MATTHEW GIAMOU

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EDUCATION

University of Toronto Institute for Aerospace Studies Expected May 2022
Ph.D. in Aerospace Engineering
Cumulative GPA: 4.0/4.0

Massachusetts Institute of Technology Graduated June 2017
M.S. in Aerospace Engineering
Cumulative GPA: 4.6/5.0

University of Toronto Graduated May 2015
B.A.Sc. with High Honours in Engineering Science, Aerospace Major
Robotics and Mechatronics Minor
Cumulative GPA: 3.86/4.00

RESEARCH AND WORK EXPERIENCE

University of Toronto Institute for Aerospace Studies January 2018 - Present
Robotics Researcher *Toronto, ON*

- Researcher in the Space and Terrestrial Autonomous Robotic Systems laboratory under Professor Jonathan Kelly
- Developing algorithms for autonomous perception, state estimation, and planning systems
- Collaborating with colleagues on projects involving resource-efficient multi-agent SLAM, aircraft parameter estimation, and sensor calibration

AeroAstro, MIT September 2015 - June 2017
Robotics Researcher *Cambridge, MA*

- Researcher in the Aerospace Controls Lab under Professor Jonathan How
- Developed multi-agent navigation, mapping, and planning for wilderness search and rescue using multiple quadrotors in cooperation with NASA Langley Research Center
- Integrated hardware and custom software for 3 quadrotors; worked with a team of other students and engineers to design and conduct indoor and outdoor autonomous demonstrations of algorithms
- Wrote and published papers for major robotics conferences and journals while completing a M.S. thesis

University of Toronto Institute for Aerospace Studies May 2014 - August 2015
Undergraduate Research Assistant *Toronto, ON*

- Researched automatic extrinsic calibration algorithms for inertial measurement units and 2D laser rangefinders for mobile robots and hand-held mapping devices
- Assisted graduate students with field experiments involving mobile robots and in writing papers

Infinera Canada Inc. May 2013 - April 2014
Optical Network Design Engineer *Ottawa, ON*

- Worked full time as an engineering intern on a team designing coherent optical communication systems
- Developed, optimized and tested simulations of communication channel models, adaptive filters, and state of-the-art error correcting codes in C, C++ and MATLAB
- Developed Python and C++ tools for automated cloud computing via Amazon Web Services to run and analyze large scale Monte Carlo simulations of error correcting codes

WaveDNA Inc. April 2012 - April 2013
Software Engineer *Toronto, ON*

- Worked full time in the summer followed by part time work during the school year as a member of an Agile software development team designing intelligent music composition software
- Designed and implemented statistical tools using Markov chain models to aid musicians in beat composition for the product's "Beat Weaver" application
- Designed and implemented music software features and user interface elements in Java
- Performed user tests and unit tests to ensure software met changing design specifications

Department of Computer Science, University of Toronto May 2011 - April 2012
Undergraduate Research Assistant *Toronto, ON*

- Worked under the supervision of Professor Gerald Penn on analysis of audio fingerprinting algorithms and their performance on feature length film audio
- Developed a user interface in Java for a named entity retrieval task
- Assisted graduate students in conducting user studies and experiments

AWARDS AND SCHOLARSHIPS

Best Workshop Paper Award October 2020
IROS workshop on bringing geometric methods to robot learning, optimization and control *Online*

- Won (with co-authors) €500 prize sponsored by the Bosch Center for AI
- Presented a paper and presentation on our novel distance geometric approach to inverse kinematics

Best Student Paper July 2020
Robotics: Science and Systems *Online*

- Won (with co-authors) for work on a novel representation for rotations in supervised deep learning

Royal Bank of Canada Fellowship September 2019 - August 2021
University of Toronto *Ontario, Canada*

- Fellowship from RBC valued at $50,000 and awarded for research excellence focused on innovation and application of artificial intelligence

Natural Sciences and Engineering Research Council CGS-D May 2019 - April 2022
University of Toronto *Ontario, Canada*

- Scholarship from the government of Canada valued at $105,000 awarded for academic and research excellence

Vector Institute Post-Graduate Affiliate May 2019 - Present
University of Toronto *Ontario, Canada*

- Selected by the Vector Institute for research excellence in applications related to machine learning and artificial intelligence
- Awarded $6,000 and granted access to Vector Institute resources

Queen Elizabeth II Graduate Scholarship September 2018 - August 2019
University of Toronto *Ontario, Canada*

- Scholarship from province of Ontario of $15,000 awarded for academic and research excellence

Nominated for ICRA Best Paper Award on Multi-Robot Systems May 2018
IEEE Conference on Robotics and Automation *Brisbane, Australia*

· One of four papers nominated for the award at the largest annual robotics conference
· Presented work on resource-efficient communication for multi-robot SLAM to judges and audience on conference main stage

Best Student Paper September 2016
IEEE Int. Conf. on Multisensor Fusion and Integration (MFI) *Baden-Baden, Germany*

· Won (with co-authors) $500 prize for work on extrinsic sensor calibration

Summer Research Fellowship May 2014
University of Toronto Institute for Aerospace Studies *Toronto, ON*

· Academic fellowship award of $6,000 provided to conduct a summer research project

Engineering Science Research Opportunities Program May 2011
Department of Engineering Science, University of Toronto *Toronto, ON*

· Academic fellowship award of $6,000 provided to conduct a summer research project

TECHNICAL STRENGTHS

Mathematics	Optimization, Probability, Control Theory, Graph Theory
Programming Languages	Python, MATLAB, C, C++, Java
Frameworks & APIs	ROS, CVX, OpenCV, Simulink, Pandas, SciPy, Scikit-Learn
Software Tools	Git, LaTeX, AWS, Unix Tools

TEACHING AND MENTORSHIP

ROB311: Introduction to Artificial Intelligence January 2019 - Present
University of Toronto *Ontario, Canada*

· Co-developed and co-instructed a course on artificial intelligence for 3rd year Engineering Science students in the Machine Intelligence major
· Created and delivered lectures and tutorials on state space search, propositional logic, inference, constraint programming, game theory, and game-playing agents
· Developed a course syllabus, reading lists, Python assignments and a midterm examination

Mentoring Undergraduates May 2018 - Present
University of Toronto *Ontario, Canada*

· Supervised an undergraduate student from the summer of 2018 through their 4th year thesis, leading to a publication
· Helped another undergraduate student formulate a winning research award application in January 2019; worked with that student to publish multiple papers

SELECTED PUBLICATIONS

Emmett Wise*, **Matthew Giamou***, Soroush Khoubyarian, Abhinav Grover, and Jonathan Kelly. "Certifiably Optimal Monocular Hand-Eye Calibration" *Intl. Conf. on Multisensor Fusion and Integration for Intelligent Systems (MFI)*. IEEE, 2020.

Valentin Peretroukhin, **Matthew Giamou**, David M. Rosen, W. Nicholas Greene, Nicholas Roy, and Jonathan Kelly. "A Smooth Representation of Belief over SO(3) for Deep Rotation Learning with Uncertainty." *Robotics: Science and Systems*. RSS Foundation, 2020.

Filip Marić*, **Matthew Giamou***, Soroush Khoubyarian, Ivan Petrović, and Jonathan Kelly. "Inverse Kinematics for Serial Kinematic Chains via Sum of Squares Optimization ." *Intl. Conf. on Robotics and Automation (ICRA)*. IEEE, 2020.

Matthew Giamou, Ziye Ma, Valentin Peretroukhin, and Jonathan Kelly. "Certifiably Globally Optimal Extrinsic Calibration from Per-Sensor Egomotion" *IEEE Robotics and Automation Letters* 4.2 (2019): 367-374.

Kasra Khosoussi, **Matthew Giamou**, Gaurav S. Sukhatme, Shoudong Huang, Gamini Dissanayake, and Jonathan P. How. "Reliable graph topologies for SLAM." *Intl. J. of Robotics Research (IJRR)*. Sage, 2018.

Matthew Giamou*, Kasra Khosoussi*, and Jonathan P. How. "Talk Resource-Efficiently to Me: Optimal Communication Planning for Distributed SLAM Front-Ends." *Intl. Conf. on Robotics and Automation (ICRA)*. IEEE, 2018.

Matthew Giamou, Yaroslav Babich, Golnaz Habibi, Jonathan P. How. "Stable laser interest point selection for place recognition in a forest. *Intl. Conf. on Intelligent Robots and Systems (IROS)*, pp. 4290-4297. IEEE, 2017.

Jacob Lambert, Lee Clement, **Matthew Giamou**, and Jonathan Kelly. "Entropy-Based Sim(3) Calibration of 2D Lidars to Egomotion Sensors." *Intl. Conf. on Multisensor Fusion and Integration for Intelligent Systems (MFI)*. IEEE, 2016.

Beipeng Mu, **Matthew Giamou**, Liam Paull, Ali-akbar Agha-mohammadi, John Leonard, Jonathan How. "Information-based active SLAM via topological feature graphs." *55th Conference on Decision and Control*, pp. 5583-5590. IEEE, 2016.

Valentin Peretroukhin, Lee Clement, **Matthew Giamou**, and Jonathan Kelly. "PROBE: Predictive robust estimation for visual-inertial navigation." *Intl. Conf. on Intelligent Robots and Systems (IROS)*, pp. 3668-3675. IEEE, 2015.

LEADERSHIP AND VOLUNTEERING

Debates on the Future of Robotics Research II June 2020
Co-organizer *Online*

· Planned and structured three formal debates for a half-day virtual workshop at ICRA

Crisis Text Line Powered by Kid's Help Phone May 2020 - Present
Crisis Responder *Toronto, ON*

· Received 30+ hours of online training in suicide prevention and supporting people of all ages in crisis
· Helped over 50 at risk individuals from across Canada via text message in weekly four hour shifts

Debates on the Future of Robotics Research I May 2019
Co-organizer *Montreal, QU*

· Planned and structured three formal debates and a series of lightning talks at a full-day ICRA workshop

UTIAS Aerospace Students' Association September 2018 - September 2019
Social Coordinator *Toronto, ON*

· Elected as social coordinator and council member by fellow graduate students
· Attending council meetings and organizing all UTIAS social events
· Captaining and organizing intramural soccer team for 2018-2019

Gradlife Advisory Committee September 2018 - Present
Graduate Student Representative *Toronto, ON*

- Attend monthly committee meetings
- Evaluate and provide feedback on programming and resources available to graduate students

FIRST Robotics 2015 - 2019
Competition Judge *Toronto, ON*

- FRC Dean's List Judge at York University District 2018
- FRC Machine, Creativity and Innovation Judge at Durham District 2018
- FIRST Lego League Robot Design Judge at Ontario Championships 2015
- Programming mentor to Martingrove Collegiate Institute's FRC team

MIT Faculty Committee on the Library System September 2016 - May 2017
Graduate Student Representative *Cambridge, MA*

- Attended monthly meetings as one of two representatives for MIT's graduate student body
- Read policy briefs and plans for library strategy and projects
- Met with diverse internal and external stakeholders to discuss the future of MIT's library system

MITxplore Math Day March 2016
Group Leader *Cambridge, MA*

- Supervised a group of children aged 5-12 throughout a day of math activities
- Taught teamwork, communication, and math concepts

HOBBIES

Soccer, winter sports, spelunking, and tennis
Reading novels (mostly classics, experimental, and Russian literature)
Video games (strategy, puzzles, and narrative-driven)
Jamming with friends and family (guitar, bass, and terrible singing)