Bruno Magalhaes

High Performance Computing, Machine Learning and Simulation

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Native in Portuguese, fluent in English and French, proficient in Spanish and fair in Slovenian
Hobbies : waterpolo, skiing, reading, travelling, cryptocurrency, guitar

Work Experience

ongoing – Sep 2019 | AI Resident, Microsoft Research, Cambridge, UK
- DNNs and Bayesian Optimization (closed-form solutions, Variational Inference, Monte-Carlo methods)
- Sequence-data learning for time prediction (DNNs, RNNs, Encoder-Decoder with LSTMs/GRUs & Attention Mechanism)
- Feature selection and dimensionality reduction (PCA, PointNet)
- Graph Neural Networks for large-scale knowledge bases

Aug 2019 – Mar 2015 | Doctoral Assistant ▷ Postdoctoral Researcher, École Polytechnique Fédérale de Lausanne, Switzerland
- Research, conceptualization, implementation and publication of new methods for asynchronous execution of the simulation of detailed neural networks on large networks of highly-heterogeneous compute nodes
- Technologies : asynchronous runtime systems (HPX), computation and communication; global memory addressing; distributed task scheduling, concurrency and threading; dynamic load-balancing; vectorization and cache-optimization;
- Teaching assistant for Unsupervised and reinforcement learning, Project in Neuroinformatics and *In silico* neuroscience.

C | C++ | Python | HPX-5 | MPI | LaTeX | tensorflow | google test | TCLAP | Sundials CVODE

Feb 2015 – Mar 2011 | Research Engineer for High Performance Computing, 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
- Efficient algorithms for distributed IO and 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 infrastructures, Noble Group, Hong Kong, New York, São Paulo & London
- 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, Investment Property Databank (MSCI Real Estate), London, UK
- Development of web-based geographical systems and Windows apps for efficient real estate data handling and analytics

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

Education

Jun 2019 – Mar 2015 | PhD Computational Neuroscience, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland
- Thesis *Asynchronous Simulation of Neuronal Activity* nominated for the EPFL doctoral school excellency award (TOP 8% doctorates) and for the IBM research award for the best thesis in computational sciences
- Visiting scholar at the Center for Research in Extreme Scale Technologies at Indiana University (US), Summers 2015-17

Sep 2009 – Oct 2008 | MSc Advanced Computing, Imperial College London, UK
- Final project on *GPU-enabled steady-state solution of large Markov models* researching distributed, multi-core CPU and GPU computation of large Markov models awarded distinction and published at NSMC'10. Finished degree with Merit.

Jul 2007 – Oct 2002 | Licenciatura (5-year BSc) Systems Engineering and Computer Science, University of Minho, Portugal
- Exchange student at the University of Maribor, Slovenia, 2005/2006. Finished degree with A (Top 10%)

Publications

peer-reviewed; first author unless mentioned otherwise

- **submitted** Efficient Distributed Transposition of Large-Scale Multigraphs And High-Cardinality Sparse Matrices
- **2020** Fully-Asynchronous Fully-Implicit Variable-Order Variable-Timestep Simulation of Neural Networks, Proc. International Conference on Computational Science, Amsterdam, Holland (ICCS 2020)
- **2019** Asynchronous SIMD-Enabled Branch-Parallelism of Morphologically-Detailed Neuron Models, Frontiers in Neuroinformatics
- **2019** (PhD thesis) Asynchronous Simulation of Neuronal Activity, EPFL Scientific publications
- **2019** Fully-Asynchronous Cache-Efficient Simulation of Detailed Neural Networks, Proc. International Conference on Computational Science (ICCS 2019), Faro, Portugal
- **2019** Exploiting Implicit Flow Graph of System of ODEs to Accelerate the Simulation of Neural Networks, Proc. International Parallel & Distributed Processing Symposium (IPDPS 2019), Rio de Janeiro, Brazil
- **2016** An efficient parallel load-balancing strategy for orthogonal decomposition of geometrical data, Proc. International Super Computing (ISC 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. International Workshop on the Numerical Solution of Markov Chains (NSMC 2010), Williamsburg, Virginia