

Monika Roznere

Computer Science Ph.D. Candidate
Upcoming Assistant Professor of Computer Science

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Academic Appointments

Assistant Professor

Binghamton University

📅 Starting August 2024 📍 Vestal, NY

🏢 Department of Computer Science

Research Interests

How can we enable accessible robots to explore unmapped and poorly understood environments – like the ocean?

Keywords: *marine robotics, active perception, sensor fusion, 3D from multi-view and sonars, multi-sensor calibration, next-best-view planning, camera models, exploration and navigation strategies, multi-robot cooperation, image enhancement, environmental monitoring, localization and mapping, artificial intelligence, machine learning*

Education

Ph.D. in Computer Science

Dartmouth College

📅 Jun. 2024 📍 Hanover, NH

👤 Advisor: Alberto Quattrini Li

📖 *Active 3D Reconstruction Using Monocular Camera and Lights*

B.Sc. in Computer Science

Binghamton University

📅 Jun. 2018 📍 Vestal, NY

🏆 *Magna Cum Laude*

University of Bath

📅 Feb. - May 2017 📍 Bath, England

Employment History

Ph.D. Research Assistant

Dartmouth College

📅 Sep. 2018 – Jun. 2024

📍 Hanover, NH

🏢 Department of Computer Science

👤 Advisor: Alberto Quattrini Li

Guest Ph.D. Student

Woods Hole Oceanographic Institution

📅 Jan. – Apr. 2023

📍 Woods Hole, MA

🏢 Department of Applied Ocean Physics & Engineering

👤 Advisor: Yogesh A. Girdhar

Instructional Programmer

Binghamton University

📅 Oct. 2015 – May 2018

📍 Vestal, NY

🏢 Department of Chemistry

👤 Supervisor: Alexsa Silva

Student Researcher

Binghamton University

📅 Jun. 2017 – May 2018

📍 Vestal, NY

🏢 Department of Computer Science

👤 Advisor: Lijun Yin

Student Researcher

Binghamton University

📅 Jun. – Aug. 2016

📍 Vestal, NY

🏢 Department of Physics

👤 Advisor: Alexey Kolmogorov

Teaching

Professor, Dept. of Computer Science, Binghamton University

- CS XXX: ☞ Fall 2024

Substitute Teacher, Dept. of Physical Education & Recreation, Dartmouth College

- FLIP: Cardio Conditioning (Substitute Teacher) ☞ Summer 2022

DIFUSE Graduate Fellow (Coarse Designer), Dept. of Computer Science, Dartmouth College

- ANTH 006/040: Introduction to Biological Anthropology / Human Functional Anatomy ☞ Spring 2022
- ENGS 037: Introduction to Environmental Engineering ☞ Winter 2022

Teaching Assistant, Dept. of Computer Science, Dartmouth College

- DCAL: Future Faculty Teaching Series (Training) ☞ Winter 2022
- COSC 076/276: Artificial Intelligence ☞ Fall 2021
- COSC 010: Problem Solving via Object Oriented Programming ☞ Spring 2020
- COSC 081/281: Principles of Robot Design and Programming ☞ Fall 2019
- COSC 081/281: Principles of Robot Design and Programming ☞ Summer 2019
- COSC 001: Introduction to Programming & Computation ☞ Fall 2018

Teaching Assistant, Dept. of Art and Design, Binghamton University

- ARTS 210: Graphic Design I ☞ Spring 2015

Publications

Notation:

Bold underline author: self.

*: equal contribution.

📄 Peer-Reviewed Conference Papers

- **M. Roznere**, A. K. Pediredla, S. E. Lensgraf, Y. Girdhar, and A. Quattrini Li, "Underwater dome-port camera calibration: Modeling of refraction and offset through n-sphere camera model," in *Proc. ICRA, IEEE*, 2024.
- K. Masaba, **M. Roznere**, M. Jeong, and A. Quattrini Li, "Adaptive spatial and temporal field sampling using a variance decay model," in *Proc. ICRA, IEEE*, 2024.
- **M. Roznere**, P. Mordohai, R. I., and A. Quattrini Li, "3-d reconstruction using monocular camera and lights: Multi-view photometric stereo for non-stationary robots," in *Proc. ICRA, IEEE*, 2023.
- H. Liu, **M. Roznere**, and A. Quattrini Li, "Deep underwater monocular depth estimation with single-beam echosounder," in *Proc. ICRA, IEEE*, 2023.
- B. Joshi, M. Xanthidis, **M. Roznere**, *et al.*, "Underwater exploration and mapping," in *Proc. AUV, IEEE*, 2022.
- M. Xanthidis, B. Joshi, **M. Roznere**, *et al.*, "Mapping of underwater structures by a team of autonomous underwater vehicles," in *Proc. ISRR, Springer*, 2022.
- P. Yang, H. Liu, **M. Roznere**, and A. Quattrini Li, "Monocular camera and single-beam sonar-based underwater collision-free navigation with domain randomization," in *Proc. ISRR, Springer*, 2022.
- **M. Roznere***, M. Jeong*, L. Maechling, *et al.*, "Towards a reliable heterogeneous robotic water quality monitoring system: An experimental analysis," in *Proc. ISER, Springer*, 2021.
- **M. Roznere** and A. Quattrini Li, "Underwater monocular image depth estimation using single-beam echosounder," in *Proc. IROS, IEEE*, 2020.
- M. Jeong, S. E. **M. Roznere** Lensgraf, A. Sniffen, D. Balkcom, and A. Quattrini Li, "Catabot: Autonomous surface vehicle with an optimized design for environmental monitoring," in *Proc. OCEANS, IEEE*, 2020.
- Z. Tian, C. J. Carver, Q. Shao, **M. Roznere**, A. Quattrini Li, and X. Zhou, "Polartag: Invisible data with light polarization," in *Proc. Hotmobile Workshop (best demo award)*, ACM, 2020.
- **M. Roznere** and A. Quattrini Li, "Real-time model-based image color correction for underwater robots," in *Proc. IROS, IEEE*, 2019.

👤 Conference and Workshop Presentations

- M. Jeong, **M. Roznere**, K. Masaba, *et al.*, "Revolutionizing water quality monitoring: Autonomous surface vehicles and artificial intelligence integration," poster at *Northeast Aquatic Biologists Conference*, 2024.
- K. Masaba, **M. Roznere**, M. Jeong, and A. Quattrini Li, "Persistent monitoring of large environments with robot deployment scheduling in between remote sensing cycles," presentation at *Northeast Aquatic Biologists Conference (student presentation winner)*, 2024.
- **M. Roznere**, P. Mordohai, and A. Quattrini Li, "Towards photometric stereo for non-stationary underwater robots: High-resolution model accuracy vs. real-time application," poster at *ICRA Robotic Perception and Mapping: Emerging Techniques Workshop*, 2022.

- **M. Roznere***, M. Jeong*, K. Masaba, *et al.*, "Towards context-based sampling for environmental monitoring heterogeneous robots and remote sensing technologies," presentation in *ICRA Robotics for Climate Change Workshop*, 2022.
- M. Jeong, **M. Roznere**, K. Masaba, A. Chadda, and A. Quattrini Li, "Towards full pipeline development of decision-making for autonomous surface vehicles in challenging aquatic environments," presentation at *US-Korea Conference (UKC) (best presentation paper award)*, 2022.
- **M. Roznere** and A. Quattrini Li, "Towards photometric stereo for underwater robots," presentation at *ICRA 1st Advanced Marine Robotics TC Workshop: Active Perception*, 2021.
- **M. Roznere** and A. Quattrini Li, "Underwater photometric stereo for next best view," poster at *CRA-WP Grad Cohort for Women*, 2021.
- K. Masaba, B. Steele, **M. Roznere**, *et al.*, "Knowledge-guided machine learning modelling of limnological data for prediction of chlorophyll-a distribution," presentation at *Knowledge Guided Machine Learning Workshop*, 2021.
- M. Xanthidis, B. Joshi, N. Karapetyan, *et al.*, "Towards multi-robot shipwreck mapping," presentation at *ICRA 1st Advanced Marine Robotics TC Workshop: Active Perception*, 2021.
- **M. Roznere** and A. Quattrini Li, "On the mutual relation between slam and image enhancement in underwater environments," presentation at *ICRA Underwater Perception Workshop (best paper award)*, 2019.
- **M. Roznere** and A. Quattrini Li, "Physics-based underwater color correction method enhanced by learning-based techniques," poster at *RAS International Summer School on Deep Learning for Robot Vision*, 2019.
- **M. Roznere** and A. Quattrini Li, "Applying an attenuation-dependent image formation model for underwater robotic navigation," poster at *Northeast Robotics Colloquium (NERC)*, 2018.

Interdisciplinary Project Collaborations

- E. R. Arsenault, Q. K. Shingai, M. Jeong, *et al.*, "Autonomous surface vehicles reveal spatiotemporal variability in lake surface waters," in *Limnology & Oceanography (under review)*, 2023.
- H. J. Brown, B. T. Sinn, **M. Roznere**, and S. Simon, "Investigating the pollination biology of asarum shuttleworthii (asaraceae) using affordable remote camera units," in *Otterbein University's Senior Research Symposium*, 2023.
- Q. K. Shingai, E. C. Berendsen, J. V. Trout-Haney, *et al.*, "Spatial distribution of tributary inputs in the surface waters of an oligotrophic lake," in *Ecological Society of America (ESA) Annual Conference*, 2023.
- E. Arsenault, Q. K. Shingai, M. Jeong, *et al.*, "Using autonomous surface vehicles to reveal spatial variability in lake surface waters," in *Joint Aquatic Sciences Meeting (JASM)*, 2022.
- A. R. Quinn, E. R. Arsenault, B. G. Steele, *et al.*, "Tracking seasonal blooms in eutrophic lake in maine, usa," in *Global Lake Ecological Observatory Network (GLEON) All Hands' Meeting*, 2022.
- Q. K. Shingai, **M. Roznere**, J. T. Kerby, J. V. Trout-Haney, J. Mahoney, and K. L. Cottingham, "Developing an open-source virtual reality lake environment for education, outreach and research," in *Global Lake Ecological Observatory Network (GLEON) All Hands' Meeting*, 2022.
- Q. K. Shingai, E. Arsenault, K. L. Cottingham, *et al.*, "Investigating spatial and temporal heterogeneity of an oligotrophic lake using autonomous surface vehicle technology," in *Joint Aquatic Sciences Meeting (JASM)*, 2022.
- E. R. Arsenault, Q. K. Shingai, H. A. Ewing, *et al.*, "Autonomous surface vehicles reveal spatial variability in lake surface waters," in *Global Lake Ecological Observatory Network (GLEON) All Hands' Meeting*, 2021.
- K. L. Cottingham, "Predicting cyanobacterial blooms in freshwater lakes: The promise of new partners, tools, and technologies," in *Ecological Society of America Annual Meeting*, 2020.

Publications in Progress

- S. Simon, **M. Roznere**, and B. Sinn, *Camera-based pollination observation: Asarum shuttleworthii case study*, in prep. for *Application in the Plant Sciences*, 2024.

Awards and Grants

- Link Foundation Ocean Engineering & Instrumentation Fellowship, **\$34,000** 📅 2023-24
- Dartmouth's Neukom CompX Grant for project "Lake Sim: Exploring Watershed Moments", **\$25,000** 📅 2023
- ICRA Student Travel Award, **\$1,300** 📅 May 2023
- Dartmouth's Guarini Travel Award (for IEEE RAS Summer School on Multi-Robot Systems), **\$1,000** 📅 2023
- Dartmouth's Neukom Travel Grant (for IEEE RAS Summer School on Multi-Robot Systems), **\$1,000** 📅 2023
- CRA-WP Grad Cohort for Women Registration and Travel Stipend 📅 2021
- ISER PhD Student Travel Award, turned down 📅 2021
- NSF GRFP Honorable Mention 📅 2020
- RAS Travel Support Grant, **\$900** 📅 Oct. 2019
- IROS Student and Developing Countries (SDC) Travel Award, **\$600** 📅 Aug. 2019
- ICRA U/W Perception Workshop Best Paper Award, **NVIDIA Jetson Nano Development Kit** 📅 May 2019
- Bankoski Award for Computer Science Research, **\$3,000** 📅 Jan. 2018

Talks

- 21st Annual Marine Robotics Workshop, Barbados, "Underwater 3D reconstruction using monocular camera and lights" 📅 Feb. 2024
- Binghamton University, Vestal, NY, "Underwater 3D reconstruction using monocular camera and lights" 📅 Jan. 2024
- Barnet 6th graders, VT, "SEPA – Meet an underwater roboticist" 📅 Spring 2021
- Tunbridge 7th and 8th graders, VT, "SEPA – Meet an underwater roboticist" 📅 Spring 2021
- RMS 6th graders, Hanover, NH, "Perception for low-cost underwater robots" 📅 Spring 2021

- STEM Enrichment Youth (STEMEY), “Discovering the aquatic world with robots” 📅 Spring 2021

Review Activities

- *Journal articles*: RA-L 2023, 2022; JAOE 2023; JOE 2023, 2022, 2020
- *Conference papers*: ICRA 2024, 2023, 2022, 2021; IROS 2022, 2021, 2020, 2019; ISRR 2022

Mentorship

Reality and Robotics Lab, Dept. of Computer Science, Dartmouth College

- *Master students*: Haowen Liu (2021-23), Siddharth Agrawal (2020-21), Jennifer Jain (2018-19), Evan Honnold (2019)
- *Undergraduate students*: Xenia Dela Cueva (2023-24), Hannah. J. Brown (2023), Pengzhi Yang (intern) (2020-22), Megan Ren (2020), Gui Marinho (2020), Ioana-Andrada Pantelimon (2020), Chloe Nicolaou (2020), Alex Rodriguez (2020), Lily Maechling (2020), Suzan Eskalen (2020), Yueshan Li (intern) (2019), Wendell Beane (2019)

Outreach

- E.E. Just Program (Graduate Fellow) 📅 Sep. 2021 – Dec. 2022
- DIFUSE (Graduate Fellow) 📅 Jan. – Jun. 2022
- Women in STEM (WiSTEM) ENVISION (Research Competition Judge) 📅 Feb. – Mar. 2022
- Dartmouth Graduate Student Council (Computer Science representative) 📅 May – Sep. 2021
- SEPA – Rural STEM Educator Program (Graduate Mentor; 6-7th Grade) 📅 Sep. 2020 – Jun. 2021
- Women in Science Project (WISP) (Mentor to Lily Maechling and Suzan Eskalen) 📅 Jan. – Jun. 2020
- Dartmouth E-Pen Pals (K-12) 📅 Apr. – Aug. 2020

Technical Skills

Marine Robots

- Blue Robotics BlueROV2
- Custom-made above-water communication board, tethered to BlueROV2 and linked to on-shore station via WiFi
- Custom-made autonomous pontoon boat (Catabot)

Ground Robots

- TurtleBot3
- Husarian ROSbot 2.0

Sensors

- Tritech Gemini 1200ik multibeam sonar
- Imagenex Sidescan Sonar
- WaterLinked Doppler Velocity Log (DVL) 1000
- Blue Robotics Ping360 mechanical sonar
- Blue Robotics Ping1D single-beam echosounder
- YSI EXO2 water quality sensors
- WaterLinked Underwater GPS short baseline

Tools and Libraries

- Robot Operating System (ROS), OpenCV, CUDA, PyTorch

Languages

- C++, Python, C, Java, MATLAB, R, Perl, Ruby, Prolog, Haskell, JavaScript, HTML, CSS3

Software

- Ardupilot, Gazebo simulator, Illustrator, Premiere Pro, Photoshop, InDesign, AutoCAD

Field Trials

- Photometric stereo (PS) SLAM as well as Mechanical sonar, side-scan sonar and multibeam data collection 📅 Barbados, 2024
- Multibeam and side-scan sonar data collection of shipwrecks 📅 Lake Winnepesaukee, NH, 2023
- Photometric stereo (PS) and multibeam sonar data collection at shipwrecks and nighttime 📅 Barbados, 2023
- Camera and multibeam sonar data collection at shipwrecks 📅 Lake Champlain, VT, 2022
- PS and multibeam sonar data collection with BlueROV2 in cenotes and caves 📅 Mexico, 2021
- Data collection with self-made Autonomous Surface Vehicle for lake monitoring 📅 NH, ME, 2020 – 2021
- Under-ice perception and navigation with BlueROV2 and DVL sensor 📅 Lake Sunapee, NH, 2020
- Echosounder and perception data collection at reefs and shipwrecks 📅 Barbados, 2020
- Color correction data collection at reefs and shipwrecks 📅 Barbados, 2019