task we consider is based on a nano quadrotor platform (Bitcraze's Crazyfly).

## Releasing Robots into the Wild Workshop |

International Conference on Robotics and Automation (ICRA) 2022  
Organizer, Workshop on robot simulation tools addressing the (i) the scarcity of sufficiently realistic simulation tools, tasks, and datasets to reliably compare algorithmic progress; and (ii) the lack of reliable and repeatable processes to transfer those simulation results to the real-world.

## Deployable Decision Making in Embodied Systems |

Neural Information Processing Systems (NeurIPS) 2021  
Organizer, This workshop will bring together researchers from machine learning, computer vision, robotics, and control to facilitate interdisciplinary discussions on the topic of deployable decision making in embodied systems. Two discussion themes: 1) Deployable Learning Algorithms for Embodied Systems and 2) Safe Learning and Decision Making in Uncertain and Unstructured Environments.

## Safe Real-World Robot Autonomy |

International Conference on Intelligent Robots and Systems (IROS) 2021  
Organizer, This workshop facilitated interdisciplinary discussions and initiated collaboration on the topic of safe autonomy for real-world applications. The workshop had four components: a tutorial on Safe Robot Autonomy and three moderated discussions addressing: 1) Safety Definitions and Requirements, 2) Open Challenges and Opportunities for Integrating Theoretic and Data-driven Approaches and 3) Evaluation of Safety-Aware and Safety-Assured Algorithms.

## Robotics for People (R4P): Perspectives on Interaction, Learning and Safety Workshop |

Robotics: Science and Systems Conference (RSS) 2021  
Program Committee Member.

## TECHNICAL SKILLS

**Coding Languages** | Python, Visual Basic, C++

**Software Tools** | ROS (Robot Operating System), MATLAB, Solidworks

**Machining** | Basic Machining Course

## CERTIFICATIONS

**Advance Drone Pilot Certificate** | Transport Canada 2019-Present  
Required legally for outdoor drone flight in restricted airspace

## FIELD EXPERIMENTS

**Autonomous Vision-based Flight** | Suffield 2018  
Demonstrated successful vision-based autonomous aerial vehicle flight at field trials at Defense Research and Development Canada (DRDC) in Suffield, Alberta, Canada.

**Autonomous Vision-based Flight** | Montreal 2018  
Demonstrated successful vision-based autonomous aerial vehicle flight for inspection in downtown Montreal, Canada.

## PAST EXTRACURRICULARS

**PASS** | 1st Year Engineering Math Mentor 2016

**ILEAD** | Engineering Leadership Organization 2013-2016

**WISE** | Campus Ambassador Women in Science and Engineering 2015

**Habitat for Humanity** | Building in Cape Town, South Africa 2011

**Hart House Chess Club** | Pan-American Team & Simultaneous Exhibitions 2013-2014

**FIDE Chess Instructor** | International Chess Instructor 2011

## INTERESTS

Integrating machine learning and control algorithms; Practical robotic applications; Reading; Technology; Systems approach to design; Community development; Teaching and facilitating learning; Economics and current events.