Valentin Peretroukhin

University of Toronto
Institute for Aerospace Studies
Toronto, ON M5R1Z6 Canada

Phone: 416-557-1519

email: v.peretroukhin@mail.utoronto.ca
URL: http://valentinp.com

Current position

PH.D. CANDIDATE, Space and Terrestrial Autonomous Robotic Systems Lab
University of Toronto
Thesis: *On Learning Deep, Probabilistic Measurement Models for State Estimation*
Supervised by Professor Jonathan Kelly

Areas of specialization

Deep Learning for State Estimation • Uncertainty Quantification • Constrained Optimization

Education

2014 M.A.Sc. (Incomplete, direct transfer to Ph.D.) in Aerospace Robotics
Institute for Aerospace Studies, University of Toronto, GPA: 4.00/4.00

2013 B.A.Sc. in Engineering Science, Aerospace Major
University of Toronto, GPA: 3.86/4.00.
Senior Thesis: *Optimal Camera Perspective for Stereo Visual Odometry*
Supervised by Professor Tim Barfoot

Grants, honours & awards

2015 **NSERC Alexander Graham Bell Canada Graduate Scholarship-Doctoral**
CGS-D3, 3 years, $105 000 total value

2015 **Ontario Centre of Excellence SmartStart Seed Grant**
Awarded to Diem Medical, $25 000 total value

2013 **NSERC Canada Graduate Scholarships-Master's Program**
CGS-M, 1 year, $17 500 total value

2012 **Canadian Space Agency Student Travel Bursary**
Student travel to the International Symposium for Physical Sciences in Space, $2 000 total value

2010 **NSERC Undergraduate Summer Research Award**
For research in the Flight Systems and Control Lab, $4 500 total value

Publications

2018 V. Peretroukhin, L. Clement, and J. Kelly, "Inferring sun direction to improve visual odometry: A deep learning approach," *International Journal of Robotics Research*, 2018

2018 V. Peretroukhin and J. Kelly, "DPC-Net: Deep pose correction for visual localization," *IEEE Robotics and Automation Letters*, 2018

2017 B. Wagstaff, V. Peretroukhin, and J. Kelly, "Improving foot-mounted inertial navigation through real-time motion classification," in *Proceedings of the International Conference on Indoor Positioning and Indoor Navigation (IPIN'17)*, Sapporo, Japan, Sep. 18–21 2017

2017 V. Peretroukhin, L. Clement, and J. Kelly, "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'17)*, Singapore, May 29–Jun. 3 2017, pp. 2035–2042

2017 L. Clement, V. Peretroukhin, and J. Kelly, "Improving the accuracy of stereo visual odometry using visual illumination estimation," in *2016 International Symposium on Experimental Robotics*, ser. Springer Proceedings in Advanced Robotics, D. Kulic, Y. Nakamura, O. Khatib, and G. Venture, Eds. Berlin Heidelberg: Springer International Publishing, 2017, vol. 1, pp. 409–419, invited to Journal Special Issue

2016 V. Peretroukhin, W. Vega-Brown, N. Roy, and J. Kelly, "PROBE-GK: Predictive robust estimation using generalized kernels," in *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA'16)*, Stockholm, Sweden, May 16–21 2016, pp. 817–824

2015 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'15)*, Hamburg, Germany, Sep. 28–Oct. 2 2015, pp. 3668–3675

2015 V. Peretroukhin, L. Clement, and J. Kelly, "Get to the point: Active covariance scaling for feature tracking through motion blur," in *Proceedings of the IEEE International Conference on Robotics and Automation Workshop on Scaling Up Active Perception*, Seattle, Washington, USA, May 30 2015

2015 L. Clement, V. Peretroukhin, 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'15)*, Halifax, Nova Scotia, Canada, Jun. 3–5 2015, pp. 23–30

2015 B. Stenning, L. Bajin, C. Robson, V. Peretroukhin, G. R. Osinski, and T. D. Barfoot, *Towards autonomous mobile robots for the exploration of steep terrain.* Springer International Publishing, 2015, pp. 33–47

2014 V. Peretroukhin, J. Kelly, and T. D. Barfoot, "Optimizing camera perspective for stereo visual odometry," in *Proceedings of the Canadian Conference on Computer and Robot Vision (CRV'14)*, Montreal, Quebec, Canada, May 7–9 2014, pp. 1–7

Teaching

Course Instructor

2018 **AER521: Mobile Robotics and Perception**
Winter 2018, Co-Instructor, 60 students

- Fourth year / graduate course in mobile robotics control, motion planning, and state estimation.
- Presented lectures on vehicle modelling, path tracking control, path planning, visual odometry, SLAM, and machine learning for robotics (Deep Learning and Gaussian Processes).

Teaching Assistant

2013-2017 **ESC103: Engineering Mathematics and Computation**
Fall 2013-2017, Tutorial and Lab Teaching Assistant, 2 sections, 20+ Students in each

- Taught weekly tutorials and labs with engaging discussions and interactive lessons on topics in linear algebra and scientific programming in MATLAB.
- Led the creation and administration of MATLAB lab assignments and final examination in 2016.
- Consistently highly ranked in Teaching Assistant evaluations. Nominated for Teaching Excellence Award.

2017 **Engineering Problem Solving and Mathematics**
Summer 2017, Teaching Assistant and Co-Organizer, 12 Students

- Co-organized a week-long summer preparatory course for incoming first year engineering students.
- Introduced scientific computing through MATLAB. Created and facilitated a laboratory exercise that implemented differential equations through circuits.

2014 **CSC190: Computer Algorithms and Data Structures**
Winter 2014, Lab & Teaching Assistant

- Lead bi-weekly labs for two sections of 100+ first year engineering students. Taught fundamental data structures and algorithms in C.

Leadership Experience

2015-2017 **Diem Medical (formerly Pillsy)**
Co-founder and CTO

- Created Diem Pouch: a smart pill pouch and app that helps patients take medication consistently. Lead development of iOS app and integration with Bluetooth-enabled hardware.
- Accepted into two accelerators: Start at UTIAS and Hatchery. Received funding from the Ontario Centre of Excellence. Invited to open Toronto Stock Exchange.
- Press from University of Toronto Press, the Toronto Star, and Wired Magazine.

2013-2016 **Aerospace Students' Association**
Executive Member, President (2015-2016)

- Served on executive committee for a student body of over 120 graduate students at the University of Toronto Institute for Aerospace Studies.
- Lead the organization of several events and committees at the Institute, including a comprehensive student feedback report, an interactive booth at the *Science Rendezvous*, and an invited speaker seminar series.

Professional Experience

2013 **Autonomous Space Robotics Lab**
Research Assistant, University of Toronto

- Adapted Visual Teach & Repeat algorithm to work on quadrotor in collaboration with a student at ETH, Zurich.
- Extended and re-constructed instrumented ascender assembly on rover to better assist in high gradient descents.

2011-2012 **Canadian Space Agency**
Student Researcher, Physical Sciences in Space, St.Hubert, Quebec.

- Developed parallel software toolkit in Mathematica to analyze residual gravity levels from the International Space Station, Parabolic Aircraft and recoverable satellites.
- Participated in 2 different campaigns onboard the Falcon 20 parabolic aircraft, accumulating over an hour of reduced gravity time.
- Presented a research poster at International Symposium for Physical Sciences in Space in Bonn, Germany.
- Lead an interactive zero gravity workshop for over 60 French and English secondary school teachers at a Space Educators Conference.

Language Fluency

English (*native*), Russian (*fluent*), French (*working knowledge*)

Other Interests & Hobbies

- General Aviation
  I hold a Canadian Private Pilot's License and love flying Cessna 172s for fun!
- Philosophy
  I am an avid reader of primary and secondary philosophical texts (from Aristotle to Camus). I sometimes write about them in a blog/podcast called NeverFromConcentrate.
- Athletics & the Outdoors
  I play soccer, hockey, basketball, and tennis. I am an avid snowboarder, and love to hike and camp.