Wennie Tabib

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Objective

My long-term research objective is to accelerate the assimilation of intelligent active perceiver robots into society by innovating methods that (1) unify perceptual pipelines to enable perception in the small; (2) select informative visual fields to sense; and (3) model the consequences of actions.

Education

Ph.D. in Computer Science, Carnegie Mellon University — 2019
Thesis: *Approximate Continuous Belief Distributions for Exploration*
Advisors: Nathan Michael and Red Whittaker

M.S. in Robotics, Carnegie Mellon University — 2014
Advisor: Red Whittaker

B.S. in Computer Science, Carnegie Mellon University — 2012

Employment

Systems Scientist — 2021 – present
Robotics Institute, Carnegie Mellon University
PI of the Resilient Intelligent Systems Lab

Postdoctoral Fellow — 2019 – 2021
Robotics Institute, Carnegie Mellon University
Resilient Intelligent Systems Lab (PI: Nathan Michael)

Research Assistant — 2014 – 2019
Computer Science Department, Carnegie Mellon University
Resilient Intelligent Systems Lab (PI: Nathan Michael)
Planetary Robotics Lab (PI: Red Whittaker)

Software Engineer — 2013 – 2015
Astrobotic Technology, Inc.

Hardware Engineer Intern — 2012
Astrobotic Technology, Inc.

Software Engineer Intern — 2011

Apple, Inc.

Software Engineer Intern 2010
Northrop Grumman

Awards and Honors

SSRR: Best Paper Award 2024
Out of 44 accepted papers

T-RO: King-Sun Fu Memorial Best Paper Award Honorable Mention 2023
Out of 200 accepted journal articles

SSRR: Best Paper Award 2022
Out of 56 accepted papers

NASA Space Technology Research Fellowship 2014-2018
$272,000 fellowship (54 awarded in 2014).

Paul and Daisy Soros Fellowship for New Americans 2013-2015
$90,000 fellowship for New Americans (30 awarded in 2013)

Publications

Journal Articles

1. Kshitij Goel and **Wennie Tabib**. Incremental multimodal surface mapping via self-organizing gaussian mixture models. *IEEE Robotics and Automation Letters*, 8(12):8358–8365, 2023. doi:10.1109/LRA.2023.3327670

2. Kshitij Goel, Nathan Michael, and **Wennie Tabib**. Probabilistic point cloud modeling via self-organizing gaussian mixture models. *IEEE Robotics and Automation Letters*, pages 1–8, 2023. doi:10.1109/LRA.2023.3256923

3. **Wennie Tabib**, Kshitij Goel, John Yao, Curtis Boirum, and Nathan Michael. Autonomous cave surveying with an aerial robot. *IEEE Transactions on Robotics*, 38(2):1016–1032, 2022. doi:10.1109/TRO.2021.3104459. **Best Paper Award Finalist**

4. Cormac O'Meadhra, **Wennie Tabib**, and Nathan Michael. Variable resolution occupancy mapping using gaussian mixture models. *IEEE Robotics and Automation Letters*, 4(2):2015–2022, 2019. doi:10.1109/LRA.2018.2889348

5. **Wennie Tabib**, Cormac O'Meadhra, and Nathan Michael. On-manifold gmm registration. *IEEE Robotics and Automation Letters*, 3(4):3805–3812, 2018. doi:10.1109/LRA.2018.2856279

Conference Papers

6. Jonathan Lee, Abhishek Rathod, Kshitij Goel, John Stecklein, and **Wennie Tabib**. Rapid quadrotor navigation using an onboard depth camera. In *2024 IEEE International Symposium on Safety*

Security and Rescue Robotics (SSRR), November 2024. doi:10.48550/arXiv.2411.04326. **Best Paper Award Winner**

7. Kshitij Goel and **Wennie Tabib**. Gira: Gaussian mixture models for inference and robot autonomy. *2024 IEEE International Conference on Robotics and Automation (ICRA)*, pages 6212–6218, 2024. doi:10.1109/ICRA57147.2024.10611216

8. Kshitij Goel, Yves Georgy Daoud, Nathan Michael, and **Wennie Tabib**. Hierarchical collision avoidance for adaptive-speed multirotor teleoperation. In *2022 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pages 20–27, 2022. doi:10.1109/SSRR56537.2022.10018782. **Best Paper Award Winner**

9. Yves Georgy Daoud, Kshitij Goel, Nathan Michael, and **Wennie Tabib**. Collaborative human-robot exploration via implicit coordination. In *2022 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pages 80–86, 2022. doi:10.1109/SSRR56537.2022.10018729

10. Kshitij Goel, **Wennie Tabib**, and Nathan Michael. Rapid and high-fidelity subsurface exploration with multiple aerial robots. In Bruno Siciliano, Cecilia Laschi, and Oussama Khatib, editors, *International Symposium on Experimental Robotics (ISER)*, pages 436–448, Cham, 2021. Springer International Publishing. ISBN 978-3-030-71151-1. doi:10.1007/978-3-030-71151-1_39

11. **Wennie Tabib** and Nathan Michael. Simultaneous localization and mapping of subterranean voids with gaussian mixture models. In Genya Ishigami and Kazuya Yoshida, editors, *Field and Service Robotics*, pages 173–187, Singapore, 2021. Springer Singapore. ISBN 978-981-15-9460-1. doi:10.1007/978-981-15-9460-1_13

12. **Wennie Tabib**, Kshitij Goel, John Yao, Mosam Dabhi, Curtis Boirum, and Nathan Michael. Real-time information-theoretic exploration with gaussian mixture model maps. In *Proceedings of Robotics: Science and Systems*, FreiburgimBreisgau, Germany, June 2019. doi:10.15607/RSS.2019.XV.061

13. **Wennie Tabib**, Red Whittaker, and Nathan Michael. Efficient multi-sensor exploration using dependent observations and conditional mutual information. In *2016 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, pages 42–47, 2016. doi:10.1109/SSRR.2016.7784275

14. **Wennie Tabib**, Micah Corah, Nathan Michael, and Red Whittaker. Computationally efficient information-theoretic exploration of pits and caves. In *2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 3722–3727, 2016. doi:10.1109/IROS.2016.7759548

15. Corinne Vassallo, **Wennie Tabib**, and Kevin Peterson. Orbital slam. In *2015 12th Conference on Computer and Robot Vision*, pages 305–312, 2015. doi:10.1109/CRV.2015.47

16. Heather Jones, **Wennie Tabib**, and William L. Red" Whittaker. Planning views to model planetary pits under transient illumination. In *2015 IEEE Aerospace Conference*, pages 1–15, 2015. doi:10.1109/AERO.2015.7119079

Workshop Papers

17. **Wennie Tabib** and Nathan Michael. Generative modeling of depth observations with gmms for active perception. In *RSS Workshop on Aerial Interaction and Manipulation: Unsolved Challenges*

and Perspectives, 2019

18. **Wennie Tabib**, Cormac O'Meadhra, and Nathan Michael. Robust real-time gmm registration. In *RSS Pioneers Workshop*, 2018

Preprints

19. **Wennie Tabib**, John Stecklein, Caleb McDowell, Kshitij Goel, Felix Jonathan, Abhishek Rathod, Meghan Kokoski, Edsel Burkholder, Brian Wallace, Luis Ernesto Navarro-Serment, Nikhil Angad Bakshi, Tejus Gupta, Norman Papernick, David Guttendorf, Erik E. Kahn, Jessica Kasemer, Jesse Holdaway, and Jeff Schneider. Decentralized uncertainty-aware active search with a team of aerial robots. *arXiv preprint arXiv:2410.08507*, 2024. doi:https://doi.org/10.48550/arXiv.2410.08507. Under review at ISER 2025
20. Kshitij Goel, , and **Wennie Tabib**. Distance and collision probability estimation from gaussian surface models. *ArXiv*, January 2024. doi:10.48550/arXiv.2402.00186. Under review at IROS 2025

Student Advising

Ph.D. Students

Michael Anoruo	2024 – present
Nicole Chan	2024 – present
Kshitij Goel	2021 – 2024

M.S. Students

Jonathan Lee	2023 – present
Akshay Chekuri	2022 – 2024
Rohan Dhesikan	2022 – 2023
Yves Georgy Daoud (co-advisor Nathan Michael)	2021 – 2022

Ph.D. Thesis Committee

Seungchan Kim	–
Maggie Hansen	–
Mohammadreza Mousaei	–
Azarakhsh Keipour	2022

M.S. Thesis Committee

Tyler Harp	2025
Guanqi He	2025
Erin Wong	2023
Yehonathan Litman	2022

Teaching

16-362: Mobile Robots Algorithm Laboratory	Fall 2023, 2024
Website: `https://mral-cmu.github.io`	
16-761: Mobile Robots	Spring 2024,

Website: https://mr-cmu.github.io | 2025

Invited Talks

DARPA Forward Breakthrough in Field Robotics Technical Panel | Nov 2022
Host: Tim Chung
Texas A&M University

DARPA Forward Breakthrough in Field Robotics Technical Panel | Aug 2022
Host: Tim Chung
Colorado State University

2nd RSS Workshop on Informative Path Planning and Adaptive sampling | Jul 2019
Host: Dr. Graeme Best

Massachussets Institute of Technology | May 2019
Host: Prof. Nick Roy

Jet Propulsion Laboratory | Aug. 2016
Host: Dr. Larry Matthies

Service

University, College, and Department Service

Robotics Institute Ph.D. Admissions Committee | 2023–2025

Organizing Committee

Gaussian Representations for Robot Autonomy: Challenges and Opportunities | 2025
Workshop Co-Organizer, Robotics: Science and Systems (R:SS) conference

GIRA: Gaussian Mixture Models for Inference and Robot Autonomy Workshop | 2023
Workshop Co-Organizer, R:SS conference

Robotics: Science and Systems Conference | 2018
Conference Web Chair

Challenges and Opportunities for Resilient Collective Intelligence in Subterranean Domains | 2018
Workshop Co-Organizer, R:SS conference

Resilient Intelligence in Autonomous Systems: Challenges and Opportunities | 2017
Workshop Co-Organizer, R:SS conference

Service in Western Pennsylvania

Netherworld Newsletter Editor | 2022–present
Editor of the Netherworld News for the Pittsburgh Grotto, which contains information about the group's research and exploration activities. Published six times per year.

Mid Alantic Karst Conservancy (MAKC) Science Committee | 2022–present
Evaluate the merit of scientific work to be conducted at the MAKC Cave preserves.

Laurel Caverns Science and Geology Team | 2021–present
Robotic cave mapping and expanding passages deeper into the cave.

Refereeing: Conference and Journals

IEEE Safety, Security, and Rescue Robotics	2022
International Symposium on Robotics Research	2022
IEEE Transactions on Robotics	2016, 2019, 2020, 2021, 2023
Robotics: Science and Systems	2019, 2020
Autonomous Robots	2018, 2021
Robotics and Automation Letters	2018-2020, 2021, 2024
International Symposium on Experimental Robotics	2018, 2020
IEEE International Conference on Robotics and Automation	2021, 2022, 2024

Outreach

Out of Bounds Grotto — 2025

I will be presenting my lab's research to members of the Out of Bounds Grotto. Event details may be found at https://outofboundsgrotto.org/events/.

Senate Robotics Showcase & Demo Day — 2024

Presented my lab's research to members of Congress and their staff. Event details may be found at https://www.cmu.edu/news/stories/archives/2024/may/cmu-co-hosts-senate-robotics-showcase-and-demo-day.

Central Ohio Grotto — 2023

Presentation about how to leverage robots for cave exploration and mapping to members of the Central Ohio Grotto chapter of the National Speleological Society. Event details may be found at https://tinyurl.com/3n3sy32a.

Appalachian Science Communicators at Laurel Caverns — 2022

Presented autonomy for cave exploration and mapping to members of the Appalachian Science Communicators chapter of the National Association for Science Writers at Laurel Caverns. Event details may be found https://www.appscicomm.org/events-1/cave-science-up-close.

NASA Space Technology Research Grants Technology Day — 2017

Presented aerial robotic system and research in caves to members of the House and Senate on Capitol Hill in Washington, D.C.