Open paid thesis position in Engineering (Master's/PhD)

Low-Power, Digital Neuromorphic Processor Design
for Smart Lab-on-CMOS Devices

Description

Integrated microanalytical systems are poised to enable ubiquitous (bio)chemical fluid assessment, and to have a revolutionary impact on the prevention of key health and sustainability threats of our time. In these systems, the use of electrochemical sensor arrays stands out due to their capability to generate multivariate data from liquid samples, enlarging the number of chemical properties that can be determined simultaneously. To manufacture the arrays, microsensors fabricated in semiconductor technologies offer advantages such as miniaturization, robustness, mass fabrication, and ease of integration with electronic circuits for embedded artificial intelligence, making them particularly suitable for advanced monitoring at the point of interest.

μsensor array — Neural network processing on the edge — Lab-on-CMOS
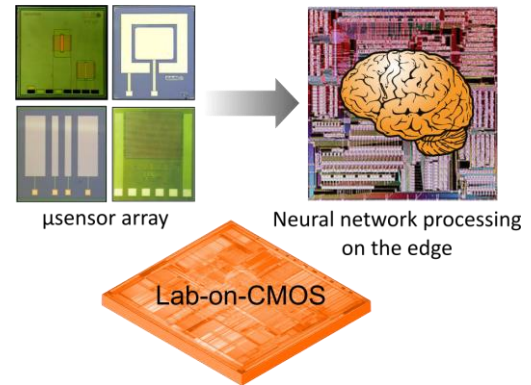
In this project, you will collaborate with a multidisciplinary team with expertise in neuroscience, computer science, chemistry, and microelectronics to develop cutting-edge solutions with intelligent microanalytical capability in a single miniaturized lab-on-CMOS. Your specific objective will be to apply the latest research advances in neuroscience and machine learning into integrating brain-inspired, digital deep neural network processors to accelerate chemical perception on chip. Your novel chips will be validated in real industrial and medical applications linked to ongoing European and National R&D projects.

Background & skills

- Finishing a Master's degree in Electronics/IT/Computer Science Engineering (or similar);
- Knowledge of Deep Neural Network training/inference in accelerated computing environments (TensorFlow and/or PyTorch libraries). Previous exposure to computational neuroscience is a plus;
- Experience with FPGA/embedded systems programming;
- Research-oriented attitude, capable of taking initiatives and with a solid problem-solving attitude;
- Ability to work in an interdisciplinary team, w/ fluent spoken and written English.

Tasks

- Modelling of the neuromorphic neural network processor on software, including corner cases.
- Architectural design and Verilog implementation of the hardware.
- Functional and post-synthesis simulation based on a Xilinx FPGA.
- Tape out of your own digital chips and performance characterization including accuracy, latency, and power.

What we offer

- Paid thesis position, with an official go/no-go PhD assessment within 6 months.
- An excellent technical infrastructure in a stimulating, multidisciplinary, and dynamic environment;
- Extensive benefits package for work-life balance in line with Spanish Administration's and CSIC's regulations;
- International collaboration network with possibility to perform research stays among partners in related European and National projects;
- Personalized hands-on training on cutting-edge technology topics with links to industry;
- Opportunity to join an ongoing startup project as entrepreneur.

Contact

To apply, please send your <u>CV, references, and academic records</u> with subject "NeuroProcessor" to: Dr. Josep Maria Margarit josepmaria.margarit@csic.es