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
> Strong interest and knowledge in reinforcement learning algorithms
> 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, Fortran, pybind11, Unix, MPI, Dask, HTML, CSS
> Deep Learning Frameworks: Python, NumPy, PyTorch, some use of Keras and TensorFlow

RESEARCH EXPERIENCE

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

Deep Reinforcement Learning and Computer Vision   Jan. 2021 – Present
> Personal Project
   Currently implementing and reproducing a model-based reinforcement learning algorithm for Atari proposed by Kaiser et al. (2020)

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 and velocity-model building algorithms, efficient implementations of numerical schemes with GPUs
   Thesis contributions:
   (1) 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 referred to as full waveform inversion
   (2) 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)
   (3) Successfully applied method on a deep-water node-acquisition 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 to improve reliability/efficiency of early-warning systems

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

LANGUAGES

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

AWARDS AND ACHIEVEMENTS

Academics
> 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

Trail-running
> 2018 First place overall, Spartan Race Diablo Grande Super Open
> 2018 First place overall, Inside Trail Pacifica Foothills Trail Half Marathon
> 2015 First place overall, Mount Diablo Coastal Trail Runs Half Marathon

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).

- Revil, A., Barnier, G., Karaoulis, M., Sava, P., Jardani, A. and Kulessa, B., 2014. Seismoelectric coupling in unsaturated porous media: theory, petrophysics, and saturation front localization using an electroacoustic approach. Geophysical Journal International, 196(2), pp.867-884