Postdoctoral / Researcher position
C@UCA research center

Exploration of brain-inspired computing with self-organizing neuromorphic architectures

A post-doctoral position (3 years) is available at LEAT lab (UMR CNRS 7248, Sophia-Antipolis, France) in collaboration with the Neuroscience and Cognition research center C@UCA to study the mechanisms underlying neural self-organization and their transposition on neuromorphic hardware. The post-doc project is a part of an international collaborative project recently awarded by the ANR (International Collaborative Research Project SOMA).

Scientific context
Neuromorphic systems design is becoming an increasingly important topic at European [**HBP2015**, **BrainScales2014**] and international level [**TrueNorth2014]** that shows its massive and continuous dissemination in many fields of application [**Misra2010**].
But the hardware implementation of artificial neural networks is also an interesting way to research new computational paradigms for the design of future adaptive calculators for autonomous systems [**SOM2015**]. In the context of the international project SOMA, the goal is to understand the cortical plasticity in the brain, to develop artificial neural networks based on distributed Self-Organizing Maps to model these adaptive mechanisms and to design hardware architectures supporting these computational models. The developed models could be optionally embedded onto mobile robotic platforms.
We will rely on the results obtained previously on neural competition in cellular architectures (reduction of near-neighbor communications) [**SOM2015**] to propose the design of a parallel distributed architecture, without any central coordinator, where the topologies of connections are created automatically and self-organized [**LISSOM1997**].
According to his background, the candidate will develop the models on top of the available neuromorphic systems in the project: the multicore Spinnaker system **[Spinnaker2016]**, FPGA-based neural architectures [**NPU2015**], and the asynchronous ChronoCam camera.
The candidate will also serve as Scientific Manager in a master training program in neuroscience and cognition training of C@UCA (implementing existing research/pedagogical projects as well as interacting with the master committee to determine innovative research/pedagogical directions). Scientific management will represent one third of the working time.

Position context
Benoît Miramond is Full Professor of University Côte d'Azur (**UCA**) affiliated to the research lab in electronics, **LEAT**. He is member of the center on neurosciences and cognition **C@UCA** and co-founder of the national working group (GDR CNRS) on bio-inspired computing **BioComp** [**BioComp2017**]. He will be the main responsible.
Alexandre Muzy is research fellow at CNRS affiliated to the research lab in computer science, I3S. He is member of Center on neurosciences and cognition **C@UCA**. He will coordinate the implementations achieved on the Spinnaker system as well as the scientific management of the training program.
This position takes place in the international research project SOMA between France and Switzerland, leaded by LEAT in collaboration with INRIA in Bordeaux, LORIA in Nancy and inIT lab in Geneva. SOMA starts in march 2018 and is funded both by French research agency (ANR PRCI 17-CE24-0036) and Swiss research agency (FNS).

We are seeking a highly motivated applicant (possibly with strong experience in bio-inspired computing).
Candidates should have a doctoral degree in one of the following field:

- Computer sciences (artificial neural networks),
- Digital electronics (bio-inspired architectures),
- Computational neurosciences

Skills: Proficiency in written and spoken English, Autonomy, Sense of initiative and contact

Practical information
Starting date: first semester 2018
Salary: 2050 € / month
Places: LEAT Lab, Campus SophiaTech, 930 route des Colles, 06903 Sophia Antipolis, France and training program Mod4NeuCog, 1645 Route des Lucioles, 06410 Sophia Antipolis, France.
Duration: 3 years with the perspective of a long-term career development in UCA
Employment, payment and social benefits are determined by CNRS
Contact: Candidates should send their CV, motivation letter, list of publications and 2 letters of reference to Prof. Benoît Miramond (benoit.miramond@unice.fr) and Dr. Alexandre Muzy (alexandre.muzy@cnrs.fr).

BIBLIOGRAPHY

[**BioComp2017**] Groupe De Recherche BioComp (CNRS), http://gdr-biocomp.fr/.

[**BrainScales2014**] K. Meier, Physical Models of Neural Circuits in BrainScaleS and the Human Brain Project Status and Plans, Neuro-Inspired Computational Elements Workshop, 2014

[**HBP2015**] Egidio Dangelo, The Human Brain Project: High Performance Computing for Brain Cells Hw/Sw Simulation and Understanding, Euromicro Conf. on Digital System Design, 2015.

[**LISSOM1997**] Risto Miikkulainen, James A. Bednar, Yoonsuck Choe, and Joseph Sirosh, Self-Organization, Plasticity, and Low-Level Visual Phenomena in a Laterally Connected Map Model of the Primary Visual Cortex, 1997

[**Misra2010**] J. Misra and I. Saha, "Artificial neural networks in hardware: A survey of two decades of progress," Neurocomputing, vol. 74, no. 1–3, pp. 239 – 255, 2010, artificial Brains.

[**NPU2015**] Laurent Fiack, **Benoit Miramond**, Laurent Rodriguez, Hardware design of a neural processing unit for bio-inspired computing, IEEE New Circuits And Systems Conference, 2015.

[**SOM2015**] Laurent Rodriguez, **Benoit Miramond**, Bertrand Granado, Toward a sparse self-organizing map for neuromorphic architectures, ACM Journal on Emerging Technologies in Computing Systems (JETC), 2015.

[**Spinnaker2016**] Knight, James C. and Furber, Steve B. Synapse-Centric Mapping of Cortical Models to the SpiNNaker Neuromorphic Architecture, Frontiers in Neuroscience, 2016.

[**TrueNorth2014**] Paul A. Merolla et al., A million spiking-neuron integrated circuit with a scalable communication network and interface, Science, 2014.