

Amy Phung

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EDUCATION

Massachusetts Institute of Technology & Woods Hole Oceanographic Institution Joint Program June 2021 – Present
Cambridge, MA

Ph.D. Student in Aeronautics and Astronautics & Applied Ocean Science and Engineering

- Advised by: Richard Camilli
- S.M. Thesis: Enabling Robotic Manipulation in Remote Environments with Shared Autonomy
- GPA: 4.8/5.0

Olin College of Engineering August 2017 – May 2021
Needham, MA

B.S. in Engineering: Robotics

- Recipient of 4-year, Olin Merit Tuition Scholarship valued at more than \$100,000
- GPA: 4.0/4.0

Sea Education Association January 2020 – March 2020
Woods Hole, MA

Global Oceans Program

- Conducted a comparative study between three different sources of chlorophyll-a measurements: satellites, robotic Biogeochemical Argo floats, and shipborne fluorometers

RESEARCH EXPERIENCE

Woods Hole Oceanographic Institution June 2021 – Present
Woods Hole, MA

Graduate Research Assistant

- Conducting research to improve perception systems for deep-sea vehicles. Developed virtual reality (VR) and desktop interfaces to support participation from remote scientists within shared autonomy framework for at-sea testing off the coast of Southern California

Olin College Senior Consulting Project in Engineering September 2020 – May 2021
Needham, MA

Product Owner

- Developed VR interfaces using Unity and C# for the Monterey Bay Aquarium Research Institute (MBARI) to improve ROV piloting for scientific sampling
- Implemented human-robot interactions in VR with hand gestures and gaze tracking
- Coordinated activities and design reviews for a 5-person engineering team
- Co-authored user study publication in collaboration with researchers at UC Santa Cruz and MBARI

Olin Ground Robotic Autonomous Vehicle Lab October 2017 – May 2021
Needham, MA

Lead Student Researcher

- Co-lead project involving machine learning based obstacle detection and classification in a 3D LiDAR scan to aid navigation. Project was selected as a finalist in the Panasonic Prototype 3D LiDAR Challenge, which provided \$2,500 for project funding and a prototype LiDAR
- Simulated robotic tractor in Gazebo with ROS integration to augment off-board testing capabilities, reducing test cycle time from 3-hour field tests to 1-hour of debugging in simulation
- Developed algorithms for path planning research related to autonomous dirt road leveling
- Designed and implemented electromechanical three-point hitch subsystem to actuate road grader
- Established ROS communications between onboard sensors, actuators, and computing systems

Woods Hole Oceanographic Institution June 2020 – September 2020
Woods Hole, MA

Summer Student Fellow

- Developed a computer vision-based calibration method to characterize sensor-to-angle relationships for 6 degree-of-freedom manipulators without physical operator assistance for use in remote underwater environments
- Implemented method using ROS, C++, and Python for testing with a physical hydraulic manipulator testbed setup

PUBLICATIONS

A. Phung, G. Billings, G. Burgess, R. Camilli, “Unattended Geo-referenced Survey with An Autonomous Underwater Glider”, 2024. (Submitted)

A. Phung, G. Billings, R. Camilli, “Sonar-Aided Manipulation in Low-Visibility Conditions by Novice Users”, *IEEE/MTS OCEANS Halifax*, 2024.

A. Phung, G. Billings, A.F. Daniele, M.R. Walter, R. Camilli, “A Shared Autonomy System for Precise and Efficient Remote Underwater Manipulation” *IEEE Transactions on Robotics*, vol. 40, pp. 4147-4159, 2024.

A. Phung, G. Billings, A.F. Daniele, M.R. Walter, R. Camilli, “Enhancing scientific exploration of the deep sea through shared autonomy in remote manipulation” *Science Robotics* 8.81, 2023.

G. Billings, **A. Phung**, R. Camilli, “DVL-Based Odometry for Autonomous Underwater Gliders” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.

A. Elor, T. Thang, B. Hughes, A. Crosby, **A. Phung**, E. Gonzalez, K. Katija, S. Haddock, E. Martin, B. Erwin, L. Takayama, “Catching Jellies in Immersive Virtual Reality: A Comparative Teleoperation Study of ROVs in Underwater Capture Tasks” *ACM Symposium on Virtual Reality Software and Technology (VRST)*, 2021. ****Best Paper Award****

E. Martin, B. Erwin, K. Katija, **A. Phung**, E. Gonzalez, S. Thun, H. Cullen, S. Haddock, “A Virtual Reality Video System for Deep Ocean Remotely Operated Vehicles” *IEEE/MTS OCEANS San Diego - Porto*, 2021.

A. Phung, “A comparison of Biogeochemical Argo sensors, remote sensing systems, and shipborne field fluorometers to measure Chlorophyll-A concentrations in the Pacific Ocean off the northern coast of New Zealand” *IEEE/MTS OCEANS Singapore-U.S. Gulf Coast*, 2020.

PRESENTATIONS

A. Phung, G. Billings, A. Daniele, M. Walter, R. Camilli, “Partially automated robotic manipulation assisted by a shared autonomy framework for collaborative analysis and input from multiple remote scientists through natural language input and 3D scene understanding for real-time, in-situ elemental analysis” *Ocean Sciences Meeting*, 2022.

A. Phung, G. Billings, A. Daniele, M. Walter, R. Camilli, “Toward Efficient Under-Ice Exploration of Ocean Worlds Using Distributed Autonomy and 3D Workspace Reconstruction Presented in VR for Intuitive Understanding” *Astrobiology Science Conference*, 2022.

GRANTS, HONORS, AND AWARDS

Future Investigators in NASA Earth and Space Science and Technology: \$149,998 | Aug. 2023

WHOI Ocean Ventures Fund: \$9,950 | July 2023

Link Ocean Engineering & Instrumentation Fellowship: \$68,000 | Sept. 2022, 2023

National Science Foundation (NSF) Graduate Research Fellowship: \$138,000 | Sept. 2021

Woods Hole Oceanographic Institution Summer Student Fellowship: \$6,500 | June 2020

Olin Tuition Scholarship: Four-year half-tuition merit scholarship, \$100,800 | Aug. 2017 – May 2021

Santa Clarita Valley Scholarship Foundation Scholarship: \$1,000 | May 2017

College of the Canyons Foundation Scholarship: \$1,000 | May 2017

INDUSTRY EXPERIENCE

Relativity Space

May 2019 – August 2019

Automation Intern

Inglewood, CA

- Developed and tested computer vision algorithms and controls to automate high-precision end-effector position adjustments on industrial manipulators in a noisy welding environment. Enabled precise < 0.01 mm adjustments on a robot whose accuracy specifications were ± 0.05 mm. Project increased team bandwidth by reducing frequency of off-hours requests to on-call engineer

GE Aviation

May 2018 – August 2018

Product Support Intern

Lynn, MA

- Spearheaded development on Rotorcraft Operations Center (ROC), a project that automates the process of pulling and manipulating raw helicopter engine data from a database and applies statistical tools to create virtual dashboards for predictive fleet monitoring
- Developed software in Python to aid in engine dataset analysis, which reduced analysis time from 2 hours to 5 minutes