ANDRÉS BARAJAS

Data Scientist

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Data Scientist with a strong background in physics and mathematics, and over 6 years of experience in European Research Council (ERC)-funded projects.
Expert in data analysis, signal processing, and computational modeling. Proficient in Python, C, C++, and Fortran, with extensive experience developing algorithms for data-driven solutions, including machine learning applications. Highly skilled in communication, organization, and problem-solving, with a proven track record of teaching and knowledge sharing across diverse domains.

EXPERIENCE

Post-doc

Temporal series analysis - ERC Seismaze

March-2021 - December 2024 ISTerre, Grenoble, France

- Design of generative encoder-decoder convolutional neural networks (CNN) for signal recovery
- Implementation of matrix transformation and decomposition methods for information extraction
- Temporal and spectral analysis (Fourier transform) of volcanic and tectonic signals
- Conception and design of digital filters for the generation of synthetic waveforms
- Development of techniques and codes to study long temporal data series

PhD

Environmental and theoretical seismology - ERC F-image

November 2017 - March 2021 ISTerre, Grenoble, France

- Development of a physical model of wave propagation and mathematical estimation of sensitivity kernels through Monte Carlo simulations
- Construction of a physical model to estimate the water levels in underground aquifer reservoirs from rainfall data
- Processing and interpreting multi-year GPS, rain, and seismic data to identify correlations.
- Inversion of seismic data to identify the depth in the Earth's crust changes from measurements obtained at the surface.
- Measurement of the seismic velocity changes from ambient noise

University professor

Physics professor

January 2014 - November 2017 Bogotá, Colombia

- Professor in Universidad America of Classical Mechanics, Hydrostatics, Electrostatic and Modern Physics to students of engineering programs
- Adjunct Professor in Universidad de los Andes of Classical Mechanics, Electrostatic, and Experimental Physics to students of engineering, medicine, and basic science programs

SKILLS SUMMARY

Data Analysis
Physics (wave propagation, thermodynamics, mechanics, ...), Mathematics (linear algebra, calculus, differential equations, ...), Deep learning, Machine learning, Signal processing, Inverse problem, Monte Carlo simulations

Programming Languages
Python (pytorch, pandas, numpy, scipy, igraph, matplotlib), C, C++, Fortran, Bash, Latex.

Software
VSCode, Github, Microsoft Office (Excel, PowerPoint, Word), Illustrator, Photoshop

Operative Systems
Linux, MacOS, Windows

SOFTS SKILLS

Achiever | Communication Skills | Writing | Big data set management | Organization & Time Management

LANGUAGES

Spanish (Native)
English
French
Italian

EDUCATION

Master - Theoretical physics

Univerdad de los Andes

January 2012 – December 2013

Courses: *Advanced quantum mechanics, Electrodynamics, Statistical mechanics, Analytical mechanics*

PUBLICATIONS

Journal Articles

- **A. Barajas** and N. Shapiro, "Digital filters for waveform generation (in progress)," *Geophysical Journal International*, 2025.
- **A. Barajas**, N. M. Shapiro, and G. Prieto, "Differential phase analysis for volcanic tremor detection and source location," *Journal of Geophysical Research: Solid Earth*, vol. 129, no. 10, e2024JB029010, 2024.
- **A. Barajas**, C. Journeau, K. Obara, and N. M. Shapiro, "Comparison of continuously recorded seismic wavefields in tectonic and volcanic environments based on the network covariance matrix," *Journal of Geophysical Research: Solid Earth*, vol. 128, no. 12, e2023JB026784, 2023.
- **A. Barajas**, L. Margerin, and M. Campillo, "Coupled body and surface wave sensitivity kernels for coda-wave interferometry in a three-dimensional scalar scattering medium," *Geophysical Journal International*, vol. 230, no. 2, pp. 1013–1029, 2022.
- **A. Barajas**, P. Poli, N. d'Agostino, L. Margerin, and M. Campillo, "Separation of poroelastic and elastic processes of an aquifer from tectonic phenomena using geodetic, seismic, and meteorological data in the pollino region, italy," *Geochemistry, Geophysics, Geosystems*, vol. 22, no. 11, e2021GC009742, 2021.

Bachelor of Sciences-Physics

Universidad Nacional de Colombia

February 2004 – June 2010

Courses: *Relativity, Quantum mechanics, Thermodynamics, Integral calculus, Topology, Differential equations*

CONFERENCES

International Conferences

- AGU conferences, 1st author, San Francisco, New Orleans, 2019, 2021.
- EGU conferences, 1st author, Vienna, 2019, 2020, 2022, 2023, 2024.
- Summer school, 1st author, Cargese, 2019, 2022.

INTERESTS

Biology, Language, Teaching, Dancing, Running