Abhishek Goudar

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I am a full-stack roboticist building systems and algorithms to enable aerial and ground vehicles to operate reliably in everyday environments.

Education

Ph.D. in Robotics September 2020–Current
Institute for Aerospace Studies, University of Toronto, Toronto, Canada
Advisor: Angela P. Schoellig
Topic: Localization for Indoor Environments

Master of Science –Robotic Systems Development July 2014 –December 2015
School of Computer Science, Carnegie Mellon University, Pittsburgh, USA

B.E. in Electronics and Communication(First class with distinction) July 2009 - August 2013
Visvesvaraya Technological University, India

Publications

[1] **A. Goudar** and A. P. Schoellig, "Online Spatio-temporal Calibration of Tightly-coupled Ultrawideband-aided Inertial Localization", in *Proc. of the RSJ International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic: IEEE, Sep. 2021, pp. 1161–1168

[2] **A. Goudar**, W. Zhao, T. D. Barfoot, *et al.*, "Gaussian Variational Inference with Covariance Constraints Applied to Range-only Localization", in *Proc. of the RSJ International Conference on Intelligent Robots and Systems (IROS)*, Kyoto, Japan: IEEE, Oct. 2022, pp. 2872–2879

[3] W. Zhao, **A. Goudar**, and A. P. Schoellig, "Finding the right place: Sensor placement for UWB time difference of arrival localization in cluttered indoor environments", *IEEE Robotics and Automation Letters*, vol. 7, no. 3, pp. 6075–6082, 2022

[4] **A. Goudar**, T. D. Barfoot, and A. P. Schoellig, "Continuous-Time Range-Only Pose Estimation", in *Proc. of the 20th Conference on Robots and Vision (CRV)*, Montreal, QC, Canada: IEEE, Jun. 2023, pp. 29–36

[5] W. Zhao, **A. Goudar**, M. Tang, *et al.*, "Uncertainty-Aware Gaussian Mixture Model for UWB Time Difference of Arrival Localization in Cluttered Environments", in *Proc. of the RSJ International Conference on Intelligent Robots and Systems (IROS)*, Detroit, MI, USA: IEEE, Oct. 2023, pp. 5266–5273

[6] **A. Goudar**, W. Zhao, and A. P. Schoellig, "Range-Visual-Inertial Sensor Fusion for Micro Aerial Vehicle Localization and Navigation", *IEEE Robotics and Automation Letters*, vol. 9, no. 1, pp. 683–690, Jan. 2024

[7] **A. Goudar**, F. Dümbgen, T. D. Barfoot, *et al.*, "Optimal Initialization Strategies for Range-Only Trajectory Estimation", *IEEE Robotics and Automation Letters*, vol. 9, no. 3, pp. 2160–2167, Mar. 2024

[8] W. Zhao, **A. Goudar**, X. Qiao, *et al.*, "UTIL: An ultra-wideband time-difference-of-arrival indoor localization dataset", *The International Journal of Robotics Research*, vol. 43, no. 10, pp. 1443–1456, Sep. 2024

[9] W. Zhao*, A. Goudar*, M. Tang*, *et al.*, *Ultra-wideband Time Difference of Arrival Indoor Localization: From Sensor Placement to System Evaluation*, Dec. 2024. arXiv: 2412.12427 [cs](* denotes equal contribution)

[10] **A. Goudar** and A. P. Schoellig, "Sensor Query Schedule and Sensor Noise Covariances for Accuracy-Constrained Trajectory Estimation", *IEEE Robotics and Automation Letters*, vol. 10, no. 7, pp. 6983–6990, Jul. 2025

[11] **A. Goudar** and A. P. Schoellig, "Decentralized and Fully Onboard: Range-aided Cooperative Localization and Navigation on Micro Aerial Vehicles", *IEEE Robotics and Automation Letters*, vol. (Submitted), 2025

Teaching Experience

University of Toronto, ON, Canada — Winter 2024 and Winter 2025
Teaching Assistant: ROB498 Robotics Capstone

- Developed hardware (hardware wiring, assembly, and software configuration) kits for building quadrotors.
- Held weekly office hours and graded assignments.

Carnegie Mellon University, Pittsburgh, USA — Winter 2015
Teaching Assistant: 16-642 Manipulation, Mobility and Control

- Held weekly office hours for assisting students with assignments.
- Assisted with marking assignments and exams.

Nagraj Tutorials, Karnataka, India — 2013-2014
Teaching Assistant: Engineering Mathematics

- Lecturer for 20 hours of content for Engineering Calculus I, II and III.

Work Experience

Humatics , Waltham, USA — 2018 –2019
Robotics Software Engineer

- Developed sensor fusion algorithms for Ultra-wideband-aided localization.
- Assisted with testing and deployment of prototype localization software stack at multiple venues.

5D Robotics, Carlsbad, USA — 2016 –2018
Robotics Software Engineer

- Developed localization algorithms for Ultra-wideband-aided localization.
- Developed communication libraries for Time Domain radios, Segway platforms, and other robotic platforms.
- Systems Integrator for fully scale autonomy on unmanned ground vehicles (UGVs).

Near Earth Autonomy, Pittsburgh, USA — Summer, 2016
Software Intern

- User interface (UI) and hardware driver development for oscillation scanning mode on Riegl Lidars.

Skills

- **Languages:** C, C++, Python, Julia.
- **Hardware:** STM32 ARM Cortex series, Arduino.
- **Libraries:** GTSAM, Ceres, ROS, ROS2, git, PX4-Autopilot, Docker.