

# Justin Tomasi

Mobile Robotics, Computer Vision, Machine Learning, State Estimation

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## Education

### Master of Applied Science, Aerospace Engineering • University of Toronto

Toronto, Canada

Institute for Aerospace Studies • Space and Terrestrial Autonomous Robotic Systems (STARS) Lab

2018 - 2020

- Thesis title: "Learned Adjustment of Camera Gain and Exposure Time for Improved Visual Feature Detection and Matching." Advised by Dr. Jonathan Kelly.
- Ontario Graduate Scholarship valued at \$10,000.

### B.E.Sc., Electrical Engineering (with Distinction) • Western University

London, Canada

Department of Electrical and Computer Engineering • Faculty of Engineering

2011 - 2016

- NSERC undergraduate research award.
- Jean Ann Maynard Scholarship Recipient.
- Bluewater Power 4th Year Capstone Project Award.

## Experience

### Graduate Researcher • University of Toronto

Toronto, Canada

Institute for Aerospace Studies • Space and Terrestrial Autonomous Robotic Systems (STARS) Lab

2018 - 2020

- Research focused on improving the robustness of visual perception algorithms for autonomous vehicles.
- Made extensive use of modern state estimation, computer vision, and visual navigation algorithms.
- Developed and tested a predictive deep learning-based camera parameter adjustment system that runs online.
- Conducted real-world driving experiments using vehicles equipped with machine-vision cameras.
- Obtained improved robustness and performance of visual odometry in challenging lighting conditions.

### Laboratory Teaching Assistant • University of Toronto

Toronto, Canada

ROB301: Introduction to Robotics • Division of Engineering Science

2019

- Assisted in the development, implementation, and troubleshooting of autonomous robot laboratory experiments in ROS.
- Instructed and guided students with the implementation of state estimation, perception and control algorithms.

## Projects

### LiDAR-IMU Calibration for an Autonomous Vehicle • University of Toronto

Toronto, Canada

AER 1514 Mobile Robotics Course Project

2019

- Implemented a state-of-the-art sensor calibration technique for a 3D Velodyne LiDAR-to-IMU calibration.
- Utilized real-world Velodyne point cloud and IMU data captured using the 'aUToronto' autonomous vehicle.

### SLAM using Factor Graphs and GTSAM • University of Toronto

Toronto, Canada

AER 1513 State Estimation Course Project

2018

- Implemented a SLAM algorithm using factor graphs for various mobile robot datasets.
- Utilized the Georgia Tech Smoothing and Mapping (GTSAM) library to solve the SLAM problem.

## Skills

### Technical Expertise

Visual Navigation, SLAM, Deep Learning, Computer Vision, State Estimation, Sensor Calibration

### Programming

C++, Python, ROS, MATLAB, LaTeX, Git, Linux

### Libraries

C++ Standard Library, PyTorch, NumPy, SciPy, OpenCV, PCL, ORB-SLAM2, Libviso2, GTSAM

### Hardware

Various Machine Vision Cameras, Various Mobile Robot Platforms, 2D/3D LiDARs

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## Professional and Extracurricular Activities

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### VP Social • Aerospace Students' Association

Toronto, Canada

University of Toronto Institute for Aerospace Studies

2018-2019

- The ASA represents graduate students at UTIAS and organizes athletic, social, academic, and professional events.

### Engineer in Training • PEO

Toronto, Canada

Professional Engineers Ontario

2016-Present

- The PEO is the regulatory body for the engineering profession in Ontario.

### Student Volunteer • Canadian National Exhibition UTIAS Demo Booth

Toronto, Canada

University of Toronto Institute for Aerospace Studies

2019

- The Centre for Aerial Robotics Research and Education hosted a demonstration booth at the Canadian National Exhibition.

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## Awards & Honours

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2019 **Ontario Graduate Scholarship**, \$10,000

Toronto, Canada

2016 **Jean Ann Maynard Scholarship**, \$1,800

London, Canada

2016 **Bluewater Power Distribution 4th Year Project Award**, \$400

London, Canada

2015 **NSERC Undergraduate Research Award**, \$4,500

London, Canada

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## Publications

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- [1] J. Tomasi, B. Wagstaff, S. L. Waslander, and J. Kelly, "Learned camera gain and exposure control for improved visual feature detection and matching," *submitted to: IEEE Robotics and Automation Letters*, 2021.
- [2] J. Tomasi, "Learned adjustment of camera gain and exposure time for improved visual feature detection and matching," Master's thesis, University of Toronto, 2020.
- [3] L. Clement, M. Gridseth, J. Tomasi, and J. Kelly, "Learning Matchable Image Transformations for Long-Term Metric Visual Localization," *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 1492–1499, 2020.