

Bruno Magalhaes

PhD Neuroscience candidate with Computer Science background

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Av. de France 38, 1004 Lausanne, Switzerland Born the 20th August 1984 in Braga, Portugal
Native in Portuguese, fluent in English and French, fair in Spanish and Slovenian



PhD candidate researching large-scale algorithms for the simulation of biologically inspired neural networks. Interested in brain sciences, machine Learning and parallel and distributed computing.

Education

ongoing Mar 2015	PhD Neuroscience, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland <ul style="list-style-type: none">Title : Large-scale Asynchronous Simulation of Neuronal ActivityTechnologies : 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 : Neuroscience - cellular mechanisms, Neuroscience - behavior and cognition, Biological modeling of neural networks and Machine learningTeaching Assistant (400 hours) for Unsupervised and reinforcement learning in neural networks, Projects in neuroinformatics and <i>In silico</i> neuroscienceVisiting 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 <div>C C++ Python HPX-5 MPI TeX tensorflow google test TCLAP Sundials CVODEs API IBM BlueGene/Q</div>
Sep 2009 Oct 2008	MSc Advanced Computing, Imperial College London, UK <ul style="list-style-type: none">Final thesis on multi-core CPU, GPU and parallel computation of large Markov models in heterogeneous networks, awarded distinction and published at NSMC'10. Finished degree with Merit. <div>C NVIDIA CUDA Message Passing Interface (MPI) Posix threads Java</div>
Jul 2007 Oct 2002	BEng (5 year programme) Systems Engineering and Computer Science, University of Minho, Portugal <ul style="list-style-type: none">Exchange student at the University of Maribor, Slovenia, 2005/2006. Finished degree with final grade A.

Work Experience

Feb 2015 Mar 2011	Scientific Assistant and HPC Engineer, The Blue Brain Project, EPFL, Lausanne, Switzerland <ul style="list-style-type: none">Parallel algorithms for spatial decomposition of neural networksParallel algorithms for distributed task-stealing programming models on neural networksParallel algorithms for synaptic map reconstruction via efficient distributed sparse matrix transpositionAlgorithms for the distributed spatial indexing of detailed neuron morphologies <div>C C++ Message Passing Interface (MPI) OpenMP CMake IBM BlueGene/P and /Q parallel IO (MPI, HDF5)</div>
Feb 2011 Sep 2009	Junior Architect for IT infra-structures, Noble Group, Worldwide <ul style="list-style-type: none">Network design of a contingency data centre for all EU Power & Gas trading infrastructure, London, UKNetwork and infrastructure design of a port and warehouse for coffee and soy beans, Santos, BrazilImplementation of a web-based software for metals and coffee trading, New York, USA <div>Cisco and 3Com network devices ASP.NET</div>
Oct 2008 Mar 2007	Analyst programmer, MSCI (former IPD - Investment Property Databank), London, UK <ul style="list-style-type: none">Development of a web-based geographical system for real estate data search and analyticsDevelopment of software for data query and warehousing <div>C# Visual Basic F# ASP.NET MS SQL Server SSIS google maps API javascript</div>
Sep 2005 Jan 2005	Software developer (part-time), Department of Physics, University of Minho, Portugal <ul style="list-style-type: none">Development of parallel algorithms for analysis of collisions of particles, in collaboration with CERN <div>Fortran Message Passing Interface (MPI) C</div>

Publications peer reviewed; first author unless mentioned otherwise

- in preparation Fully Implicit, Fully Asynchronous, Variable Order, Variable Timestep Simulation of Detailed Neural Networks
- submitted 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
- 2019 Fully-Asynchronous Cache-Efficient Simulation of Detailed Neural Networks, Proc. International Conference on Computational Science, Faro, Portugal
- 2019 Exploiting Implicit Flow Graph of System of ODEs to Accelerate the Simulation of Neural Networks, Proc. International Parallel & Distributed Processing Symposium, Rio de Janeiro, Brazil
- 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 and blockchain enthusiast, currently building a trading bot as a hobby
 - > Machine Learning enthusiast, currently developing 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
 - > Currently a player at Lausanne Natation Water-Polo team, on the Swiss National League B
 - > Enjoys skiing, snowboarding, travelling and cooking. Trying to learn electric guitar