

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Naval Architecture and Marine Engineering

Ryan M. Eustice, associate professor of naval architecture and marine engineering, with tenure, Department of Naval Architecture and Marine Engineering, associate professor of mechanical engineering, without tenure, Department of Mechanical Engineering, and associate professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to professor of naval architecture and marine engineering, with tenure, Department of Naval Architecture and Marine Engineering, professor of mechanical engineering, without tenure, Department of Mechanical Engineering, and professor in electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.	2005	Massachusetts Institute of Technology/Woods Hole Oceanographic Institution, Ocean Engineering, Cambridge, MA
B.S.	1998	Michigan State University, Mechanical Engineering, East Lansing, MI

Professional Record:

2013 – present	Associate Professor (with tenure), Department of Naval Architecture and Marine Engineering, University of Michigan
2013 – present	Associate Professor (without tenure), Department of Mechanical Engineering, University of Michigan
2013 – present	Associate Professor (without tenure), Department of Electrical Engineering and Computer Science, University of Michigan
2009 – 2013	Assistant Professor, Department of Mechanical Engineering, University of Michigan
2007 – 2013	Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan
2006 – 2013	Assistant Professor, Department of Naval Architecture and Marine Engineering, University of Michigan

Summary of Evaluation:

Teaching: Professor Eustice is an effective teacher and dedicated mentor. Courses he created or co-created (ROB 550 Robotic Systems Lab and NA 568/EECS 568 Mobile Robotics) are highly popular for NAME and EECS graduate students as well as students from other departments throughout of the College of Engineering. His effectiveness both in and outside of the classroom as an instructor and mentor has been documented in his course evaluations and student feedback. He has graduated nine Ph.D. students as the chair or co-chair to date in addition to currently supporting another four Ph.D. students. His former Ph.D. students are in very high demand by

the mobile robotics industry and academia. Professor Eustice considers how to teach effectively, making extensive use of sophisticated visualization and live or logged algorithmic runs. He motivates his students through the use of real-world datasets from actual missions. He inspires students with his passion and ideas through weekly individual and group meetings. Above all, he is always willing to make time for discussion, which enables his students to step forward and feel supported in their research.

Research: Professor Eustice has established himself as an international leader in his research area, which is the fundamental robotic problem of Simultaneous Localization and Mapping (SLAM) with extension to advanced navigation for autonomous driving. He combines deep and rigorous theoretical work with careful and extensive experimental evaluation, applying his research in the most demanding real-world environments including underwater and automotive settings.

He made a major theoretical contribution in his award-winning 2006 paper on exactly sparse extended information filters, and he and his team have since been extending these insights in subsequent papers, several receiving “Best Paper” recognition. Research in difficult problems such as underwater mapping and localization for ship hull inspection have been ongoing, and are leading to commercialization of his technology. More recent work on automotive applications builds on the same rigorous foundation. His track record of successful collaborative work with Ford Motor Company and Toyota Research Institute has allowed him and his research group to develop the leading theoretical and experimental facility focused on advanced perception and navigation for autonomous driving. External reviewers mention the influence of his work on their own.

Recent and Significant Publications:

- R. W. Wolcott, R. M. Eustice, “Robust LIDAR localization using multiresolution Gaussian mixture maps for autonomous driving,” *International Journal of Robotics Research*, 2017; 36(3): 2929–319.
- J. M. Walls, R. M. Eustice, “An origin state method for communication constrained cooperative localization with robustness to packet loss,” *International Journal of Robotics Research*, 2014; 33(9): 1191–1208.
- R. W. Wolcott, R. M. Eustice, “Visual localization within LIDAR maps for automated urban driving,” *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, Chicago, IL, United States of America, 09/2014, pp. 176–183 (Best Student Paper Award).
- N. Carlevaris-Bianco, M. Kaess, R. M. Eustice, “Generic node removal for factor-graph SLAM,” *IEEE Transactions on Robotics*, 2014; 30(6): 1371–1385.
- A. Kim, R. M. Eustice, “Real-time visual SLAM for autonomous underwater hull inspection using visual saliency,” *IEEE Transactions on Robotics*, 2013; 29(3): 719–733.
- R. M. Eustice, H. Singh, J. J. Leonard, “Exactly sparse delayed-state filters for view-based SLAM,” *IEEE Transactions on Robotics* (King-Sun Fu Memorial Best Transactions on Robotics Paper of the Year Award of the IEEE Robotics and Automation Society), 2006; 22(6): 1100–1114.

Service: Professor Ryan Eustice has a strong record of service both to the university and to professional organizations. He has served on numerous committees during his time at the University. He has been active in department activities, such as serving on doctoral exams committees and chairing ad-hoc policy committees. At the college level, he has been a member of the Faculty Search Committee for Autonomous Vehicles/Robotics, the Scholastic Standing Committee, the NAME Five-Year Internal Review Committee, and the dean's NAME Departmental Chair Search Advisory Committee. Professor Eustice was a core faculty member helping to create and launch a new M.S. and Ph.D. program in robotics as part of a broader initiative to form a new Robotics Institute. At the university level, he was asked to serve on several important and broad-reaching university committees including the design committee for Mcity and the inaugural Autonomous Systems Committee established to form the university's policies on autonomous vehicles.

Professor Eustice has initiated a new public outreach effort as part of his research collaboration with NOAA Thunder Bay National Marine Sanctuary (TBNMS) in Alpena, Michigan. This activity includes a series of public forum science lectures on robotics, involvement in K-12 science webcasts through OceansLive.org, and a robotics kiosk display in the NOAA Maritime Heritage Museum Center focusing on robotic technology and engineering science.

External Reviewers:

Reviewer A: "The recent investments from Ford and later TRI that Ryan has attracted to the university are a huge testament both to the importance of the technology that Ryan is working on and his personal status within the field of autonomous robotics."

Reviewer B: "...his name regularly comes up in conversations as one of the primary leaders in autonomous driving research, most others being either at Google or Uber. Moreover, in collaboration with other faculty at the University of Michigan he has established a new Robotics Institute that has established Michigan as one of the premier robotics research centers in the country."

Reviewer C: "Professor Eustice is one of the best faculty members [of his cohort] working in robotics today... His reputation and achievements are, in my opinion, on par with the strongest international players at his level of seniority in the domain... I believe his work has been original, insightful, and places him at the forefront of his research community."

Reviewer D: "Dr. Eustice is unquestionably one of the world's leading authorities in simultaneous localization and mapping, or SLAM ..."

Reviewer E: "In short, Prof. Eustice is a star. His work has had impact by pushing the boundaries of underwater robotics and autonomous vehicles. His work is transforming transportation. He has defined a unique research program with perception and decision-making components. His publication record, service record, and fund-raising record are very strong. He is training many students."

Summary of Recommendation: Professor Eustice is a leading researcher and educator in robotics and autonomous systems. He played a key role in developing the robotics and autonomous vehicle program and bringing international visibility from people outside the NAME community to the department and the University of Michigan. It is with the support of the College of Engineering Executive Committee that I recommend Ryan M. Eustice for promotion to professor of naval architecture and marine engineering, with tenure, Department of Naval Architecture and Marine Engineering, professor of mechanical engineering, without tenure, Department of Mechanical Engineering, and professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science.



Alec D. Gallimore, Ph.D.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2018