

Tue J. Boesen

MACHINE LEARNING RESEARCHER

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Summary

I am a data scientist specialized in machine learning. I have worked both as: researcher, project lead, and technical advisor/consultant on various projects. I have a solid foundation in: mathematics, data science, and general optimization techniques. Within machine learning, I have specialised in physics-informed and graph neural networks, but I have experience with most areas of deep learning.

Selected experience

Proteic Bioscience Inc.

[Vancouver, Canada](#)

MACHINE LEARNING CONSULTANT

Jan 2022 - June 2022

- Lead developer of equivariant neural networks for energy and force predictions for biomolecular systems.
- Developed MLOps framework with MLflow and Optuna.

University of British Columbia (UBC)

[Vancouver, Canada](#)

POSTDOCTORAL RESEARCH FELLOW IN MACHINE LEARNING

May 2019 - Aug 2021

- Developed novel physics-informed neural network frameworks.
- Published reversible mimetic graph neural networks.
- Developed self-supervised conditional probability neural networks inspired by natural language processing models.
- Published a semi-supervised active learning algorithm.
- Deployed large scale training on Amazon Web Services.

Computational Geoscience Inc.

[Vancouver, Canada](#)

AI RESEARCH SCIENTIST

May 2019 - Aug 2020

- Developed clustering techniques for oil exploration.
- Published novel graph-based semi-supervised learning methods applied to seismic data.

HydroGeophysics Group at Aarhus University

[Aarhus, Denmark](#)

RESEARCH ASSISTANT

Aug 2017 - Nov 2017

- Open-sourced a sparse iterative parallel linear solver based on my research during my Ph.D.
- Open-sourced an OpenMP parallelization framework developed during my Ph.D.

Danske Bank

[Copenhagen, Denmark](#)

ANALYST, GRADUATE POSITION

Sep 2013 - Apr 2014

- Worked in customer insight creating forecast models.

HydroGeophysics Group at Aarhus University

[Aarhus, Denmark](#)

SCIENTIFIC PROGRAMMING CONSULTANT

Mar 2013 - Sep 2013

- Created SPIA in Pascal, an application for ground-based electromagnetic measurements.

Education

Aarhus University

[Denmark](#)

PH.D. IN GEOPHYSICS

2015 - 2018

- Thesis: Numerical methods for electromagnetic geophysics beyond 1D

Aarhus University

[Denmark](#)

M.S. IN THEORETICAL PHYSICS

2010 - 2011

- Thesis: Foundation for a parallel time-dependent density functional theory simulator in a spherical harmonic basis using the exact exchange energy functional

Aarhus University

[Denmark](#)

B.S. IN PHYSICS

2006 - 2010

- Thesis: Feynmans Pathintegral i 1 dimension med fokus på sinusbaner (Feynman's path integral in 1 dimension with focus on sinusoidal trajectories)

Skills

Platforms	Windows, Linux Ubuntu, AWS
Programming Languages	Python, Pytorch, LaTeX, Git, Matlab, Fortran, Julia, Delphi/Pascal, OpenMp, MPI
	Danish, English

Teaching and supervision

Teaching

Aarhus University, Denmark

INSTRUCTOR

2009-2017

- Calculus.
- Electric and Electromagnetic methods.
- Data processing and interpretation for groundwater mapping.
- Geophysical methods.
- Hydrogeophysical field course (twice).

Supervision

UBC, Canada

CO-SUPERVISOR

2020

- Jingrong Lin – Ph.D. student in geophysics and machine learning.

About me

My main hobbies outside work are rock climbing and beach volley. Apart from those I like to tinker with various projects, my current project is to **develop a framework** that can play various boardgames, while previous ones include: building a quadcopter, and designing and building a hangboard with a CNC machine and laser cutter.

Publications

In Preparation

Neural DAEs: Constrained neural networks
 Tue Boesen, Eldad Haber, Uri M Ascher
arXiv preprint arXiv:2211.14302 (2022). 2022

Journal Articles

A-optimal active learning

Tue Boesen, Eldad Haber

Physica Scripta 98.4 (Mar. 2023) p. 045014. IOP Publishing, 2023

Mimetic neural networks: a unified framework for protein design and folding

Moshe Eliasof, Tue Boesen, Eldad Haber, Chen Keasar, Eran Treister

Frontiers in Bioinformatics 2 (2022). 2022

Data-driven semi-supervised clustering for oil prediction

Tue Boesen, Eldad Haber, G Michael Hoversten

Computers & Geosciences 148 (2021) p. 104684. Pergamon, 2021

An efficient 2D inversion scheme for airborne frequency-domain data

Tue Boesen, Esben Auken, Anders Vest Christiansen, Gianluca Fiandaca, Casper Kirkegaard, Andreas Aspmo Pfaffhuber, Malte Vöge

Geophysics 83.4 (2018) E189–E201. Society of Exploration Geophysicists and American Association of Petroleum ..., 2018

A parallel computing thin-sheet inversion algorithm for airborne time-domain data utilising a variable overburden

Tue Boesen, Esben Auken, Anders Vest Christiansen, Gianluca Fiandaca, Cyril Schamper

Geophysical Prospecting 66.7 (2018) pp. 1402–1414. European Association of Geoscientists & Engineers, 2018

A review of airborne electromagnetic methods with focus on geotechnical and hydrological applications from 2007 to 2017

Esben Auken, Tue Boesen, Anders V Christiansen

Advances in geophysics 58 (2017) pp. 47–93. Elsevier, 2017

Conference Proceedings

Semi-supervised clustering for oil prospectivity

Tue Boesen, Eldad Haber, G Michael Hoversten

ICLR AI for Earth Sciences workshop, 2020

Efficient 2D hybrid inversion of airborne frequency domain data

E Auken, T Boesen, AVC Christiansen, GF Fiandaca, AA Pfaffhuber, MV Vöge

Second European Airborne Electromagnetics Conference, 2017

2D FEM inversion with a moving footprint and a hybrid 1D and 2D forward and derivative implementation

Tue Boesen, Esben Auken, Malte Vöge, Casper Kirkegaard, Kristoffer Rønne Andersen, Andreas Aspö Pfaffhuber, Anders Vest Christiansen

AGU Fall Meeting Abstracts, 2016

Rapid inversion of large airborne AEM data datasets utilizing massively parallel co-processors

C Kirkegaard, K Andersen, AV Christiansen, E Auken, T Boesen

First European Airborne Electromagnetics Conference, 2015

Utilizing massively parallel co-processors in the AarhusInv 1D forward and inverse AEM modelling code

Casper Kirkegaard, Kristoffer Andersen, Tue Boesen, Anders V Christiansen, Esben Auken, Gianluca Fiandaca

ASEG Extended Abstracts, 2015

2.5D inversion of sea ice thickness from helicopter EM data

M Vöge, A Pfaffhuber, E Auken, C Kirkegaard, T Boesen, S Hendricks, P Hunkeler

First European Airborne Electromagnetics Conference, 2015