Pedro Bruel | Researcher and Software Engineer

Performance Evaluation, Modeling, and Optimization

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Research Experience

JAN '20 - JAN '21 **Researcher, Project Manager, and Co-Advisor**
University of São Paulo, Brazil
with Hewllett Packard Enterprise

Developed statistical software in Julia, managed and co-advised 1 undergraduate and 7 masters students in the application of performance evaluation, modeling, and optimization methods to different domains

NOV '19 - JAN '20 **Visiting Researcher**
Hewllett Packard Enterprise, Palo Alto

Conducted performance measurement and optimization, using Gaussian Process Regression, for Neural Networks and Deep Learning hardware accelerators

NOV '17 - JUL '21 **Researcher**
Grenoble Informatics Laboratory
University of Grenoble Alpes, France

Developed and applied Design of Experiments and Gaussian Process Regression methods for optimizing High Performance Computing kernels and compilers on CPUs, GPUs and FPGAs, and Neural Networks

JAN '15 - JUL '21 **Researcher**
Software Systems Laboratory
University of São Paulo, Brazil

Developed and applied Search Heuristics and Online Learning methods for optimizing High-Level Synthesis compilers for FPGAs and for the CUDA Compiler

JAN '15 - JAN '16 **Researcher**
University of São Paulo, Brazil
with Hewllett Packard Enterprise

Developed and applied Search Heuristics and Online Learning an autotuner for the LegUp High-Level Synthesis compiler for Altera FPGAs

JAN '12 - JAN '15 **Research Intern**
Computer Music Research Group
University of São Paulo, Brazil

Developed a Multiagent System in Java, Pure Data, and C for music composition via agent interaction

Teaching Experience

JAN '15 - JULY '21 **Teaching Assistant**
University of São Paulo, Brazil

Recurring TA for the *Parallel and Distributed Programming* and *Introduction to Programming* courses, preparing teaching material, giving lectures, and preparing and grading assignments and projects

Education

2015 – 2020 **PhD in Computer Science**
University of Grenoble Alpes, France
University of São Paulo, Brazil

Title: *Toward Transparent and Parsimonious Methods for Automatic Performance Tuning*

2010 – 2014 **BsC in Molecular Sciences**
University of São Paulo, Brazil

Title: *A Protocol for creating Multiagent Systems in Ensemble with Pure Data*

Select Publications

Huang, S., Ankit, A., Silveira, P., Antunes, R., Chalamalasetti, S.R., El Hajj, I., Kim, D.E., Aguiar, G., **Bruel, P.**, Serebryakov, S. and Xu, C., **2021**. Mixed precision quantization for ReRAM-based DNN inference accelerators. 26th IEEE Asia and South Pacific Design Automation Conference (ASP-DAC).

Bruel, P., Quinito Masnada, S., Videau, B., Legrand, A., Vincent, J. M., and Goldman, A., **2019**. *Autotuning Under Tight Budget Constraints: A Transparent Design of Experiments Approach*. 19th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGRID).

Bruel, P., Goldman, A., Chalamalasetti, S.R. and Milojicic, D., **2017**. *Autotuning high-level synthesis for FPGAs using OpenTuner and LegUp*. ReConFigurable Computing and FPGAs (ReConFig), International Conference.

Bruel, P., Chalamalasetti, S.R., Dalton, C., El Hajj, I., Goldman, A., Graves, C., Hwu, W.M., Laplante, P., Milojicic, D., Ndu, G. and Strachan, J.P., **2017**. *Generalize or Die: Operating Systems Support for Memristor-based Accelerators*. IEEE Intl. Conference on Rebooting Computing (ICRC).

Bruel, P., Amarís, M. and Goldman, A., **2017**. *Autotuning CUDA compiler parameters for heterogeneous applications using the OpenTuner framework*. Concurrency and Computation: Practice and Experience.

Skills

Statistics and Learning

- Using Design of Experiments to reduce the cost to explore and construct models in high-dimensional search spaces
- Building and improving surrogate models, such as neural networks and decision trees
- Determining parameter significance and running sensitivity analysis

Reproducible Research | Optimal Design | Linear Models | Search Heuristics | Clustering | Bayesian Modeling | Gaussian Process Regression | Sensitivity Analysis | Convolutional Neural Networks | ANOVA

Software Engineering

- Developing and maintaining free software libraries and projects, and contributing to projects such as GNU Emacs
- Practicing and enforcing software engineering best practices and agile methods
- Developing and optimizing applications for neural networks and parallel & distributed programming

C | Lisp | C++ | OpenMP | pthreads | Pytorch | MPI | CUDA C | R | Julia | Python | Java | Agile Methods | Test Driven Development | Automated Testing | Continuous Integration

Tools and Infrastructure

- Developing and maintaining reproducible workflows, software environments, experiments, and results using version control, virtualization, computational documents, and archival systems
- Maintaining, configuring, and updating GNU/Linux systems, managing users, providing IT support
- Developing and deploying applications for clouds and remote computer systems
- Automating data wrangling, formatting, analysis, and plotting, producing high-quality print-ready documents

GNU/Linux | git | Zenodo | docker | singularity | bash | LaTeX | Emacs | org-mode | vim | tidyverse | Jupyter | Grid5000 | GCE | AWS

Communication and Management

- Writing research projects and funding proposals for teams with multiple members
- Coordinating and advising research and software engineering teams
- Assessing team resources and throughput to plan achievable milestones
- Conflict resolution and mediation, interpersonal communication
- Preparing and coordinating project presentations, reports, and deliverables

Languages

Portuguese: **CEFR C2** (Native)
English: **CEFR C2** (Fluent)
French: **CEFR C2** (Fluent)
Spanish: **CEFR B1** (Intermediate)

Teaching

- Preparing and giving lectures on various Computer Science and Statistics subjects, such as parallel computing concepts, architectures, and industry-standard tools, and Design of Experiments
- Preparing and grading tests and group programming projects to exercise concepts and achieve learning objectives
- Promoting a student-centered course, fostering online and in-class discussions among students and teachers