

Multiple fully-funded PhD positions available: Hardware and Software for Neuromorphic Computing

Several fully-funded PhD positions are available at the Distributed, Intelligent, and Scalable Computing (DISCO) Lab (<http://www.drexel-disco.com>), Department of Electrical and Computer Engineering, Drexel University, Philadelphia, USA.

These positions are open for appointment from Fall, 2020 or sooner.

The research will focus on hardware (analog and mixed signal design) and software (programming language, compilers, and run-time resource allocation) for neuromorphic computing. The positions are related to large innovation projects from the National Science Foundation (NSF) and the National Institute of Health (NIH). Research activities will be conducted in close collaboration with European Universities and institutions, and will include internships and visits to these organization, in each year of PhD.

Concretely, we are looking for applicants with a strong background and interest in one (or all) of the following:

NC0038: Compiler, Architecture, and Synthesis of Neuromorphic Architectures:

Executing a program on a computer involves several steps: compilation, resource allocation, and run-time mapping. Although very well defined for mainstream computers, no prior work has investigated these steps in a systematic manner for neuromorphic systems. This project will develop compiler tool chains to translate a user's machine learning program to low-level languages that can be interpreted by neuromorphic systems. A key initiative will be to develop a common representation across different platforms. Resource optimization strategies will be developed to improve program performance; as well as an Operating System like framework that will allow programmers to easily deploy their machine learning programs on neuromorphic systems.

Required/desired skills: Familiarity with computer architectures, operating systems, object-oriented programming and data structures will be required. Familiarity or interest in compiler design will be helpful for the project.

NC0040: Security of Neuromorphic Computing with Non-Volatile Memory Technologies:

This project will address the vulnerability of neuromorphic architectures to side-channel attacks, when used in internet-of-things and other similar computing paradigms. In particular, the project will involve design-technology co-optimization to make neuromorphic computing safe. Research will involve investigation on machine learning algorithms that are vulnerable to attacks, developing efficient solutions for implementation in hardware.

Required/desired skills: Some familiarity exposure in cryptography, machine learning, non-volatile memory (PCM, STT-MRAM, ReRAM, etc) is needed. Experience in device-level, circuit-level or system-level modeling will be useful.

Within these areas, the positions come with many freedoms in terms of the specific research direction, methodology, and approaches taking the specific project needs into consideration. Accordingly, in addition to the detailed CV, the applicant should provide a short cover letter, GRE score and TOEFL/IELTS score. These materials should be emailed to anup.das@drexel.edu with the project code in the subject line.