Bruno Magalhaes

Machine Learning and Distributed, Parallel, High Performance Computing

brunomaga@gmail.com +41 77 498 89 92 brunomaga brunomaga ibrunomaga
citizenship : Portuguese languages : Portuguese, English, French, Spanish
Lausanne, Switzerland hobbies : waterpolo, skiing, cooking, board games
short resume, for more details visit https://brunomaga.github.io updated 17/08/2022

Work Experience

present – Sep 2019 — AI Resident » Researcher » Senior Researcher, Microsoft Research, Cambridge (UK)
- as Sr Researcher : distributed ML data and model parallelism; efficient ML systems and IO; mentoring of junior members;
- as Researcher, 2021-present : computer vision models for object recognition and classification on 3D glass for Project Silica; full-stack development of large scalable pipelines for Machine Learning on the cloud (AzureML);
- as AI Resident, 2019-20 : end-to-end development of ML models (PyTorch) and pipelines for : (1) improving dynamic load balancing of users across email servers, learning time series of user logs on distributed databases, using DNNs, RNNs, GRU Encoder-Decoders, and Bayesian Optimization; (2) development of a recommendation system using Graph Neural Nets on a distributed petabyte-scale graph of meetings, documents, emails and users;

Aug 2019 – Mar 2015 — PhD candidate » postdoctoral researcher, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland
- Research, development (C, C++) and publication of new methods for asynchronous variable-step simulation of detailed spiking neural networks on Cray and SGI supercomputers with over 10K compute nodes;
- Technologies : asynchronous runtime systems (HPX-5), 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.

Feb 2015 – Mar 2011 — Research Engineer for High Performance Computing, Blue Brain Project, EPFL, Lausanne, Switzerland
- Research, development (C,C++, MPI, OpenMP) and publication of methods for parallel/distributed volumetric spatial decomposition, load balancing, spatial indexing, sorting, I/O, sparse matrix transpose, and graph navigation, that underlie an efficient storage and processing of neural networks on SGI and IBM BlueGene supercomputers with 16K compute nodes;

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 (now MSCI Real Estate), London, UK
- Development of a search engine and web/windows app (C++, C#, .NET) for efficient storage and analytics of financial data

Education

Jun 2019 – Mar 2015 — PhD Computational Neuroscience, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland
- Summary : distributed-parallel optimization & simulation of large neural networks using asynchronous runtime systems;
- 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 (awaiting decision)
- Visiting researcher 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 *GPU-enabled steady-state solution of large Markov models* based on distributed, multi-core CPU and GPU (CUDA) 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 and first author unless mentioned otherwise

2020	Fully-Asynchronous Fully-Implicit Variable-Order Variable-Timestep Simulation of Neural Networks, Proc. International Conference on Computational Science (ICCS 2020), Amsterdam, Holland
2020	Efficient Distributed Transposition of Large-Scale Multigraphs And High-Cardinality Sparse Matrices, arXiv
2019	Asynchronous SIMD-Enabled Branch-Parallelism of Morphologically-Detailed Neuron Models, Frontiers in Neuroinformatics
2019	Asynchronous Simulation of Neuronal Activity, EPFL Scientific publications (PhD thesis)
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	Magalhaes et al,. 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	GPU-enabled steady-state solution of large Markov models, Proc. International Workshop on the Numerical Solution of Markov Chains (NSMC 2010), Williamsburg, Virginia (MSc final project)
on hold	Distributed Asynchronous Execution Speeds and Scales Up Over 100x The Detection Of Contacts Between Detailed Neuron Morphologies