Seth McCammon

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Assistant Scientist at Woods Hole Oceanographic Institution. My main research interests are in developing adaptive sensing techniques to enable robots to reason about their environment as they explore it. I work on developing these techniques for field robotics applications and deploying them on hardware, particularly in the marine domain.

Research Interests

Field Robotics | Information Gathering | Long-Term Autonomy | Machine Learning | Marine Robotics | Multiagent Systems | Planning with Uncertainty | Probabilistic Robotics | Topological Path Planning

Professional Experience

- **Assistant Scientist** - Applied Ocean Physics & Engineering Department
  Woods Hole Oceanographic Institution — Feb 2023 - Present
- **Postdoctoral Scholar** - Applied Ocean Physics & Engineering Department
  Woods Hole Oceanographic Institution — Feb 2021 - Feb 2023
- **Doctoral Research Assistant** - Collaborative Robotics and Intelligent Systems Institute
  Oregon State University — Sept 2015 - Dec 2020
- **Undergraduate Researcher** - ARGALLab
  Northwestern University — Fall 2013 - Spring 2015
- **Undergraduate Research Intern** - STORM Lab
  Vanderbilt University — Summer 2013

Education

- **Oregon State University** — **Corvallis, OR**
  Ph.D. in Robotics — 2020
  Topologically-Guided Robotic Information Gathering — Thesis Advisor: Dr. Geoffrey A. Hollinger
- **Northwestern University** — **Evanston, IL**
  B.S. in Computer Science, Minor in Classical Studies — 2015

Publications

Summary: 4 peer-reviewed journal articles, 6 peer-reviewed conference papers (1 under review), 3 workshop papers, and 1 poster presentation.

Journal Articles

- **S. McCammon** and G. Hollinger "Topological Path Planning for Autonomous Information Gathering," Autonomous Robots, vol. 45, no. 6, pp. 821-842, Sept 2021.
- **S. McCammon**, G. Marcon dos Santos, M. Frantz, T. P. Welch, G. Best, R. K. Shearman, J. D. Nash, J. A. Barth, J. A. Adams, and G. Hollinger, "Ocean front detection and tracking using a team of heterogeneous marine vehicles," Journal of Field Robotics, vol. 38, no. 6, pp. 854-881, Sept 2021.
- N. Lawrance, R. DeBortoli, D. Jones, **S. McCammon**, L. Milliken, A. Nicolai, T. Somers and G. Hollinger, "Shared autonomy for low-cost underwater vehicles," Journal of Field Robotics, vol. 36, no. 3, pp. 495-516, May 2019.
- K. Benoit-Bird, T. Welch, C. Waluk, I. Wangen, P. McGill, C. Okuda, G. Hollinger, M. Sato, **S. McCammon**. "Equipping an underwater glider with a new echosounder to explore ocean ecosystems," Limnology and Oceanography: Methods, vol. 16, no. 11, pp.734-749, Nov. 2018.

Refereed Conference Papers

- Y. Girdhar, N. McGuire, L. Cai, S. Jamieson, **S. McCammon**, B. Claus, J. E. San Soucie, J. E. Todd, and T. A. Mooney "CUREE: A Curious Underwater Robot for Ecosystem Exploration" in Proc. *IEEE International Conference on Robotics and Automation* (ICRA), London, UK, 2023
- **S. McCammon**, N. Aoki, T. A. Mooney, and Y. Girdhar "Adaptive Online Sampling of Periodic Processes with Application to Coral Reef Acoustic Abundance Monitoring" to appear at *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Kyoto, Japan, Oct. 2022.
- I. Rankin, **S. McCammon**, and G. Hollinger "Robotic Information Gathering using Semantic Language Instructions," in Proc. *IEEE International Conference on Robotics and Automation* (ICRA), Xi'an, China (virtual), May. 2021.
- **S. McCammon**, D. Jones, and G. Hollinger, "Topology-Aware Self-Organizing Maps for Robotic Information Gathering" in Proc. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Las Vegas, NV (virtual), Oct. 2020.
- **S. McCammon**, T. Welch, C. Waluk, K. Benoit-Bird, J. Barth, and G. Hollinger, "Onboard autonomy system for the Slocum glider," in Proc. *IEEE/MTS OCEANS Conference*, Seattle, WA, Oct. 2019.
- **S. McCammon** and G. Hollinger. *"Topological hotspot identification for informative path planning with a marine robot,"* in Proc. *IEEE International Conference on Robotics and Automation* (ICRA), Brisbane, May 2018.
- **S. McCammon** and G. Hollinger. *"Planning and executing optimal non-entangling paths for tethered underwater vehicles,"* In proc. *IEEE International Conference on Robotics and Automation* (ICRA), Singapore, May 2017. **Finalist: Best Automation Paper**
- N. Lawrance, T. Somers, D. Jones, **S. McCammon**, and G. Hollinger. *"Ocean deployment and testing of a semi-autonomous underwater vehicle."* in *Proc. MTS/IEEE OCEANS Conference*, Monterey, CA, Sept 2016.

Workshop Papers and Poster Presentations

- I. C. Rankin, **S. McCammon**, T. Somers, N. Lawrance, and G. A. Hollinger "Explaining Robot Decisions Using Contrasting Examples" in Review at *HRI for Explainable Robotics Workshop at IEEE International Conference on Robot & Human Interactive Communication* (RO-MAN), Busan, South Korea, 2023
- **S. McCammon**, F. Jensen, T. A. Mooney, Y. Girdhar "A Visual Acoustic Sensor Emplacement for Long-Term Monitoring of Coral Reef Biodiversity" In Proc. Ocean Sciences Meeting (OSM), Virtual, 2022.
- I. Rankin, **S. McCammon**, and G. Hollinger, "Optimized robotic information gathering using semantic language instructions," in Proc. Robotics: Science and Systems Conference Workshop on Robots in the Wild: Challenges in Deploying Robust Autonomy for Robotic Exploration (RSS), virtual, July, 2020.
- **S. McCammon** and G. Hollinger, "Planning non-entangling paths for tethered underwater robots using simulated annealing," in *Proc. Robotics: Science and Systems Conf. Workshop on Robot Learning and Planning (RSS16)*, Ann Arbor, MI, June, 2016.
- N. Lawrance, T. Somers, D. Jones, **S. McCammon** and G. Hollinger, "Ocean deployment and testing of a semi-autonomous underwater vehicle," in *Proc. IEEE International Conference on Robotics and Automation Workshop on Marine Robot Localization and Navigation (ICRA)*, Stockholm, May 2016.

Funding Sources

- An Ecologically Curious Robot for Monitoring Coral Reef Biodiversity, National Science Foundation, Co-PIs: Yogesh Girdhar (WHOI), Aran Mooney (WHOI), Frants Jensen (Syracuse), Seth McCammon (WHOI), Amount $1,499,986. Funded for 2022-2024

Invited Talks

- "Topologically Guided Robotic Information Gathering"
  - University of Southern California, April 2021, Los Angeles, CA (Virtual)
  - Indiana University, Dec 2020, Bloomington, IN (Virtual)
  - Woods Hole Oceanographic Institution, March 2020, Woods Hole, MA
- "Autonomous Robots for Ocean Science"
  - Pacific Lutheran University, Febuary 2022, Tacoma, WA (Virtual)

Workshop Organization

- "Explainable and Trustworthy Robot Decision Making for Scientific Data Collection," co-organized with Nisar Ahmed, P. Michael Furlong, and Geoff Hollinger at Robotics: Science and Systems Conf. (RSS) Workshop, virtual, May 2020

Awards and Honors

- **Finalist: Best Automation Paper - ICRA 2017:** *'Planning and executing optimal non-entangling paths for tethered underwater vehicles'*

- **Northwestern Undergraduate Research Grant - Summer 2014:** *'Autonomous Mapping and Path Planning Module for a Smart Wheelchair'*
- **Northwestern McCormick Autonomous Robot Design Competition:** Winner (2013), 3rd Place (2014, 2015), *with Kevin Ye, Daniel Thirman, and Georgiy Mazin*
- **Myke Minbiole Elegant Engineering Award - 2013:** *with Kevin Ye and Georgiy Mazin*

Outreach and Service

- Crescent Valley High School ROV Curriculum Development 2019-2020
- Judge, Oregon and New England Regional MATE ROV Competitions 2017-2022
- Northwestern University Alumni Admissions Interviewer 2020-2022
- REU Summer Intern Student Advisor 2017-2019
- ASE High School Summer Intern Student Advisor 2019
- Northwestern University Robotics Club Executive Committee, Founding Member 2014-2015

Personal

- Citizenship: United States
- Languages: English