Jeffrey W. Kaeli, PhD

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Introduction

Mobile platforms, from autonomous vehicles to smart phones, are capable of capturing optical imagery in volumes that are too vast to be exhaustively analyzed by trained human observers. My research interests focus around using computer vision and machine learning techniques to quantitatively answer scientific questions about these datasets and streamline the interaction between humans and computers in understanding visual data.

Education

Ph.D. in Mechanical and Oceanographic Engineering (2013) **MIT/WHOI Joint Program**

Thesis: *Computational Strategies for Understanding Large Underwater Optical Image Datasets*
Advisor: Hanumant Singh (WHOI Deep Submergence Lab)
Committee: John Leonard (MIT CSAIL), Ramesh Raskar (MIT Media Lab), Antonio Torralba (MIT CSAIL)

B.S. in Mechanical Engineering, Minor in Biology, *Magna Cum Laude* (2007) **Virginia Tech**

Experience

Research Engineer at Woods Hole Oceanographic Inst., Woods Hole, MA (6/2014 - present)
Ocean Systems Laboratory

- anomaly detection in side scan sonar imagery for improved AUV mission autonomy
- novel propulsion system for a low-cost AUV

Visiting Investigator at Woods Hole Oceanographic Inst., Woods Hole, MA (9/2013 - 5/2014)
Ocean Systems Laboratory

- image processing for target detection in optical and acoustic data from robotic underwater platforms

Postdoctoral Investigator at Woods Hole Oceanographic Inst., Woods Hole, MA (8/2013 - 10/2013)
Deep Submergence Laboratory

- visual summaries for low-bandwidth mission-time mapping with AUVs

Teaching Assistant at Virginia Tech, Blacksburg, VA (8/2005 - 5/2007)
Department of Engineering Education

- *ENGE 1024: Engineering Exploration*, a mandatory course for all freshmen engineers
- taught hands-on curriculum-based recitations of 30 students

Grading Coordinator at Virginia Tech, Blacksburg, VA (8/2005 - 5/2007)
Department of Engineering Education

- developed problem sets and solution manuals for *ENGE 1024: Engineering Exploration*
- managed team of a half dozen undergraduate graders for a class of 1200+ students

Publications

- **Kaeli, J.W.** and Singh, H. *Online Data Summaries for Semantic Mapping and Anomaly Detection with Autonomous Underwater Vehicles.* Proceedings of IEEE/MTS OCEANS, Genova, Italy (2015).

- **Kaeli, J.W.**, Leonard, J.J., and SIngh, H. *Visual Summaries for Low-Bandwidth Semantic Mapping with Autonomous Underwater Vehicles.* Proceedings of IEEE/OES AUV, Oxford, MS (2014).

- **Kaeli, J.W.** *Computational Strategies for Understanding Underwater Optical Image Datasets.* PhD Thesis, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution (2013).

- Eastman, J.T., Amsler, M.O., Aronson, R.B., Thatje, S., McClintock, J.B., Vos, S.C., **Kaeli, J.W.**, Singh, H., and La Mesa, M. *Photographic survey of benthos provides insights into the Antarctic fish fauna from the Marguerite Bay slope and the Amundsen Sea.* Antarctic Science (2012).

- **Kaeli, J.W.**, Singh, H., Murphy, C. and Kunz, C. *Improving Color Correction for Underwater Image Surveys.* Proceedings of IEEE/MTS OCEANS, Kona, HI. 2011.

- **Kaeli, J.W.**, Singh, H., and Armstrong, R.A. *An Automated Morphological Image Processing Based Methodology for Quantifying Coral Cover in Deeper-Reef Zones.* Proceedings of IEEE/MTS OCEANS, Boston, MA. 2006.

- Snook, J.S., Lohani, V.K., Lo, J., Sirvole, K., Mullin, J., **Kaeli, J.W.**, and Griffin, H. *Incorporation of a 3-D Interactive Graphics Programming Language into an Introductory Engineering Course.* Proceedings of ASEE Annual Conference, Portland, OR. 2005.

PATENT APPLICATIONS

- Austin, T.C.; Allen, B.; Purcell, M.; **Kaeli, J.W.** "Asymmetric Propulsion and Maneuvering System," **2014**, U.S. Provisional Patent Application 61/975,253, April 4, 2014.

FIELD WORK

- **tracking invasive predatory crabs on the continental shelf and slope of Antarctica**
  - 52 days aboard icebreakers *R/V Nathaniel B. Palmer* and *R/V Oden* in the Southern Ocean (11/2010 - 1/2011)
  - deployed and operated SeaSLED towed camera system
  - developed MATLAB GUIs for dataset annotation and organism sizing
  - part of the Antarctic ASPIRE project `http://antarcticaspire.org/`

- **imaging benthic habitats affected by the Deepwater Horizon oil spill**
  - 7 days aboard *R/V Walton Smith* in the Gulf of Mexico (9/2010)
  - deployed and operated SeaSLED towed camera system

- **range-only active target reaquisition and imaging sonar surveys of target**
  - 1-week demonstrations at Naval Support Activity, Panama City, FL (8/2009, 9/2010)
  - data analysis and target characterization using REMUS autonomous underwater vehicle

- **ship hull inspection using high-frequency multibeam sonar**
  - 1-week demonstration at Newport Naval Station, Newport, RI (5/2008)
  - 2-week demonstration at Eckernförde Naval Base, Kiel, Germany (8/2008)
  - multibeam map construction for target detection using REMUS autonomous underwater vehicle

- **introductory oceanography cruise for first year graduate students**
  - 10 days aboard the *SSV Corwith Cramer* in the North Atlantic Ocean (6/2007)

AWARDS

- **George G. Panteleyev Award** for improving graduate student life at WHOI (2014)

- Second Place, Undergraduate Student Poster Session at *IEEE/MTS OCEANS* (2006)

- **Dean's List of Instructors** at Virginia Tech (fall 2005, fall 2006)

- **Dean's List of Students** at Virginia Tech, *all semesters* (fall 2002 - spring 2007)

- **Eagle Scout Award** (2001)