

# RUI CHEN

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## EDUCATION

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**Massachusetts Institute of Technology (MIT)**  
**Woods Hole Oceanographic Institution (WHOI)**

Ph.D. Candidate, MIT-WHOI Joint Program

Applied Ocean Science and Engineering

National Science Foundation Graduate Research Fellowship

**Relevant Coursework:** Array processing, Discrete-time signal processing, Environmental ocean acoustics, Applied machine learning, Unmanned marine vehicle autonomy, sensing & communications, Stochastic systems

Cambridge, MA

Woods Hole, MA

Expected June 2021

GPA: 4.9/5

**Northwestern University**

B.A. with Honors, *Magna Cum Laude*

Majors in Integrated Science, Physics, Earth Science

NOAA Ernest F. Hollings Undergraduate Scholarship

Outstanding Student in Physics (2014, 2015)

Inductee, Phi Beta Kappa Society

Evanston, IL

June 2016

GPA: 3.88/4

## RESEARCH EXPERIENCE

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**Arctic Ocean Underwater Ambient Noise**  
*Graduate Research Assistant, MIT-WHOI*

July 2016 - Present  
Cambridge, MA

- Investigate environmentally-induced changes to Arctic underwater ambient noise using signal processing techniques including time-frequency analysis, beamforming, and transient event detection & estimation using Matlab and Python
- Model and correlate underwater acoustic propagation to environmental variability using raytracing (Bellhop), wavenumber integration (OASES), and normal modes (Kraken)
- Develop a convolutional neural network approach using Tensorflow and Keras to estimate range of surface noise sources that exhibit 20% increase in accuracy and more robustness to environmental mismatch compared to conventional matched field method
- Implement image processing and hierarchical clustering with Python and OpenCV to automatically detect and group transient noise features in data spectrograms; allows for easier categorization of transients compared to amplitude-based approach

**Arctic Ice Cover Cryo-seismic Monitoring**  
*Graduate Research Assistant, MIT-WHOI*

December 2018 - Present  
Woods Hole, MA

- Collaborate with WHOI scientist to monitor Arctic ice cover activity near the coast of northern Alaska with a deployed planar geophone array to better understand ambient noise generation
- Design and implement an event detection and localization algorithm that combines match filtering followed by time-difference-of-arrival estimate using Matlab; able to locate events within array perimeter with < 10% error

**Cold, Diffuse Interstellar Clouds**  
*Undergraduate Research Assistant, Northwestern University*

September 2014 - June 2016  
Evanston, IL

- Extracted and analyzed star UV spectrum data from telescope databases to determine cloud distance and density using the image reduction and analysis facility program (IRAF) to better understand star formation within these clouds

**Tsunami Danger Threshold Modeling**  
*Research Intern, Pacific Tsunami Warning Center*

Summer 2015  
Honolulu, HI

- Formulated a current velocity threshold for tsunami warning issuance by employing a 1-D shallow water model in Matlab to simulate tsunami events and quantifying the human and economic impacts of the waves

## TECHNICAL PROJECTS

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**AUV Mission for Temperature Front Estimation**

MIT Marine Vehicle Autonomy Course

- Leveraged autonomy software (MOOS-IvP) and C++ to plan an adaptive underwater vehicles behavior for autonomous sampling of a temperature front in the Charles River
- In simulation, the resultant mission enabled collaboration between two independent vehicles with acoustic message passing; reduced the required mission time compared to standard lawn-mower path planning

## Web Application for Logging Board Game Results

Personal Interest

- Utilized JavaScript and HTML to build a NodeJS application that allows for easy documentation of board game results and calculates player performance statistics; the logged data are automatically stored in a MongoDB and displayed through a web interface

## RESEARCH EXPEDITIONS

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### U.S. Navy Ice Exercise 2020 (ICEX2020)

March 2020

*Arctic Ocean*

- Collaborated with labmates to facilitate the deployment of a Bluefin-21 autonomous underwater vehicle with a towed line array for noise data collection below the Arctic ice cover

### Sea Ice Dynamics Experiment (SIDEx)

December 2018

*Barrow, AK*

- Assisted in the deployment and calibration of a planar geophone array on the ice cover near Elson Lagoon to monitor cryo-seismic activities

## PUBLICATIONS

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**R. Chen**, A. Poulsen, and H. Schmidt, "Spectral, spatial, and temporal characteristics of underwater ambient noise in the Beaufort Sea in 1994 and 2016," J. Acoust. Soc. Am. **145**, 605–614 (2019).

**R. Chen** and H. Schmidt, "Model-based convolutional neural network approach to underwater source-range estimation," J. Acoust. Soc. Am. (Submitted).

**R. Chen** and H. Schmidt, "Temporal and spatial characteristics of the Beaufort Sea ambient noise environment," J. Acoust. Soc. Am. (Submitted).

## TEACHING & ADVISING

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### Graduate Peer Career Advisor

MIT Career Advising & Professional Development, September 2019 - Present

- Conducted >50 individual career advising appointments with undergraduate and graduate students to review resumes/cover letters and offer career counseling; 100% of students rated sessions as extremely helpful

### Course Facilitator

MIT edX, November 2019 - May 2020

- Prepared and facilitated weekly online lessons for ~20 students (industry professionals) on machine learning topics as part of MIT edX's MicroMasters program on Statistics and Data Science

### Teaching Assistant

MIT Environmental Ocean Acoustics Course, Fall 2018 & 2020

- Led weekly recitations and advised students on coding projects in underwater acoustics modeling; guided novel programmers to produce functional raytracing, normal modes, and wavenumber integration codes

## LEADERSHIP

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### President

MIT-WHOI Joint Program Student Representatives, October 2019 - Present

- Lead monthly representatives meeting and help manage the group's budget
- Collaborate with other representatives to organize program events such as student orientation, academic talks, social engagements, and diversity & inclusion efforts

### Webmaster, Tour Coordinator

MIT Concert Band, May 2019 - Present

- Actively maintain the concert band website and advertise band events
- Spearheaded the planning of the band's 2019 performance tour in Washington D.C.; communicated with MIT administrators and various vendors to finalize travel logistics for ~40 band members and band equipment

## SKILLS

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**Computer:** Proficient in Matlab, Python, C++, OASES, Bellhop, Kraken. Familiar with HTML, JavaScript, NodeJS, React.

**Language:** Native fluency in English, Mandarin Chinese.