# Diego Domenzain PhD Geophysics & Seismology • MSc Mathematics • BSc Mathematics

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**Research scientist** specializing in physics-based inverse problems & optimization methods.

- Numerical modeling of partial differential equations.
- Fortran, C, Shell, Matlab, Python, Julia.
- Scientific, parallel and cloud computing.
- Combinatoric optimization methods.

- Design of non-linear optimization methods.
- Signal processing of time series.
- Uncertainty quantification of observed data.
- Iterative image processing techniques.
- Deep learning methods for pic2pic mapping.

## Experience

**Aarhus University (AU)** 2021-          *Post-doctoral Researcher* in the Hydro-Geophysics Group

- Developed a 3D non-linear optimization scheme for remediation monitoring of polluted sites using large volumes of DCIP data, and large exploration domains.
- Created a physics-based visualization scheme for 3D DC borehole data.
- Enhanced signal processing routines for harmonic denoising of time-domain IP data.

**Colorado School of Mines (CSM)** 2020-2021     *Post-doctoral Researcher* in the Geophysics Department

- Coupling deep learning and physics-based exploration methods (implementing TensorFlow).
- Field data joint inversion of electromagnetic methods (own code).
- Multi-physics inversion using elastic full-waveform, gravimetry, and DC resistivity data (own code).

**Boise State University (BSU)** 2015 - 2019          *Ph.D.* Geophysics & Seismology (GPA 3.76/4)

- Joint NSF project with the *Applied Mathematics Department* at BSU.
- Dissertation: *Joint inversion using electromagnetic waves and steady currents*

**Michigan Technological University (MTU)** 2012 - 2014     *MSc.* Discrete Mathematics (GPA 3.45/4)

- Exploring Finite Geometries and Error Correcting Codes.
- Dissertation: *Maximal arcs, above and beyond*

## Publications

* *3D inversion and visualization of DC data acquired at dense borehole location*. SEG 2022 Fall meeting. Diego Domenzain, Lichao Liu, Anders K. Kühl, Ivan Y. Vela, Anders V. Christiansen.
  *Joint full-waveform ground-penetrating radar and electrical resistivity inversion applied to field data acquired on the surface*. Geophysics 87, (2022): K1-K17. Diego Domenzain, John Bradford, Jodi Mead.
  *Efficient inversion of 2.5D electrical resistivity data using the discrete adjoint method*. Geophysics 86, (2021): 1-54. Diego Domenzain, John Bradford, Jodi Mead.
  *Joint inversion of full-waveform inversion GPR and ER data. Part 1*. Geophysics 85, no.6 (2020): 1-72. Diego Domenzain, John Bradford, Jodi Mead.
  *Joint inversion of full-waveform inversion GPR and ER data. Part 2*. Geophysics 85, no.6 (2020): 1-74. Diego Domenzain, John Bradford, Jodi Mead.
* *Inversion of 2.5D electrical resistivity data using the discrete adjoint method*. SEG 2020 Fall meeting. Diego Domenzain, John Bradford, Jodi Mead.

* *Joint inversion of full-waveform GPR and ER data enhanced by the envelope transform and cross-gradients*.
 GPR 2020 biannual meeting. Diego Domenzain, John Bradford, Jodi Mead.
* *Joint inversion of GPR and ER data*. SEG Technical Program Expanded Abstracts 2018: pp. 4763-4767.
 SEG Fall meeting 2018. Diego Domenzain, John Bradford, Jodi Mead.

The symbol **\*** denotes expanded abstract.

# Professional Activities

**Aarhus University**. 2019 - present.
*Postdoctoral Researcher*
- Developed numerical tools for in-situ remediation monitoring using DCIP data an order of magnitude faster, and more accurate than existing tools.
- Designed measuring protocols for a generic on-site survey that brought down time costs by an order of magnitude in days.
- Worked together with the remediation company Ejlskov A/S to deliver industry-relevant results.

**Colorado School of Mines**. 2020 - 2021.
*Postdoctoral Researcher*
- Enhancing geo-radar imaging techniques with machine learning and full-waveform inversion.
- Member of the research groups,
  - Center for Wave Phenomena (CWP)
  - Center for Gravity, Electrical and Magnetic Studies Methods (CGEM)

**Boise State University**. 2015 - 2020.
*Research Assistant*
  - National Science Foundation (NSF) fully funded project for the development of a joint inversion algorithm using *ground penetrating radar* (GPR) and *electrical resistivity* (ER) data for imaging electrical properties in the Earth's subsurface.
  - This grant was given to the *Applied Mathematics Department* for joint collaboration with the *Geophysics Department* at Boise State University.

*Teaching Assistant*
  - Statistical Methods for Geoscience (Graduate)
  - Geophysical Methods (Graduate/Undergraduate)
  - Geophysical Instrumentation (Graduate/Undergraduate)
  - Natural Disasters: A Geoscience Perspective on Natural Hazards, Climate Change, and Society (Undergraduate)

**TU-Delft**. 2018.
*Visiting Scholar*
  - Academic visit to TU-Delft under the supervision of Evert Slob and Dominique Ngan-Tillard.

**Michigan Technological University**. 2012 - 2014.
*Research Assistant*
  - Understanding finite fields and embedded mathematical structures.
  - A step forward in understanding prime numbers.

*Teaching Assistant*
  - Calculus I (Undergraduate)
  - Calculus III (Undergraduate)
  - Calculus IV (Undergraduate)

## Honors

**Teaching assistantship**. Boise State University. Teaching assistant for graduate course of Statistical Methods covering tuition and stipend.

**Research assistantship**. Boise State University. Graduate research assistant for the Applied Mathematics NSF funded project DMS-1418714 covering tuition and stipend.

**Research assistantship**. Boise State University. Graduate research assistant for the Applied Mathematics NSF funded project DMS-1720472 covering tuition and stipend.

**Teaching assistantship**. Michigan Tech. Teaching assistant for undergraduate course of Calculus I-IV covering tuition and stipend.

## Conferences & Proceedings

**Diego Domenzain, Lichao Liu, Anders K. Kühl, Ivan Y. Vela, Anders V. Christiansen**. *3D inversion and visualization of DC data acquired at dense borehole location*. SEG 2022 Fall meeting.

**Diego Domenzain, Lichao Liu, Ivan Yelamos Vela, Anders V. Christiansen**. *Enhancing DC data quality using the full IP response*. IP Workshop 2022.

**Diego Domenzain, John Bradford, Jodi Mead**. *Multiphysics joint inversion of field FWI-GPR and ER surface acquired data*. SEG 2021 Fall meeting.

**Diego Domenzain, John Bradford, Jodi Mead**. *Inversion of 2.5D electrical resistivity data using the discrete adjoint method*. SEG 2020 Fall meeting.

**Diego Domenzain, John Bradford, Jodi Mead**. *Joint inversion of full-waveform GPR and ER data enhanced by the envelope transform and cross-gradients*. GPR 2020 biannual meeting (postponed for 2022 because of COVID-19).

**John Bradford, AR Mangel, D Domenzain**. *Reverse-Time Migration and Full-Waveform Inversion of Surface Ground-Penetrating Radar Data*. AGU Fall meeting 2018.

**Diego Domenzain, John Bradford, Jodi Mead**. *Joint inversion of GPR and ER data using the adjoint method*. AGU Fall meeting 2018.

**Diego Domenzain, John Bradford, Jodi Mead**. *Joint inversion of GPR and ER data*. SEG Technical Program Expanded Abstracts 2018: pp. 4763-4767. SEG Fall meeting 2018.

**Diego Domenzain, John Bradford, Jodi Mead**. *Imaging by joint inversion of electromagnetic waves and DC currents*. SIAM-Geosciences meeting 2017.

**Diego Domenzain, John Bradford, Jodi Mead**. *Imaging by joint inversion of electromagnetic waves and DC currents*. SAGEEP 2017.

**Diego Domenzain, John Bradford, Jodi Mead**. *Forward modeling of ground penetrating radar (GPR) and electric resistivity tomography (ERT) using finite difference time domain and finite volume methods, first steps for a joint inversion*. AGU Fall meeting 2016.

## Attended Workshops

**Image Reconstruction from Millimeters to the Globe**. Summer 2018. Lorentz Center, Leiden University, NL.

**17th International Conference on Ground Penetrating Radar**. Summer 2018. Rapperswil, Switzerland.

**Inverse problems**. Summer 2016. Colorado State University, USA.

**Computational and Analytical Aspects of Image Reconstruction**. Summer 2015. ICERM, Brown University, USA.

## Leadership

**NOSOTROS-MTU**. President of the student organization NOSOTROS at MTU.

- Organized schedule and budget on an entire year of activities, mostly camping around the Keweenaw.

**SEG-BSU Student Chapter**. President.

- Directed Python and Git coding workshop.
- Lead geophysics field survey at the old Idaho Penitentiary cemetery. We found some dead bodies there.

## Outreach

**Climate change communicator**. BSU lead in educational project between SEG Student Chapters at BSU and TU-Delft informing younger generations about climate change challenges and the use of geophysics to solve them.

**Didactic inventor**. Design of new activities for teaching high mathematical subjects to elementary school children at the Museum of Science in the university's campus.