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pedro-brandimarte
Spanish & Brazilian Citizen

Pedro Brandimarte

Curriculum Vitae

Background in computational and theoretical physics, and mathematics. I carry extensive experience in software development, with a deep knowledge on algorithms, abstract data structures, hybrid parallel programming and high-performance computing. I am fascinated by the changes of paradigm that machine learning algorithms pose against traditional programming, as well as new forms of computing such as quantum computing. I am always very enthusiastic about tackling problems out of my comfort zone and working in a cooperative environment.

Areas of Expertise

Programming languages

Advanced	Python, C++, C, Fortran, shell script
Intermediate	R, Octave/MATLAB
Basic	Java, Ruby, Lua

Operating systems

Linux, Windows and MacOS

Key competencies

- Research, Computational Physics, Mathematical Modeling, Data Analysis
- Probability Theory, Statistics, Linear Algebra
- Algorithms, Abstract Data Structures, Parallel Computing, HPC
- Machine Learning Techniques, Deep Learning, Data Science, Data Analytics
- Communication Skills, Problem-Solving, Teamwork, Teaching/Training Skills, Goal-Oriented

Open source codes

1. Contributor of Auto Kernel Generator - **AKG** (`gitee.com/mindspore/akg/tree/master`), a polyhedral based optimizer and code generator for operators in deep neural networks. Part of the **MindSpore** project (`www.mindspore.cn/en`), an open source all scenario deep learning computing framework. [Python, C++]
2. **MCMCneuro** (`github.com/brandimarte/MCMCneuro`) data driven graph model for neuronal interactions using Bayesian statistics and Markov Chain Monte Carlo. [C, shell, R]
3. **KPM** (`github.com/brandimarte/kpm`) kernel polynomial method implementation using Chebyshev expansion for disordered lattices. [Fortran95, MPI]
4. **PhOnonS ITeratIVE VIBRATIONS** (`github.com/brandimarte/vibrations`) for vibrational and electron-phonon coupling analysis via first-principles. [C, shell]
5. **Inelastic Disorder** (`github.com/brandimarte/idisorder`) for transport on devices with random defects and inelastic scattering. [Fortran95, C++, MPI, CUDA]
6. **Inelastic SMEAGOL** (`bitbucket.org/brandimarte/smeagol-2.0` - request access) for *ab initio* inelastic electronic transport of atomic scale devices. [Fortran95, MPI, OpenMP]

Work Experience

2021–present **Huawei Technologies**, *France*

Parallel computing / Accelerator programming research engineer at Paris Research Center.

Key accomplishments:

- Headed the full refactoring of the new tiling module (modularization, better integration and clean code techniques) integrated on *MindSpore-AKG*
- Implemented the intermediate representation IR parsing
- Implemented the scheduler information extraction
- Several performance improvements
- Implemented test automation for exhaustive testing
- Benchmark evaluation on single fused operators
- Benchmark on end-to-end deep neural networks model training, such as:
  - Transformer
  - GPT-3
  - Bert
  - Wide and Deep
  - DeepFM
  - ResNet50
  - YOLO-v3 Darknet-53
  - MindSponge Protein Relaxation

2020–2021 **Alerion Tec**, *Spain*

Software engineer on computer vision, parallel imaging processing, autonomous localization and mapping.

Key accomplishments:

- Implemented two modules for parallel image processing, using FastVideo (proprietary library) and NVIDIA NPP libraries (abstraction layer over CUDA):
  - Image processing on NVIDIA Jetson embedded in inspection drones, equipped with a 50mpx full frame camera that takes pictures in raw format at 20 fps
  - Raw images processed on the fly (debayering, white balance, color correction, bad pixel correction, gamma correction, jpeg conversion) using the NVIDIA card's GPU
- Responsible for the in-flight metadata acquisition.
- Developed a clustering algorithm to automatically separate the acquired images according to the inspected blades parts, based on geo-localization data.
- Implemented a blade stitching, that is, a 2D reconstruction of the blades with the acquired images and their metadata, including geo-localization and sensors data (such as LiDAR scan for the distance from the camera to the blade).

Postdoctoral researcher

2017–2020 **Donostia International Physics Center - DIPC**, *Spain*

Electronic structure and quantum transport in graphene-based nanostructures and networks.
funding: DIPC Foundation

2015–2017 **Centro de Física de Materiales - CFM**, *Spain*

Development of tools and theoretical models for studying electron transport in nanoscale devices.
funding: European Commission, 7o Framework Programme, ICT Collaborative project

Scientific training

2006–2007 **CERN - European Organization for Nuclear Research**, *Switzerland*, ALICE experiment

Development on the AliRoot framework for simulation at the ALICE Off-line group (950h).
funding: European Commission, programme América Latina - Formación Académica (ALFA)

2004–2005 **Universidade de São Paulo**, *Brazil*, Coherent Manipulation of Atoms and Light Laboratory

Development of a magneto-optical trap experiment.
funding: National Council of Technological and Scientific Development (CNPq/PIBIC)

Supervision

2019 **Donostia International Physics Center - DIPC**, *Spain*, Supervisor
Electronic properties and tight-binding parametrization of twisted bi-layer graphene.
student: Itsaso Blanco, University College London, Faculty of Maths and Physical Sciences.

2018 **Donostia International Physics Center - DIPC**, *Spain*, Supervisor
Code development for evaluating bond order of graphene-based structures via graph theory.
student: Amaia Juaristi Arrizabalaga, Universidad del País Vasco, Departamento de Matemáticas.

Teaching

2004–2005 **Universidade de São Paulo**, *Brazil*, Instructor
Experimental Physics III and IV.

Volunteer

2008 **Educafro - Cohab de Taipas and Cohab Brasilândia**, *Brazil*
Teacher of physics and mathematics.

2001 **A. A. Criança - Associação de Apoio às Meninas e Meninos da Região Sé**, *Brazil*
Assistance to children and young people living on the streets.

Technical works

2019 **Universidade Federal do ABC - UFABC**, *Brazil*
Setup and installation of environment for scientific computing on the cluster *mildred*.

2016 **ESPEEM**, *Luxembourg*
Configuration and installation of environment for scientific computing on Google Cloud Platform.

2016 **INSPIRE - Johannes Gutenberg-Universitat Mainz**, *Germany*
Scientific computing environment setup/installation on the workstations *iph-bigbang* and *quasar*.

2015 **Centro de Física de Materiales - CFM**, *Spain*
Setup and installation of environment for scientific computing on the cluster *oberon*.

2015 **Donostia International Physics Center - DIPC**, *Spain*
Scientific computing environment setup and installation on the clusters *atlas*, *brontes* and *hemera*.

Education

2008–2014 **Ph.D. in Physics**, *Universidade de São Paulo*, USP, Brazil
Study of the influence of localized vibrational modes in charge transport properties at nanoscale systems.

2002–2007 **Bachelor in Physics**, *Universidade de São Paulo*, USP, Brazil

Complementary education

2009–2014 **Bachelor in Applied and Computational Mathematics**, *Universidade de São Paulo*, USP, Brazil
Concluded 65% of the courses (1350h).

Certifications

1 **IBM**, *2022*, IBM Quantum Challenge Fall 2022 **Achievement - Advanced**
2 **deeplearning.ai**, *2019*, Deep Learning Specialization
3 **deeplearning.ai**, *2019*, Neural Networks and Deep Learning
4 **deeplearning.ai**, *2019*, Structuring Machine Learning Projects
5 **deeplearning.ai**, *2019*, Improving DNNs: Hyperparameter tuning, Regularization and Optimization
6 **deeplearning.ai**, *2019*, Convolutional Neural Networks
7 **deeplearning.ai**, *2019*, Sequence Models
8 **Stanford University**, *2018*, Machine-Learning

Scientific Production

Publications

Author of **17** publications in high-quality peer-reviewed journals, **11 as first theory author**, with average impact factor **8.64** and all in **Q1** (citation metrics at scholar.google.com/citations?hl=en&user=P-rSYmoAAAAJ).

Commission of trust

Reviewer of scientific journals:

- ChemistrySelect
- Nature Scientific Reports
- Physica Status Solidi (b)
- The Journal of Physical Chemistry
- Journal of Physics. Condensed Matter
- The European Physical Journal

Conferences, Scientific Meetings and Workshops

Attended and presented work in scientific conferences/workshops worldwide (Germany, Hong Kong, USA, Spain, Denmark, Austria and Brazil), whose complete list can be found at lattes.cnpq.br/8885012919924529.

Organization of International Congresses

2016 **Towards reality in modelling of molecular electronics (TRMME)**, *Spain*, June 13-17
`http://trmme.dipc.org`

Research projects and grants

2018–2020 **A Novel Platform for Electronics and Quantum Electron Optics Based on Graphene Nanostructures (GRANAS)**
grant: Spanish Ministry of Economy, Industry and Competitiveness

2010–2014 **Study of the Influence of Localized Vibrational Modes in Charge Transport Properties at Nanoscale Systems**
grant: National Council of Technological and Scientific Development - CNPq

2006–2007 **CERN (European Organization for Nuclear Research) at ALICE (A Large Ion Collider Experiment)**
grant: HELEN program (High Energy Latin American Network)

2004–2005 **Vacuum Quantum Noise Squeezing by Polarization Self-rotation**
grant: National Council of Technological and Scientific Development - CNPq

Languages

Portuguese	Mother Tongue	
English	Fluent	*Understand well, speak well, read well, write well*
Spanish	Advanced	*Understand well, speak well, read well, write reasonably*
French	Intermediate	*Understand well, speak reasonably, read well, write reasonably*