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, Variational Inf., MCMC) for regression on user-induced hardware cost
- Sequence-data learning for time prediction (DNNs, RNNs, Encoder-Decoder with LSTMs/GRUs & Attention Mechanism)
- Graph Neural Networks trained on Meetings/Documents/Users/Emails for the prediction of meeting insights
- Machine Learning and data processing algorithms using large-scale distributed DBs and workflows
- Prepared and presented sessios on single-node efficiency, distributed computing & databases, and AI supercomputing

Aug 2019 – Mar 2011 | HPC Research Engineeer ▷ PhD Candidate ▷ Postdoc 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;
- Contributions focus on distributed micro-parallelism of individual neurons via branch- and graph-based parallelism, distributed fully-asynchronous execution models, and high-accuracy simulations via variable timestep;
- 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.
- Parallel (MPI) algorithms for distributed load balancing via spatial decomposition of volumetric regions; distributed task-stealing programming models; distributed (sparse) matrix operations; distributed IO; and distributed spatial indexing;

C | C++ | Message Passing Interface (MPI) | OpenMP | CMake | IBM BlueGene/P and /Q | parallel IO (MPI, HDF5) | HPX-5 | LaTeX

Feb 2011 – Sep 2009 | Junior Architect for IT infrastructures, Noble Group, Hong Kong, New York, São Paulo & London

- Network design and configuration for a backup data centre for EU Power & Gas trading infrastructure, London, UK
- Network configuration and infrastructure design for 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

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

ongoing Distributed Async. Execution Speeds and Scales Up Over Hundredfold The Detection Of Contacts Between Detailed Neuron Morphologies
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