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

Matthew K. Johnson-Roberson, assistant professor of naval architecture and marine engineering, Department of Naval Architecture and Marine Engineering, and assistant professor of electrical engineering and computer science, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to associate professor of naval architecture and marine engineering, with tenure, Department of Naval Architecture and Marine Engineering, and associate professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.   2010   University of Sydney, Robotics, Sydney, Australia
B.S.   2005   Carnegie Mellon University, Computer Science, Pittsburgh, PA

Professional Record:

2014 – 2017   Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan
2013 – present Assistant Professor, Department of Naval Architecture & Marine Engineering, University of Michigan
2010 – present Guest Investigator, Applied Ocean Physics & Engineering, Woods Hole Oceanographic Institution, Woods Hole, MA
2010 – 2013   Super Science Research Fellow, Australian Centre for Field Robotics, University of Sydney, Sydney, Australia
2009 – 2010   Post-Doctoral Fellow, Centre for Autonomous Systems, KTH Royal Institute of Technology, Stockholm, Sweden

Summary of Evaluation:

Teaching: Professor Johnson-Roberson has made significant contributions to the instruction of undergraduate ENGR 100 Underwater Vehicle Design, and to the graduate/undergraduate instruction of EECS 442 Computer Vision, as well as the graduate introduction of ROB599 Self-Driving Cars: Perception and Control, which had over 350 students enrolled in its first offering for the Fall 2017 semester. It is evident from the student letters and course evaluations that he is genuinely dedicated to teaching and mentoring. His student course evaluations are among the NAME department's better rankings with Q1/Q2 scores consistently above 4.

Research: Professor Johnson-Roberson has become well-known nationally and internationally for his work in large-area, underwater, 3D reconstruction. He formed the Deep Robot Optical Perception (DROP) Lab upon joining UM where he conducts experiments with several autonomous marine vehicles, including field deployments in Jamaica, Australia, and the Mediterranean using combinations of autonomous underwater vehicles (AUVs) and autonomous

surface vehicles (ASVs). His group's focus is on scalable methods for large-area underwater reconstructions, application of novel visual computing technology to new robotics problems, and online estimation and inference for reconstruction of 3D scenes and its material properties. On top of his impressive work in the marine robotics domain, Professor Johnson-Roberson has expanded into new areas outside of marine robotics, and leads a large research effort with Ford Motor Company in self-driving cars.

Recent and Significant Publications:

J. Li, K. Skinner, R. Eustice, M. Johnson-Roberson, "WaterGAN: Unsupervised Generative Network to Enable Real-time Color Correction of Monocular Underwater Images," *IEEE Robotics and Automation Letters*, 2017, in print.

M. Johnson-Roberson, C. Barto, R. Mehta, S. Sridhar, K. Rosaen, R. Vasudevan, "Driving in the Matrix: Can Virtual Worlds Replace Human-Generated Annotations for Real World Tasks?" *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Singapore, 2017.

J. Li, P. Ozog, J. Abernethy, R. Eustice, M. Johnson-Roberson, "Utilizing High-dimensional Features for Real-time Robotic Applications: Reducing the Curse of Dimensionality for Recursive Bayesian Estimation," *IEEE/RSJ International Conference on Intelligent Robots and Systems, Daejeon, Korea, South,* 2016, pp. 1230-1237.

M. Johnson-Roberson, M. Bryson, A. Friedman, O. Pizarro, G. Troni, P. Ozog, J. Henderson, "High-Resolution Underwater Robotic Vision-Based Mapping and Three-Dimensional Reconstruction for Archaeology," *Journal of Field Robotics,* 625, 2016.

M. Johnson-Roberson, O. Pizarro, S. Williams, I. Mahon, "Generation and Visualization of Large-Scale Three-Dimensional Reconstructions from Underwater Robotic Surveys," *Journal of Field* Robotics, 2009, 27(1): 21-51.

Service: Professor Johnson-Roberson has served on several departmental and college committees, but he has also been an integral member of the Robotics faculty at UM. He has been an associate editor for the two major IEEE robotics conferences-ICRA and IROS, and is a reviewer for the top conferences and journals in his field.

External Reviewers:
Reviewer A: "Compared to other people working in the same field, I consider Matthew Johnson-Roberson an outstanding researcher . . . my impression about his dedication and excellent previous work, for sure would meet the requirements for someone being considered for promotion and tenure at [my institution]."

Reviewer B: "His results in his paper 'Generation and Visualization of Large-scale Three-dimensional Reconstructions from Underwater Robotic Surveys' is a tour-de-force of underwater robotic mapping, showing the best 3D optical reconstructions of the seabed from autonomous underwater vehicle (AUV) data that I have ever seen."

Reviewer C: "His work in the general area of marine robotics and mapping spans the gamut from visual SLAM, looking at the effects of color on underwater imagery, stereo vision and…three dimensional image reconstructions. In each of these areas he has done important

work based on strong foundations and with a focus on problems that are important in transitioning marine robots into useful tools for the scientific community."

Reviewer D: "In my professional opinion, Dr. Johnson-Roberson is a relatively straightforward case for tenure and promotion to Associate Professor. He is one of the top people…in underwater robotics and is expanding into other areas (driverless cars) where his work is gaining recognition."

Reviewer E: "… his work on mapping, 3D reconstruction, and interpretation of underwater structures and environments has earned him international recognition. What impresses me most is his ability to synergistically combine algorithm development with field deployment and practical applications in marine science, archeology, and ship hull inspection."

Reviewer F: "He is co-director of the University of Michigan's Ford Center for Autonomous Vehicles, which to the best of my knowledge is the largest university-based research programs worldwide in autonomous mobility. It is highly unusual for an Assistant Professor to serve in such a major leadership role, and it speaks well of his abilities as a leader in both research and research administration."

<u>Summary of Recommendation</u>: Professor Johnson-Roberson is a nationally and internationally recognized scholar in the field of marine robotics. He has established the Deep Robot Optical Perception (DROP) lab as a leading research lab for 3D underwater reconstruction with growing prominence in the area of self-driving cars, a clear commitment to teaching, and substantial service contributions to the community. It is with the support of the College of Engineering Executive Committee that I recommend Matthew K. Johnson-Roberson for promotion to associate professor of naval architecture and marine engineering, with tenure, Department of Naval Architecture and Marine Engineering, and associate professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

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

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