VASSILI KOROTKINE

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Canadian Citizen, eligible for TN visa.

Summary

Robotics researcher and engineer completing a PhD in state estimation for mobile robots. Expertise in multi-sensor fusion (lidar, IMU, GNSS, wheel odometry), factor graph optimization, and Lie group-based estimation, with C++ and Python implementations. Four first-authored or co-authored publications in RA-L and IROS, plus three months of on-site industry collaboration with Denso Corporation as well as a yearlong research collaboration with Provectus Robotics.

Education

Ph.D. in Mechanical Engineering *Expected December 2026*

McGill University — Montreal, Canada

- Thesis: *Sensor Fusion Optimization Algorithms With Multi-Modal Measurement Models*
- Advisor: James Richard Forbes
- Industry Collaborations: Denso Corporation and Provectus Robotics. Focus on state estimation and sensor calibration for ground vehicles.

M.Sc. in Mechanical Engineering *2022*

McGill University — Montreal, Canada

- Thesis: *State Estimation on Matrix Lie Groups Using Iterative Filters*

B.Eng. in Mechanical Engineering *2020*

McGill University — Montreal, Canada

Technical Skills

State Estimation:	EKF, UKF, factor graph optimization (Ceres), particle filters
Sensor Fusion:	Lidar-IMU calibration, visual-inertial odometry, GNSS/INS integration, wheel odometry
Mathematics:	Lie groups (SO(3), SE(3)), manifold optimization, Bayesian inference, nonlinear least squares
Languages:	C++, Python
Libraries/Tools:	Eigen, Sophus, PCL, ROS
Systems:	Linux, Git, Docker

Research Experience

Graduate Research Assistant *2022 – Present*

Dynamics, Estimation, and Control in Aerospace and Robotics (DECAR), McGill University

- Analyzed a LiDAR-IMU targetless calibration pipeline using Ouster and Velodyne LiDAR datasets and Gazebo simulation. Characterized sensitivity of LiDAR-inertial system error to extrinsic calibration error. Currently extending to radar-inertial calibration. Research done in collaboration with Provectus Robotics.
- Developed the first polynomial-time globally optimal method for landmark-based localization with unknown data associations. Published in Robotics & Automation Letters.

- Developed a scheme for using Gaussian mixture measurement likelihoods in nonlinear least-squares solvers that addresses uncertainty characterization and convergence issues in existing methods. Published in Robotics & Automation Letters.

Industry Experience

Research Collaboration — Denso Corporation *Fall 2023 (three months on-site)*

Tokyo, Japan

- Collaborated on-site with Denso engineers prototyping visual-inertial navigation systems for assisted driving.
- Diagnosed and resolved calibration issues in a stereo camera and IMU sensor rig, delivering a working prototype.

Publications

1. **V. Korotkine**, M. Cohen and J. R. Forbes, "Globally Optimal Data-Association-Free Landmark-Based Localization Using Semidefinite Relaxations," *IEEE Robotics and Automation Letters*, vol. 10, no. 10, pp. 10250–10257, Oct. 2025.
2. **V. Korotkine**, M. Cohen and J. R. Forbes, "A Hessian for Gaussian Mixture Likelihoods in Nonlinear Least Squares," *IEEE Robotics and Automation Letters*, vol. 9, no. 9, pp. 7891–7898, Sept. 2024.
3. C. C. Cossette, M. Cohen, **V. Korotkine**, A. Del Castillo Bernal, M. A. Shalaby and J. R. Forbes, "navlie: A Python Package for State Estimation on Lie Groups," *IEEE/RSJ IROS*, Detroit, MI, 2023, pp. 5282–5287.
4. Z. C. Guo, **V. Korotkine**, J. R. Forbes and T. D. Barfoot, "Koopman Linearization for Data-Driven Batch State Estimation of Control-Affine Systems," *IEEE Robotics and Automation Letters*, vol. 7, no. 2, pp. 866–873, April 2022.

Projects

navlie *github.com/decargroup/navlie*

- Open-source Python library for on-manifold state estimation implementing EKF, UKF, particle filters, and batch solvers on Lie groups. Contributed the Interacting Multiple Model Filter module, used in a subsequent group publication. 189 GitHub stars. Presented at IROS 2023.

estimation_evaluation_toolbox *github.com/vkorotkine/estimation_evaluation_toolbox*

- Toolbox for automated evaluation of navigation systems, including C++-to-analysis pipelines and parameter sensitivity studies. Applied to analysis of GRIL-Calib, a LiDAR-IMU calibration system for ground vehicles.

Teaching & Mentorship

- Teaching Assistant, Numerical Methods in Mechanical Engineering, Fall 2021. Gave tutorials to a class of 90 students.
- Supervisory Experience Program: supervised a junior student in the DECAR lab, Summer 2026.
- Senior student on industry collaboration with Provectus Robotics Solutions. Supervised and supported junior students on the project.

Other Interests

Organized social events for the McGill Triathlon Club and the Graduate Association of Mechanical Engineering Students. Occasional baker.