Diego Domenzain

curriculum vitae

personal

github	https://github.com/diegozain
email	domenzain.diego@gmail.com
webpage	https://diegozain.github.io/

about me

I am a Mathematician with keen interest on applied problems and physics. Currently, I design better ways to explore the interior of the Earth at shallow depths. In order to achieve this I use numerical modelling of partial differential equations, mathematical non-linear optimization, signal processing (in time and frequency), and high performance computing.

The non-linear optimization algorithms I have designed, implemented, and developed are faster, lighter on memory, and of higher resolution than current industry standards.

professional experience

Computational Geophysicist, R&D — 2023 – now

Seequent - Labs, DK

Design and implementation of a 3D visualization scheme for DC data measured in arbitrary spatial configurations. Deployment and maintenance of parallel high performance computing algorithms in Azure, machine learning models for time-domain data quality control, and GPU implementation of electromagnetic physics simulations.

Postdoctoral Researcher — 2021 – 2023

Aarhus Universitet, DK

Design and implementation of a 3D DC inversion algorithm capable of handling two orders of magnitude more data than previous schemes. Worked closely with the design of a novel survey instrument to achieve the needs of our industry partner. The project specifically aimed (and was successful) at delineating the 3D spread of a contaminant-remediation agent in the subsurface.

Postdoctoral Researcher — 2020 – 2021

Colorado School of Mines, USA

Design and implementation of a multi-physics joint inversion of electromagnetic waves (radar) and DC data acquired at the surface. The result of this work was the first successful surface-acquired full-waveform inversion of radar data. Also developed a machine learning method for enhancing resolution of recovered parameters using remote sensing data.

PhD Researcher — 2015 – 2020

Boise State University, USA

Joined an existing NSF funded project aiming to join DC voltages and electromagnetic radar data in order to recover 2D subsurface electrical parameters. Successfully designed and developed such a scheme with the added bonus of a new electrical resistivity inversion algorithm capable of handling large amounts of data using low memory requirements. Moreover, through the use of numerical curvature algorithms it was possible to enhance resolution in areas of nearly zero sensitivity.

code

dcinv since 2021

Exploration geophysics software. Forward modeling of Poisson's equation for non-homogeneous 3D media with topography. Visualization and quality control of 3D electrical resistivity data. Non-linear inversion of measured voltage recovering 3D electrical conductivity. Uses less memory and is faster than existing industry-standard software (two orders of magnitude enhancements for both), enabling higher resolution results in a fraction of the time. Math & Physics engine in Fortran, visualization in Python.

alles since 2020

Personal dossier of projects not directly affiliated with any of my previous positions. Topics range from graph theory algorithms, partial differential equations, mathematical optimization, and scientific visualization of data. Written in C, Fortran, C++, Cuda, Shell, Python, Matlab. Hosted in Github.

Gerjoii since 2015

Exploration geophysics software. Forward modeling of Poisson's equation and the full electromagnetic wave equation (radar) for non-homogeneous 2D media. Non-linear multi-physics inversion of measured electric fields and voltages. Uses the full-waveform inversion (FWI) algorithm in the case of radar. Up to date this is the only software capable of inverting surface acquired radar data using the FWI scheme. Written in Matlab. Hosted in Github.

peer reviewed publications

3D DC inversion, visualization, and processing of dense time-lapse data in fine domains applied to remediation monitoring 2023

Diego Domenzain, Lichao Liu, Iván Yélamos Vela, and Anders Vest. Geophysics

Joint full-waveform ground-penetrating radar and electrical resistivity inversion applied to field data acquired on the surface 2022

Diego Domenzain, John Bradford, and Jodi Mead. Geophysics

Efficient inversion of 2.5D electrical resistivity data using the discrete adjoint method 2021

Diego Domenzain, John Bradford, and Jodi Mead. Geophysics

Joint inversion of full-waveform inversion GPR and ER data. Part 2 2020

Diego Domenzain, John Bradford, and Jodi Mead. Geophysics

Joint inversion of full-waveform inversion GPR and ER data. Part 1 2020

Diego Domenzain, John Bradford, and Jodi Mead. Geophysics

Maximal arcs, above and beyond 2014

Michigan Technological University, Master Thesis

Construction and dissection of finite geometries using algebraic and combinatorial methods.

Surface Error Correcting Codes 2012

UNAM, Bachelor Thesis

Construction of quantum error correction codes using group theory, algebraic topology, and graph theory.

mentorship

Aarhus Universitet, DK 2022 – 2023
Mentor

Devised a subject for a Master degree on signal processing of time-domain voltage data, and subsequently advised a Master student through the process of formulating and completing her Thesis.

Boise State University, USA 2018 – 2020
Teaching Assistant

Aided undergraduate and graduate courses on Geophysical Methods, Statistics, and Geophysical Instrumentation during my PhD degree.

Michigan Technological University, USA 2012 – 2014
Instructor

Taught undergraduate courses of Calculus II, III, and IV during my Master degree.

skills

Languages	Fortran, C/C++, Cuda, Julia, Python, Matlab, Bash, PowerShell, Latex, PyTorch, TensorFlow, Azure API.
Software	Low level implementation of non-linear optimization methods and numerical modeling. Design of parallel computing code with memory, speed, and accuracy performance in mind. Implementation of high performance computing in the cloud through Azure's API.

references

Available upon request