

ARIEL VARDI

Greater Boston, MA

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EDUCATION

Ph.D., MIT/WHOI Joint-Program

Cambridge, MA, USA

Mechanical Engineering and Applied Ocean Science & Engineering

May 2025

Thesis Subject: Deep Learning Framework for Geoacoustic Inversion using Normal Mode Theory

M.Sc., Technion - Israel Institute of Technology

Haifa, Israel

Energy Engineering, cum laude

2020

Thesis: Sorption-Based Cooling Using Acoustic Waves - Experimental and Theoretical Exploration

B.Sc., Technion - Israel Institute of Technology

Haifa, Israel

Environmental and Chemical Engineering, cum laude

2017

EXPERIENCE

Research Assistant

2020-2025

Woods Hole Oceanographic Institution

WHOI, MA

- Established a new Deep Learning framework for inferring ocean sediment acoustic properties using a fully automated pipeline using PyTorch and Tensorflow.
- Participated in multiple at-sea experiments that included the deployment and recovery of hydrophones, and collaborated with scientists from all over the world.
- Processed and analyzed hundreds of hours of acoustic data using Python, MATLAB and Julia.
- Developed multiple differentiable programs for underwater acoustic field modeling using Julia.
- Developed analytical models that were integrated with neural networks for establishing physics-based deep learning frameworks.

Research Assistant

2016 - 2020

Thermoacoustics Lab - Technion

Haifa, Israel

- Led the Thermoacoustic Cooling project which resulted in a 450% increase in cooling efficiency using a novel adsorption-based system.
- Developed and built an experimental Thermoacoustic system with the ability to sustain both vacuum and high pressures.
- Defined specifications, quality assurance and full development of a DAQ system using National Instruments modules and LABView.
- Derived simultaneously a mathematical model that describes the operation of the novel Thermoacoustic system and solved numerically using MATLAB.

CONFERENCES

A. Vardi, J. Leonard and J. Bonnel. Spatial Variability of the Sound Speed Ratio in the New England Mud Patch Using Neural Networks. SBCEX Workshop, Providence, Rhode Island (USA), May 2024.

A. Vardi and J. Bonnel. A deep learning approach for geoacoustic inversion using a distributed array of unsynchronized hydrophones and explosive sound sources. In IEEE UASP meeting, Exeter, (USA), Oct. 2023.

A. Vardi and J. Bonnel. An end-to-end deep learning approach for geoacoustic inversion: Application to SBCEX22 TOSSIT data. In SBCEX Workshop, San Diego CA (USA), Feb. 2023.

A. Vardi-Chouchana and J. Bonnel. An end-to-end deep learning approach for joint detection, source localization, and environmental characterization using a single hydrophone in shallow water. In ASA meeting, Nashville (USA), Dec. 2022.

SKILLS

Programming

Python, MATLAB, Julia, Wolfram Mathematica, FORTRAN, C, High Performance Computing

Software Libraries

PyTorch, JAX, Tensorflow, Numpy, Scipy, Lux.jl, SciML.jl

Language

English (fluent), Hebrew (native), French (native)

FIELD EXPERIENCE

New England Seamount Experiment (MA, USA)	2023
New England Mudpatch - Seabed Characterization Experiment (MA, USA)	2022
New England Mudpatch - Seabed Characterization Experiment (MA, USA)	2021

TEACHING EXPERIENCE

Workshop: Introduction to Python	Summer 2023 & 2024
<i>Workshop instructor</i>	<i>Woods Hole, MA, USA</i>
Workshop: Introduction to MATLAB	Summer 2021
<i>Workshop instructor</i>	<i>Woods Hole, MA, USA</i>
Transport Phenomena	Spring 2019
<i>Part of creation team, frontal teaching and course assignment grading</i>	<i>Technion, Haifa, Israel</i>
Introduction to Environmental Engineering	Spring 2018, Spring 2019
<i>Frontal teaching in recitations and course assignment grading</i>	<i>Technion, Haifa, Israel</i>
Fluid Mechanics	Fall 2017, Fall 2018
<i>Frontal teaching in recitations and course assignment grading</i>	<i>Technion, Haifa, Israel</i>

FELLOWSHIPS, AWARDS AND HONORS

Doctoral Fellowship	2020-2025
<i>WHOI-MIT Joint Program</i>	<i>MA, USA</i>
Schulich Scholarship	2015
<i>The Inter-University Institute for Marine Sciences and Dalhousie University</i>	<i>Eilat, Israel and Halifax, Canada</i>

PUBLICATIONS

- A. Vardi**, G. Averbuch, J. Leonard, Sensitivity Analysis of Normal Mode Models using Automatic Differentiation, *to be submitted*.
- A. Vardi**, P. H. Dahl, D. Dall'Osto, D. Knobles, P. Wilson, J. Leonard, J. Bonnel, Estimation of the spatial variability of the New England Mud Patch geoacoustic properties using a distributed array of hydrophones and deep learning. *J Acoust Soc Am* 156, 4229–4241 (2024).
- A. Vardi** and J. Bonnel, "End-to-End Geoacoustic Inversion with Neural Networks in Shallow Water Using a Single Hydrophone", *IEEE Journal of Oceanic Engineering*, vol. 49, no. 2, pp. 380-389 (2024)
- R. Yang, N. Blanc, **A., Vardi**, N. Ouzana and G.Z.. Ramon, "PC-TAS: A design environment for phase-change and classical thermoacoustic systems", *SoftwareX*, 19, p.101142 (2022)
- A. Vardi** and G.Z. Ramon, "Acoustically Driven Sorption Heat Pump", *Physical Review Applied*, 16(4), p.044044 (2021)

VOLUNTEERING AND ADDITIONAL ACTIVITIES

- 2010-2013 Artillery Staff Sergeant and Field Medic in IDF**
- 2013-2017 Volunteer in "Aharai Labagrut"** Mentoring for 16-19 year-old students from low social-economic backgrounds in Israel.
- 2015-2017 Co-Founder of "Ha-Asam Cooperative"** A cooperative specialized in selling food produce from farmers at lowered prices in Israel.