

# Lee Clement

## Curriculum Vitae

University of Toronto Institute for Aerospace Studies  
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### Education

- 2013–Present **Ph.D. Candidate**, *University of Toronto*.  
Mobile Robotics, Computer Vision, Machine Learning, Sensor Fusion
- 2010–2013 **B.Sc.(Maj.) with Distinction**, *University of Manitoba*, GPA: 4.31/4.50.  
Physics, Computer Science
- 2006–2010 **B.Comm.(Hons.) with Distinction**, *University of Manitoba*, GPA: 4.13/4.50.  
Accounting, Finance

### Research Experience

- 2013–Present **Ph.D. Candidate**, *University of Toronto Institute for Aerospace Studies*.  
*Thesis*: Learning models of appearance change with applications to direct visual SLAM  
*Supervisor*: Prof. Jonathan Kelly
- 2013 **Research Assistant**, *Argonne National Laboratory - Physics Division*.  
Participated in experiments with the Argonne Tandem Linac Accelerator System (ATLAS).  
*Supervisors*: Prof. Kumar Sharma and Dr. Jason Clark
- 2012 **Research Assistant**, *University of Manitoba - Physics and Astronomy*.  
Developed and implemented a bipolar outflow model in MATLAB and C for use in astro-physical modelling software.  
*Supervisor*: Prof. Jason Fiege

### Teaching Experience

- 2018 **Course Instructor**, *University of Toronto*.  
AER 521 - Mobile Robotics and Perception
- 2015–2017 **Teaching Assistant**, *University of Toronto*.  
ROB 301 - Introduction to Robotics  
AER 521 - Mobile Robotics and Perception

### Major Grants and Awards

- 2015–2018 **NSERC Postgraduate Scholarship - Doctoral Program**, *University of Toronto*.
- 2014–2015 **Kenneth Molson Fellowship**, *University of Toronto*.
- 2014–2015 **NSERC Canada Graduate Scholarship - Master's Program**, *University of Toronto*.
- 2012, 2013 **NSERC Undergraduate Student Research Award**, *University of Manitoba*.
- 2011, 2012 **Centennial Scholarship in Physics**, *University of Manitoba*.

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## Volunteer Work

- 2016-2017 **President, Aerospace Students' Association.**  
The Aerospace Students' Association represents graduate students at UTIAS and organizes athletic, social, academic and professional events.  
*Previously: Social Coordinator (2015-2016)*
- 2016-2017 **Co-founder/Aerospace Representative, GECoS.**  
The Graduate Engineering Council of Students acts as a forum for all Engineering Graduate Student Associations at UofT to collaborate and represent Engineering graduate students.
- 2016, 2017 **Student Member, UTIAS Student Experience Committee.**  
The SEC is gathers data about the UTIAS student body's experiences at the Institute and makes a report to the Director summarizing the data and suggesting improvements.
- 2014-2017 **Re-founder/Director, SEDS-Canada.**  
Students for the Exploration and Development of Space (SEDS) is an international group of student-run organizations dedicated to promoting public interest in space.

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## Professional Affiliations

- Student Member, IEEE, IEEE Young Professionals, IEEE Robotics and Automation Society.**
- Student Member, Canadian Image Processing and Pattern Recognition Society (CIPPRS).**

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## Publications

- [1] L. Clement and J. Kelly, "How to train a CAT: Learning canonical appearance transformations for robust direct localization under illumination change," *Submitted to the IEEE International Conference on Robotics and Automation (ICRA)*, under review, 2018.
- [2] V. Peretroukhin<sup>†</sup>, L. Clement<sup>†</sup>, and J. Kelly, "Inferring sun direction to improve visual odometry: A deep learning approach," *International Journal of Robotics Research (IJRR)*, invited, under review, 2017, <sup>†</sup>Joint first authorship.
- [3] —, "Reducing drift in visual odometry by inferring sun direction using a bayesian convolutional neural network," in *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, Singapore, 2017, <sup>†</sup>Joint first authorship.
- [4] J. Lambert, L. Clement, M. Giamou, and J. Kelly, "Entropy-based Sim(3) calibration of 2D lidars to egomotion sensors," in *Proceedings of the IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, Baden-Baden, Germany, 2016, Best Student Paper Award.
- [5] L. Clement, J. Kelly, and T. D. Barfoot, "Robust monocular visual teach and repeat aided by local ground planarity and colour-constant imagery," *Journal of Field Robotics*, 2016.
- [6] L. Clement, V. Peretroukhin, and J. Kelly, "Improving the accuracy of stereo visual odometry using visual illumination estimation," in *Proceedings of the IFRR International Symposium on Experimental Robotics (ISER)*, Tokyo, Japan, 2016, Toyota Student Participation Award.

- [7] V. Peretroukhin, L. Clement, M. Giamou, and J. Kelly, "PROBE: Predictive robust estimation for visual-inertial navigation," in *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2015, pp. 3668–3675.
- [8] L. Clement, J. Kelly, and T. D. Barfoot, "Monocular visual teach and repeat aided by local ground planarity," in *Proceedings of the 10th Conference on Field and Service Robotics (FSR)*, Toronto, Canada, Jun. 2015, pp. 547–561.
- [9] L. Clement<sup>†</sup>, V. Peretroukhin<sup>†</sup>, J. Lambert, and J. Kelly, "The battle for filter supremacy: A comparative study of the multi-state constraint kalman filter and the sliding window filter," in *Proceedings of the 12th Conference on Computer and Robot Vision (CRV)*, Halifax, Canada, Jun. 2015, pp. 23–30, <sup>†</sup>Joint first authorship.
- [10] V. Peretroukhin, L. Clement, and J. Kelly, "Get to the point: Active covariance scaling for feature tracking through motion blur," in *Proceedings of the ICRA Workshop on Scaling Up Active Vision*, Seattle, USA, May 2015.
- [11] L. Clement, J. Kelly, and T. D. Barfoot, "Monocular vision for long-range visual teach and repeat in unstructured environments," *NSERC Canadian Field Robotics Network (NCFRN) and Conference on Computer and Robot Vision (CRV) Joint Poster Session*, May 2014.
- [12] B. Russell, L. Clement, J. Hernandez, A. Byagowi, D. Schor, and W. Kinsner, "Implementation of a nanosatellite attitude determination and control system for the T-Sat1 mission," in *Proceedings of the Canadian Conference on Electrical and Computer Engineering (CCECE)*, Regina, Canada, May 2013.