

# JOHANNA HANSEN

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## EDUCATION

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**McGill University, Montreal, QC**

2016 – 2021

Ph.D. in Computer Science in the Mobile Robotics Lab

Thesis work on *Decision Making in Robotic Systems*

under the supervision of Dr. Gregory Dudek

**University of Texas at San Antonio, San Antonio, TX**

2012 – 2015

Graduate coursework towards Electrical Engineering (Digital Signal Processing)

**Texas State University, San Marcos, TX**

2007 – 2011

B.S. in Electrical Engineering (Networking and Communication)

Capstone Project on *Identifying Devices in the Power Grid by their Current Signatures*

B.S. in Geography with concentration in Environmental and Resource Geography

**Selected Coursework:** Machine Learning, Reinforcement Learning, Robotics, Digital Signal Processing, Numerical Estimation, Communication Systems, Networking, Data Compression and Error Coding, Geographic Information Systems, Physical Geography, Environmental Resource Management

## PUBLICATIONS

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**Hansen, J.**, Manjanna, S., Quattrini, L. A., Rekleitis, I., Dudek, G., *Autonomous Marine Sampling Enhanced by Strategically Deployed Drifters in Marine Flow Fields*, IEEE OCEANS 2018, (**Top 20 Student Submission**)

**Hansen, J.**, Dudek, G., *Coverage Optimization with Non-Actuated, Floating Mobile Sensors using Iterative Trajectory Planning in Marine Flow Fields*, IEEE IROS 2018

**Hansen, J.\***, Kastner, K.\*, Courville, A., Dudek, G., *Planning in Dynamic Environments with Conditional Autoregressive Models*, 2018 ICML workshop on Prediction and Generative Modeling in Reinforcement Learning.

Henderson P., Chang, W.D., Shkurti, F., **Hansen, J.**, Meger, D., Dudek G., *Benchmark Environments for Multitask Learning in Continuous Domains*, 2017 ICML Workshop on Lifelong Learning. <https://arxiv.org/abs/1708.04352>

Manjanna, S., **Hansen, J.**, Quattrini, L. A., Rekleitis, I., Dudek, G., *Collaborative Sampling Using Heterogeneous Marine Robots Driven by Visual Cues*, Canadian Conference on Computer and Robot Vision, 2017.

Quattrini L. A., Rekleitis, I., Manjanna, S., Kakodkar, N., **Hansen, J.**, Dudek, G., Bobadilla, L., Anderson, J., and Smith, R., *Data Correlation and Comparison from Multiple Sensors over a Coral Reef with a Team of Heterogeneous Aquatic Robots*, International Symposium on Experimental Robotics, 2016.

**Hansen, J.**, Fourie, D., Kinsey, J., Pontbriand, C., Ware, J., Farr, N., Kaiser, C., and Tivey, M., *Autonomous Acoustic-Aided Optical Localization for Data Transfer*, 2015 IEEE Oceans.

Pontbriand, C., Farr, N., Fourie, D., **Hansen, J.**, Kinsey, J., Pelletier, J., and Ware, J., *Wireless Data Harvesting Using the AUV Sentry and WHOI Optical Modem*, 2015 IEEE Oceans.

**Hansen, J.**, Wilden, G., Abbott, B., and Green, R., *The Ultrasonic Culvert Inspection System (UCIS): A Low-Cost Device for Conduit Inspection*, 2014 Transportation Research Board 93rd Annual Meeting.

## EXPERIENCE

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### McGill University

Jan 2016–current

*Graduate Researcher, Mobile Robotics Lab*

*Montreal, QC*

- Research on model-based planning and reinforcement learning with generative models for mobile robots
- Developed system for strategic marine sampling with low-cost sensors
- Developed system for portable underwater localization using low-cost USBL/GPS components

### Woods Hole Oceanographic Institution (WHOI)

Jan 2014 – Sept 2015

*Software Engineer, National Deep Submergence Facility*

*Woods Hole, MA*

- Software/Data/Electrical Engineer for deep-diving autonomous underwater vehicles (AUVs) working in research and ship-board operational environments.
- Assisted in all aspects of at-sea operations including deployments, hardware repair, and dive planning.
- Primary data scientist at-sea for geophysical, acoustic, and image processing.
- Developed automated spatio-temporal processing pipeline for high-resolution multibeam, sidescan sonar, and optical data maps.
- Assisted in overhaul of navigation (GPS/USBL/LBL/DR) processing and visualization.
- Developed user-interfaces (QT), vehicle control code (C++), data processing code (Python/Matlab), and device drivers primarily in Linux.

### Southwest Research Institute (SwRI)

Jan 2012 – Dec 2013

*Engineer, Automation and Data Systems Division*

*San Antonio, TX*

- Software/Electrical Applied Research Engineer for research, commercial, and government clients.
- Primary end-to-end software engineer building a mapping sensor consisting of acoustic transducers, DSP, camera, and embedded computer with remote control and interpretation.
- Developed sampling, filtering, visualization scheme for live acoustic data.
- Wrote beamforming calibration routine to tune for errors in sensor fabrication.

### Lower Colorado River Authority (LCRA)

Jan 2011 – Dec 2011

*Engineering Coop, Telecommunications Department*

*Austin, TX*

- Designed and configured SONET, optical fiber, Ethernet, and microwave systems for critical communication infrastructure including power generation/distribution, dam and irrigation control, and emergency response coordination.
- Project lead for pilot irrigation control system using networked 900 MHz Radios.

## OCEANOGRAPHIC RESEARCH CRUISES

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### Studies of Evolution and Ecology of Petroleum Systems, Gulf of Mexico

Jun 2015

*R/V Atlantis, Chief Scientist: Dr. David Valentine*

- Primary software/data processing engineer for Sentry AUV working with multibeam, sidescan, and sub-bottom pipeline data.

### Mapping, Exploration, and Sampling at Havre Volcano, Southwestern Pacific

Mar 2015

*R/V Revelle, Chief Scientist: Dr. Adam Soule*

- Primary software/data processing engineer for Sentry AUV in collaboration with Jason ROV. Developed sidescan and sub-bottom pipeline for processing sonar signal using MB-System.

### Monitoring Recovery of Pacific Seamounts, Hawaiian Islands

Oct 2014

*R/V Sikuliaq, Chief Scientists: Dr. Amy Baco-Taylor and Dr. Brendon Roark*

- Primary software/data engineer processing subsea navigation and images. Developed classifier for seafloor images for easier processing.

### **Juan de Fuca Ridge, Northeastern Pacific**

Jul 2014

*R/V Atlantis, Chief Scientists: Dr. James Kinsey and Dr. Maurice Tivey*

- Lead software engineer for AUV optical communication system integration. Developed acoustic/optical search algorithm for finding an optical modem on the seafloor. Also provided navigation/data processing and visualization for science.

### **Iron Eaters of the Loihi Seamount, Hawaiian Islands**

Jun 2014

*R/V Falkor, Chief Scientist: Dr. Brian Glazer*

- Primary software/data engineer working with subsea navigation, scientific sensors, and images. Developed thematic map of iron location in images for easy inspection and planning.

### **Deep Water Supercoral in Low pH Environments, Gulf of Mexico**

Apr 2014

*R/V Atlantis, Chief Scientist: Dr. Erik Cordes*

- Primary software/data engineer working with subsea navigation, scientific sensors, and images.

### **Mineral Exploration, Southeastern Pacific**

Jan 2014

*R/V Ka'imikai-O-Kanaloa, Chief Scientist: Dr. Carl Kaiser*

- Learned AUV deployment, mission planning, data processing, and networking. Developed new initiative for robust data management.

## **PROFESSIONAL ACTIVITIES**

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### **Technical Skills**

- *Software*: scientific and machine learning Python (PyTorch, NumPy, scikit-learn, Pandas, OpenCV and more), C/C++, Matlab, Bash, ROS, GIS on Linux, OSX, Windows
- *Hardware*: embedded systems, localization systems, marine instrumentation and sensing
- *Data*: geospatial and time series data, image processing, sonar, navigation
- *Languages*: English (native), Spanish (basic), French (learning)

### **Presentations**

- 2017: NIPS WiML Workshop Poster Presentation on Distributed Sensors
- 2015: CapePy Python Meetup Tutorial: Introduction to Machine Learning with Scikit-learn
- 2015: SciPy 2015 Talk: Characterizing the Seafloor with Python as a Toolbox
- 2015: BRATS Talk: Standardizing Machine Learning Tasks with Scikit-learn

### **Workshops and Professional Development**

- 2016-2018: Barbados Marine Field Trials
- 2017: MILA Deep Learning and Reinforcement Learning Summer School
- 2017: McGill Innovation's AI for Social Good Summer Lab
- 2017: National Canadian Field Robotics Symposium and Field Trials
- 2016: IEEE Marine Robotics Summer School
- 2016: National Canadian Field Robotics Symposium and Field Trials
- 2013: SciPy: Scikit-learn, Cython, Geospatial Tutorials and Tracks
- 2013: SwRI Professional Course in Proposal Writing
- 2013: SwRI Professional Course in Promoting Research and Development
- 2012: SwRI Professional Course in Technical Writing

- 2012: SwRI Professional Course in Project Management
- 2010: NAUI Master Scuba Diver, Diving for Science Certified

### **Leadership and Volunteer Work**

- 2018: NIPS WiML Volunteer
- 2017: ICML Volunteer
- 2015: Scikit-learn developer sprint in Paris
- 2015: Neural Information Processing Systems (NIPS), Volunteer
- 2015: Founder and Technical Organizer of WHOI-Software Technical Group
- 2015: CapePy Python Meetup Leader and Member
- 2014: Big-data, Robotics, Autonomy, Technology and Sensing (BRATS) Member
- 2013: South-Central CleanTech Open Incubator Judge, San Antonio and Austin TX

### **Selected Awards**

- 2017: WiML NIPS Travel Grant
- 2016: McGill GREAT Travel Award
- 2012: UTSA M.S. COE Valero Research Fellowship Offer
- 2013: Internal Research and Development Funding, Primary Investigator
- 2007: Terry Foundation Scholarship (Complete Undergraduate Funding)
- 2007: Dick Walrath Foundation Scholarship
- 2007: American Quarter Horse Association Scholarship

## **TEACHING EXPERIENCE**

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### **Texas State University**

Jan 2010–Dec 2010

- Signals and Systems Teaching Assistant
- Electronics Teaching Assistant
- Microprocessors Lab Assistant
- Engineering Management Teaching Assistant