Bruno Magalhaes

PhD Neuroscience candidate with Computer Science background

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brunomaga github.com/brunomaga linkedin.com/in/brunomaga
Swiss C Permit Born the 20th August 1984 in Braga, Portugal
Native in Portuguese, fluent in English and French, basic in Spanish and Slovenian

PhD candidate researching large-scale algorithms for biologically inspired neural networks.
Interested in the combination of brain sciences, super-computing and machine learning.

Education

present – Mar 2015 — PhD Neuroscience, EPFL (École Polytechnique Fédérale de Lausanne), Switzerland

- Topic : distributed asynchronous large-scale variable-step simulation of morphologically-detailed neural networks
- Technologies : HPX for Parallax runtime system; global memory addressing; asynchronous communication; remote procedure calls, concurrency and threading; dynamic load-balancing; distributed computation graphs, tree-parallelism and task scheduling; vectorization and cache-optimization;
- Core courses : cellular mechanisms of brain function, behavioral and cognitive neuroscience, biological modelling of neural networks, pattern classification, machine learning and scientific writing
- Teaching Assistant (400 hours) for unsupervised and reinforcement learning in neural networks, projects in neuroinformatics and *in silico* neuroscience
- Visiting scholar at Center for Research in Extreme Scale Technologies, Indiana University (US), working with HPX developers on fine-tuning asynchronous processing of neural networks, Summers 2015-17

C | C++ | Python | HPX-5 | MPI | LaTeX | tensorflow | google test | TCLAP | Sundials CVODEs API | IBM BlueGene/Q

Sep 2009 – Oct 2008 — MSc Advanced Computing (with Merit), Imperial College London, UK

- Final thesis on multi-core CPU, GPU and parallel computation of large Markov models in heterogeneous networks, awarded distinction and published.

C | NVIDIA CUDA | Message Passing Interface (MPI) | Posix threads | Java

Jul 2007 – Oct 2002 — BSc Computer Science and Systems Engineering (5 years programme), University of Minho, Portugal

- Exchange student at the University of Maribor, Slovenia, 2005/2006

Work Experience

Feb 2015 – Mar 2011 — Scientific Assistant and HPC Engineer, The Blue Brain Project, EPFL, Lausanne, Switzerland

- Parallel algorithms for spatial decomposition of neural networks
- Parallel algorithms for distributed task-stealing programming models on neural networks
- Parallel algorithms for synaptic map reconstruction via efficient distributed sparse matrix transposition
- Algorithms for the distributed spatial indexing of detailed neuron morphologies

C | C++ | Message Passing Interface (MPI) | OpenMP | CMake | IBM BlueGene/P and /Q | parallel IO (MPI, HDF5)

Feb 2011 – Sep 2009 — Junior Architect for IT infra-structures, Noble Group, Worldwide

- Network design of a contingency data centre for all EU Power & Gas trading infrastructure, London, UK
- Network and infrastructure design of a port and warehouse for coffee and soy beans, Santos, Brazil
- Implementation of a web-based software for metals and coffee trading, New York, USA

Cisco and 3Com network devices | ASP .NET

Oct 2008 – Mar 2007 — Analyst programmer, MSCI (former IPD - Investment Property Databank), London,UK

- Development of a web-based geographical system for real estate data search and analytics
- Development of software for data query and warehousing

C# | Visual Basic | F# | ASP .NET | MS SQL Server | SSIS | google maps API | javascript

Sep 2005 – Jan 2005 — Software developer (part-time), Department of Physics, University of Minho, Portugal

- Development of parallel algorithms for analysis of collisions of particles, in collaboration with CERN

Fortran | Message Passing Interface (MPI) | C

Publications

peer reviewed; first author unless mentioned otherwise

in preparation — Fully Implicit, Fully Asynchronous, Variable Order, Variable Timestep Simulation of Detailed Neural Networks

in preparation — An Efficient Algorithm for The Distributed Transpose Of Large-Scale Graphs And Sparse Matrices With High-Cardinality Cell Structures

submitted	Distributed Asynchronous Execution Model Speeds and Scales Up Over Hundredfold The Detection Of Contacts Between Detailed Neuron Morphologies
submitted	Asynchronous SIMD-Enabled Branch-Parallelism of Morphologically-Detailed Neuron Models
submitted	Fully-Asynchronous Cache-Efficient Simulation of Detailed Neural Networks
submitted	Exploiting Implicit Flow Graph of System of ODEs to Accelerate the Simulation of Neural Networks
2016	An efficient parallel load-balancing strategy for orthogonal decomposition of geometrical data. Proc. International Super Computing 2016, Frankfurt, Germany
2015	*(co-author)* Reconstruction and Simulation of Neocortical Microcircuitry, Cell 163, 456–492.
2010	*(MSc final project)* GPU-enabled steady-state solution of large Markov models, Proc. 6th International Workshop on the Numerical Solution of Markov Chains (NSMC 2010), Williamsburg, Virginia

Short Courses

2017	Advanced Topics in Machine Learning, Denmark Technical University
2017	Google Machine Learning crash course with tensorflow, Google offices, Zurich, Switzerland
2014	Compute Node-level performance engineering, Swiss National Supercomputing Center, Switzerland
2012	Advanced Course in Computational Neuroscience, Bedlewo, Poland
2011	CERN School of Computing, University of Copenhagen, Denmark
2006	Biomedical Engineering Summer University, Katholieke Universiteit Leuven, Belgium
2006	Leadership Course, Military Academy , Portugal

About me

Side Projects

- Cryptocurrencies enthusiast, currently building a trading bot as a hobby
- Machine Learning enthusiast, currently building data mining algorithms for a real estate company

Awards

- 3rd place at the Regional Olympiads of Mathematics, 1997
- 1st place at the Regional Olympiads of Mathematics, 1996

Misc

- Qualified PADI diver
- Qualified sailor for coastal waters and low sea
- Volunteer for the Swiss Red Cross (ongoing)
- Volunteer at the hospice *Casa de Asilo*, Bocal del Toro, Panama, February 2015
- Boy scout between 1991 and 2004
- Enjoys skiing, snowboarding, travelling and cooking. Trying to learn electric guitar