

GUILLAUME BARNIER

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• GitHub: github.com/gbarnier

SUMMARY

- > Expert in machine learning, scientific computing for applied mathematics, and optimization of high-dimension nonlinear inverse problems
- > Passionate about reinforcement learning algorithms and their applications
- > Excellent high-performance computing (HPC) skills with deep knowledge of graphics processing units (GPU) programming with C++/CUDA (8 years of experience)
- > Won the 2019 “Best Paper Presented by a Student at the Annual Meeting” award from the Society of Exploration Geophysicists (SEG)

ACADEMIC EXPERIENCE

Stanford University, Ph.D. in Geophysics (GPA 3.960)	Exp. 2021
Colorado School of Mines, MSc. in Geophysics (GPA 4.000)	2013
Télécom Paris University, MSc. in Electrical Engineering (GPA 3.600)	2007

MACHINE LEARNING SKILLS

- > Relevant coursework: Reinforcement Learning (CS 234), Deep Learning (CS 230), Machine Learning (CS 229), Stochastic Processes (MATH 136), Stochastic Differential Equations (MATH 236)
- > Programming: C++, CUDA, Python, Fortran, pybind11, Unix, OpenMP, MPI, Dask, HTML, CSS
- > Deep Learning Frameworks: NumPy, PyTorch, some use of Keras and TensorFlow

RESEARCH EXPERIENCE

Deep Learning, Computer Vision and Healthcare

- > Stanford Radiology and Neuroimaging (Prof. E. Tong) Jan. 2021 – Present
Predicted brain tissue damage for ischemic stroke patients using CT perfusion data, supervised deep learning, and convolutional neural nets

Geophysical Seismic Imaging

- > Stanford Exploration Project, Stanford Geophysics (Prof. B. Biondi) 2013 – Present
Research interests: optimization of large-scale non-convex inverse problems, seismic imaging algorithms, seismic velocity model building, efficient implementations of numerical schemes with GPUs
Thesis contributions:
 - Conceived an innovative industry-impactful algorithm to produce accurate images of the Earth’s subsurface using seismic waves
 - Designed a novel loss function formulation and a robust gradient-descent method to mitigate the presence of spurious local minima in a high-dimension prominent challenging seismology problem (full waveform inversion)
 - Developed an industry-quality GPU numerical implementation in C++/CUDA of thesis algorithm for 3D field datasets (tens of terabytes of data, billions of unknown parameters)
 - Successfully applied method on a deep-water 3D field survey

Numerical Methods for Wave Propagation

- > Dunham Group, Stanford Geophysics (Prof. E. Dunham) 2015 – 2017
 - Modeled and predicted tsunami wavefields using a data assimilation technique with Kalman filters
 - Created a prototype for a new reliable and efficient early-warning system

INDUSTRY EXPERIENCE

Seismic Imaging Research Intern

- > BP America - Houston TX, USA Summers 2016 and 2017
 - Deployed Ph.D. algorithm on HPC system and showed value for image quality enhancement in complex geological settings
- > Chevron - San Ramon, CA, USA Jun. 2015 – Sep. 2015
 - Improved and applied a Bayesian uncertainty estimation technique based on the Metropolis-Hastings algorithm for oil reserve quantification
- > Total – Pau, France Jun. 2012 – Sep. 2012
 - Analyzed and identified optimal reservoir-characterization solution (among three software packages) adequate to the team's needs and budget, convinced management committee to follow selection recommendation

Fixed Income Hedge Fund Structurer

- > J.P. Morgan Sales, Trading & Research - London, UK Jun. 2007 – May 2010
 - Provided pricing trade executions, and financial advice on interest rates derivative products to major investment firms including Pacific Investment Management Company (PIMCO)
 - Took initiative to develop a novel interest-rate swaps modeling code with improved accuracy compared to commercial package, which became the team's primary tool for asset pricing

LANGUAGES

French/English (bilingual), Spanish (fluent), Hebrew (beginner), Bahasa Indonesia (basics)

AWARDS

- > 2019 Award for Best Paper Presented by a Student at the Society of Exploration Geophysicists (SEG)
- > 2013 Colorado School of Mines Mendenhall Award for outstanding academic achievement
- > 2012 Colorado School of Mines Hess Corp Fellowship

SELECTED PUBLICATIONS

- Barnier, G. and Biondi, E., 2020. Full waveform inversion by model extension using a model-space multi-scale approach. In SEG Technical Program Expanded Abstracts 2020 (pp. 646-650). Society of Exploration Geophysicists.
- Barnier, G., Biondi, E. and Clapp, R., 2019. Waveform inversion by model reduction using spline interpolation. In SEG Technical Program Expanded Abstracts 2019 (pp. 1400-1404). Society of Exploration Geophysicists. **Won award for Best Paper Presented by a Student.**
- Barnier, G. and Dunham, E.M., 2016, December. Tsunami Modeling and Prediction Using a Data Assimilation Technique with Kalman Filters. In AGU Fall Meeting Abstracts (Vol. 2016, pp. NH41A-1754).