

# Wenda Zhao

Postdoctoral Fellow, University of Toronto Institute for Aerospace

Studies (UTIAS)

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Google Scholar: [scholar.google.com](https://scholar.google.com)



## RESEARCH INTERESTS

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I am a researcher in artificial intelligence and robotics dedicated to developing resilient autonomy for the most challenging environments on Earth and beyond. I hold a Ph.D. in Artificial Intelligence and Robotics from the University of Toronto Institute for Aerospace Studies (UTIAS), where I was advised by Professor Angela P. Schoellig, and I am currently a Postdoctoral Fellow with Professor Tim Barfoot, focusing on lidar-based continuous-time state estimation in geometry-degenerated environments. I am also affiliated with the University of Toronto Robotics Institute and the Vector Institute.

My research spans state estimation, reinforcement learning, and autonomous navigation, with a consistent emphasis on deploying systems in real-world, challenging conditions. My broader vision is to create fully autonomous systems that thrive where human access is limited: planetary exploration, underground mining, disaster response, and deep-ocean operations. By uniting advanced sensing, robust estimation, and AI reasoning, my research takes an interdisciplinary step toward resilient autonomy with broad scientific, industrial, and societal impact.

## EDUCATION

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- **University of Toronto** 2018 – 2024  
*Ph.D. in Aerospace Science and Engineering* Toronto, ON
  - Supervisor: Prof. Angela P. Schoellig
  - Thesis: Robust and accurate localization for heterogeneous agents using ultra-wideband (UWB) radio technology
  - Affiliations: Vector Institute, UofT Robotics Institute
- **Tongji University** 2015 – 2018  
*M.Eng. in Control Science and Engineering* Shanghai, China
  - Supervisor: Prof. Yongqing Su
  - Research: Fault and defect inspection of power systems

## EXPERIENCE

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- **Postdoctoral Fellow** 2025 – Present  
*University of Toronto, UTIAS* Toronto, ON
  - Working with Prof. Timothy D. Barfoot on lidar-based continuous-time state estimation in geometry-degenerated environments.
- **Researcher** 2024 – Present  
*UofT Autonomous Drone Racing (ADR) Team* Toronto, ON
  - Lead localization research for AI-enabled autonomous drone racing.
  - Developed visual-inertial localization pipelines for high-speed, agile flight.
- **Researcher** 2020 – Present  
*Vector Institute & UofT Robotics Institute* Toronto, ON
  - Explored reinforcement learning and optimal control for robotic decision-making.
  - Developed robust UWB-based localization systems with learning-based methods for non-Gaussian noise modeling.
- **Research Assistant** 2024  
*Technical University of Munich* Munich, Germany
  - Worked on AI-enabled autonomous drone racing with the Learning Systems and Robotics Lab.

**• Journal Articles**

- **Wenda Zhao**<sup>†</sup>, Abhishek Goudar<sup>†</sup>, Mingliang Tang<sup>†</sup>, and Angela P. Schoellig, Ultra-wideband Time Difference of Arrival Indoor Localization: From Sensor Placement Analysis to System Evaluation – IEEE Robotics and Automation Magazine (RA-M), 2024. (Under review)
- **Wenda Zhao**, Abhishek Goudar, Xinyuan Qiao, and Angela P. Schoellig, UTIL: An Ultra-wideband Time-difference-of-arrival Indoor Localization Dataset – International Journal of Robotics Research (IJRR), 2024.
- **Wenda Zhao**, Abhishek Goudar, and Angela P. Schoellig, Finding the Right Place: Sensor Placement for UWB Time Difference of Arrival Localization in Cluttered Indoor Environments – IEEE Robotics and Automation Letters (RA-L), presented at ICRA 2023.
- Abhishek Goudar, **Wenda Zhao**, and Angela P. Schoellig, Range-visual-inertial sensor fusion for micro aerial vehicle localization and navigation – IEEE Robotics and Automation Letters (RA-L), 2023.
- Siqi Zhou, Karime Pereida, **Wenda Zhao**, and Angela P. Schoellig, Bridging the Model-Reality Gap with Lipschitz Network Adaptation – IEEE Robotics and Automation Letters (RA-L), presented at ICRA 2022.
- Navid Kayhani, **Wenda Zhao**, Brenda McCabe, and Angela P. Schoellig, Tag-based Visual-inertial Localization of UAVs in Indoor Construction Environments using an On-manifold Extended Kalman Filter – Automation in Construction, 2022.
- **Wenda Zhao**, Jacopo Panerati, and Angela P. Schoellig, Learning-based Bias Correction for Time Difference of Arrival Ultra-wideband Localization of Resource-constrained Mobile Robots – IEEE Robotics and Automation Letters (RA-L), presented at ICRA 2021.

**• Conference Papers**

- **Wenda Zhao**, Abhishek Goudar, Mingliang Tang, Xinyuan Qiao, and Angela P. Schoellig, Uncertainty-aware Gaussian Mixture Model for UWB Time Difference of Arrival Localization in Cluttered Environments – IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023.
- Abhishek Goudar, **Wenda Zhao**, Timothy D. Barfoot, and Angela P. Schoellig, Gaussian Variational Inference with Covariance Constraints Applied to Range-only Localization – IROS, 2022.
- **Wenda Zhao**, Marijan Vukosavljev, and Angela P. Schoellig, Optimal Geometry for Ultra-wideband Localization using Bayesian Optimization – IFAC World Congress, 2020.
- Navid Kayhani, Adam Heins, **Wenda Zhao**, Mohammad Nahangi, Brenda McCabe, and Angela P. Schoellig, Improved tag-based indoor localization of UAVs using extended Kalman filter – ISARC, 2019.
- **Wenda Zhao**, Yongqing Su, Jiguang Yue, Huihua Mu, and Xuejiao Liu, Fragility Analysis and Weak Point Identification of Power Systems – AOPC, 2017.

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STUDENT SUPERVISION**• Xinyuan Sam Qiao**

2021 – 2022

*Undergraduate Thesis, Engineering Science, University of Toronto*

- Supervised thesis on multi-quadrotor cooperative flight with UWB-aided relative state estimation and control. Guided platform building, algorithm design, and implementation.

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TEACHING EXPERIENCE**• Teaching Assistant**

2019 – 2023

*University of Toronto Institute for Aerospace Studies*

- Graduate course: AER1217 Development of Autonomous Unmanned Aerial Systems.
- Designed materials, delivered lectures, and supervised labs on quadrotor control, vision-based georeferencing, stereo VO, and path planning.

## TECHNICAL SKILLS

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**Languages:** English, Mandarin

**Programming:** Python, C/C++, MATLAB

**Frameworks:** ROS, Docker, PyTorch

**Software:** Altium Designer, FreeCAD

**Research Areas:** State Estimation, Localization, Perception, Reinforcement Learning, Autonomy

## REFERENCES

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- **Prof. Angela P. Schoellig** | <https://www.dynsyslab.org/prof-angela-schoellig/>

Alexander von Humboldt Professor, Technical University of Munich  
Faculty Member, Vector Institute; University of Toronto Robotics Institute  
Board of Directors, Munich Institute of Robotics and Machine Intelligence

- **Prof. Timothy D. Barfoot** | <http://asrl.utias.utoronto.ca/tdb/>

Professor, University of Toronto Institute for Aerospace Studies  
Associate Director, University of Toronto Robotics Institute  
Canada Research Chair (Tier II), Canada Research Chairs Program

- **Prof. Steven L. Waslander** | <https://www.trailab.utias.utoronto.ca/stevenwaslander>

Professor, University of Toronto Institute for Aerospace Studies  
Affiliated Professor, Vector Institute; University of Toronto Robotics Institute