Dan McGann

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RESEARCH INTERESTS

My research goal is to develop *holistic* robot perception that enables robots and multi-robot teams to understand their relation to an environment (State Estimation) as well as provide a deep contextual understanding of that environment (Mapping). Specifically, I want to build perception algorithms that *scale* to the needs of future applications and are actually *deployable* in the real-world.

EDUCATION

2020 – pres. **Carnegie Mellon University** *Pittsburgh, PA*
Ph.D. in Robotics advised by Dr. Michael Kaess, GPA: 4.12/4.0

2016 – 2020 **Northeastern University** *Boston, MA*
B.S. in Computer Science with minor in Computer Engineering, GPA: 4.0/4.0

RESEARCH EXPERIENCE

2020 – pres. **Carnegie Mellon University**, *Robot Perception Lab*
Graduate Research Assistant advised by Dr. Michael Kaess
My doctoral research has focused on developing optimization algorithms to provide robust and real-time state estimates to multi-robot teams operating in unstructured environments.

2017 – 2019 **Northeastern University**, *Robotics and Intelligent Vehicles Lab*
Undergraduate Researcher advised by Dr. Taskin Padir
Studied systems design for robotic missions to Mars. Led interdisciplinary team of students who designed, constructed, and tested a robotic system for collecting water from subsurface Martian ice deposits.

PUBLICATIONS

* Equal Contribution

2024 [J1] Easton Potokar, **Daniel McGann**, Michael Kaess, "Robust Preintegrated Wheel Odometry for Offroad Autonomous Ground Vehicles," *IEEE Robotics and Automation Letters (RA-L)*, 2024

2024 [C6] Will Driessen, Siddarth Kaki, Andrew Liounis, **Daniel McGann**, Paul McKee, Andrew Tennenbaum, Alvin Yew, "Monocular Horizon Navigation," *Space Imaging Workshop*, 2024

2024 [C5] **Daniel McGann**, Michael Kaess, "iMESA: Incremental Distributed Optimization for Collaborative Simultaneous Localization and Mapping," *Robotics: Science and Systems (RSS)*, 2024

2024 [C4] **Daniel McGann**, Kyle Lassak, Michael Kaess, "Asynchronous Distributed Smoothing and Mapping via On-Manifold Consensus ADMM," *IEEE International conference in Robotics and Automation (ICRA)*, 2024 Finalist: Best Paper Award on Multi-Robot Systems

2023 [C3] **Daniel McGann**, John G. Rogers III, Michael Kaess, "Robust Incremental Smoothing and Mapping (riSAM)," *IEEE International conference in Robotics and Automation (ICRA)*, 2023

2022 [C2] Yehonathan Litman*, **Daniel McGann***, Eric Dexhimer, Michael Kaess, "Global Visual-Inertial Ground Vehicle State Estimation via Image Registration," *IEEE International conference in Robotics and Automation (ICRA)*, 2022

2019 [C1] Elisa Danthinne*, Emilia Kelly*, **Daniel McGann***, Patrick Moore*, Andrew Panasyuk*, Benjamin Zinser*, Taskin Padir, "Design and Experimental Validation of a Martian Water Extraction System," *IEEE Aerospace Conference*, 2019

FELLOWSHIPS AND AWARDS

2022 **Graduate Research Fellowship Award**, *National Science Foundation*

2020 President's Award (Awarded to top ten students of graduating class), *Northeastern University*

2019 Robert J. Shillman Award for Engineering Excellence, *Northeastern University*

2018 Michael B. Silevitch Exemplary Engineering Leadership Award, *Northeastern University*

INDUSTRY EXPERIENCE

2023 **NASA Jet Propulsion Laboratory**, *Robotic Mobility Group*
SLAM Research Intern
Explored robustness for Simultaneous Localization and Mapping (SLAM) for the Exobiology Extant Life Surveyor (EELS) project.

2022 **NASA Goddard Space Flight Center**, *Engineering and Technology Directorate*
Localization Research Intern
Explored surface optical navigation techniques for Lunar localization of rovers and crewed extra vehicular activities (EVA's).

2020 **NASA Jet Propulsion Laboratory**, *Robot Interfaces and Visualization Group*
Software Engineering Intern
Expanded the scope and precision of Surface Simulation (Ssim) a software package that validates daily rover command sequences for the Mars 2020 mission.

2019 – 2020 **Square Robot**, *Engineering Team*
Robotics Software Engineering Co-op
Developed software for an autonomous underwater vehicle. Key contributions include designing an autonomous exploration system for mapping new environments, implementing new software features, improving existing code, and operating the vehicle in field trials.

2018 **MIT Lincoln Laboratory**, *Control and Autonomous Systems Group*
Software Engineering Co-op
Designed a software framework using NASA's Core Flight System to enable the operation of constellations of cube satellites. Implemented and tested the framework in C for use with satellite simulators.

TEACHING EXPERIENCE

2022, 2023 Teaching Assistant, Robot Localization and Mapping, *Carnegie Mellon University*
Taught guest lectures, held office hours, and graded student assignments and projects.

2017 – 2019 Tutor, Fundamentals of Computer Science, *Northeastern University*
Assisted with the teaching of labs, held office hours, and graded student assignments.

2015 – 2016 Tutor, *Westcott Community Center*
Helped students with homework during an after-school program serving students from City of Syracuse public middle schools.

SKILLS AND EXPERTISE

Robotics Simultaneous Localization and Mapping (SLAM), State Estimation, Sensor Fusion, LiDAR/Inertial/Visual Perception, Robust/Distributed/Nonlinear Optimization, Lie Theory

Software C/C++, Python, ROS, GTSAM, Ceres, g2o, Eigen, git, Linux

PRESENTATIONS AND TALKS

2024 *Robust Incremental Distributed Collaborative Simultaneous Localization and Mapping*
Carnegie Mellon University Robotics Institute - Thesis Proposal

2022 *Robust Incremental Smoothing and Mapping*
Carnegie Mellon University Robotics Institute - Qualifier Talk

2019 *Northeastern University Prospecting Underground Distilling Liquid Extractor (NU PUDLE)*
NASA RASC-AL Mars Ice Challenge Poster Presentation

2018 *Northeastern University Planetary Articulating Water Extraction System (NU PAWES)*
NASA RASC-AL Mars Ice Challenge Poster Presentation

PROFESSIONAL ACTIVITIES

Professional Services

2022 - pres. Reviewer: ICRA, IROS, RA-L, T-RO, T-FR, and IJRR.

2023 Committee Member: Robotics Institute M.S. in Computer Vision Admissions Committee.

Mentorship

2024 RISS-Buddies Mentor: Provided mentorship to visiting students during their summer internship.

2022 – 2024 Robo-Buddies Mentor: Provided mentorship for new students as they join the Robotics Institute.

2018 – 2020 Founder and President: Northeastern University's Students for the Exploration and Development of Space (SEDS).

Outreach

2019 Boston Museum of Science, *Moon Landing* 50^{th}*: One Giant Anniversary*: Public education event to discuss current research for robotic exploration of space with the Boston Community.

2018 – 2019 HubWeek, *Robot Block Party*: Public engagement event on robotics and robotics research.