PhD on the topic: Neuromorphic Architectures in Memristors

The REACT MSCA DN Project: Self-awareness in humans is an innate capability, arising from the brain's ability to process a multitude of sensory inputs. Emulating this functionality in electronic systems—commonly referred to as neuromorphic computing—holds the potential to create highly intelligent machines capable of supporting a wide range of everyday applications, from autonomous vehicles to smart navigation systems. However, realizing neuromorphic computing in practice presents significant challenges, particularly in the areas of energy efficiency, reliability, and security.

The REACT MSCA Doctoral Network addresses these challenges by developing a neuromorphic platform that is inherently self-aware in terms of energy consumption, secure operation, and system reliability. As part of this initiative, 15 early-stage doctoral candidates (DCs) will be trained through a comprehensive, interdisciplinary program spanning material science, device physics, computer architecture, hardware prototyping, compiler design, simulation and emulation tools, as well as cybersecurity, reliability, and system verifiability.

REACT offers a uniquely structured training environment, combining academic excellence with industrial collaboration. DCs will benefit from close mentorship by leading researchers and industry experts, while also developing essential skills in scientific writing, research ethics, time management, and entrepreneurship.

By the conclusion of the REACT project, participants will be well-equipped to pursue impactful careers across academia and industry, with the REACT program serving as a strong foundation for their future success.

As part of the Marie Curie ITN project *REACT*, KTH will focus on developing a memristor-based neuromorphic architecture, with particular emphasis on the BCPNN model pioneered at KTH. Other neuromorphic models will also be investigated. The PhD candidate will contribute to enhancing an existing simulation framework to validate memristor-based models in terms of functionality and accuracy, while also accounting for non-idealities and device variability. In addition, the candidate will develop memristor fabric fragments as SiLago blocks ("Silicon Lego bricks") to enable rapid composition of memristor-based computational structures

Organization:

Since 1827, KTH Royal Institute of Technology, has grown to become an international leading technical university. As the largest institution in Sweden for technical education and research, we bring together students, researchers, and educators worldwide. Our activities are grounded in a strong tradition of advancing science and innovation, focusing on contributing to sustainable societal development. Within the School of EECS, Division of Electronics and Embedded Systems, a 4-year PhD position is available. The candidate will be part of Professor Ahmed Hemani's research group that works on custom computing machines, VLSI design and design automation, and neuromorphic computation in memristor. The group is engaged in multiple EU and IMEC funded projects and is developing a Lego inspired design framework called SiLago (Silicon Lego). The group is part of

multiple international and national projects. The position is funded by MSCA DN for 36 months and the remaining 12 months will be covered by other funding sources. The candidate is expected to undertake secondment(s) during the first three years of the project.

Qualification & Eligibility:

- Mobility Rule: Candidates must not have resided or carried out their main activity in "**host country**" for more than 12 months in the 3 years immediately before the recruitment date.
- PhD Rule: Applicants must not already possess a doctoral degree at the date of recruitment.
- Academic Background:
    - A Master's degree (or equivalent) in Electrical Engineering, Microelectronics, Computer Science, Biomedical Engineering, Neuroscience, or a related field, with a strong focus on neuromorphic circuits, analog/mixed-signal circuit design, machine learning, or computational neuroscience.
    - Excellent academic performance and a demonstrated interest in interdisciplinary research.
- Research Experience
    - Proven research experience through peer-reviewed publications, academic projects, or advanced coursework related to neuromorphic computing, memristive devices, or brain-inspired architectures.
    - Familiarity with one or more of the following areas is advantageous: machine learning, analog/mixed-signal circuit design, or memristive device.
- Technical Skills
    - Solid understanding of neural network architectures, particularly spiking neural networks (SNNs) and brain-inspired computational models.
    - Knowledge of neuromorphic computing paradigms, memristor devices, and their integration into hardware systems.
    - Experience in circuit design, analog electronics, or mixed-signal systems is highly desirable.
    - Proficiency in analog/mixed-signal chip design flow and hardware description languages such as Verilog-A/Verilog, particularly within Cadence or similar EDA environments.
    - Strong programming skills in Python, MATLAB, or C++ for neural network simulation, data analysis, and modeling tasks.
- Soft Skills:
    - Excellent written and oral communication skills in English.
    - Ability to work independently and as part of an interdisciplinary team.
    - Strong problem-solving mindset and critical thinking ability.
    - Good management and organizational skills to handle multiple research tasks.
- A collaborative and proactive attitude towards innovation and scientific exploration.

Conditions of employment:

Type of employment: Temporary position

Contract type: Full Time

Employment start date: 1st November 2025 (intended)

Place: Stockholm, Sweden

Salary: According to KTH's doctoral student salary agreement.

Starting salary 33.000 SEK / month (ca 2950 EUR)

HR Contact: Lisa Olsson, HR Officer, rekrytering@eecs.kth.se

Link to KTH announcement: http://kth.varbi.com/what:job/jobID:841505/

Application:

Please submit the following material, concatenated in a single PDF file and upload this file as your 'CV' by means of the application form at Vacancies – project-react.eu.

- A cover letter motivating your application and detailing the motivation to apply for this specific PhD project (1 page max).
- An academic CV.
- A research statement (2 pages max) describing your personal research interests and previous research projects.
- A certified list of grades from your undergraduate degree(s) up to the moment of application (in case your MSc degree has not yet been awarded).
- The names and e-mail addresses of 2 academic referees who are willing and able to write recommendation letters for you, including the supervisor of your MSc research project.

You may apply for this position until 31 October 11:59pm / before 1st November 2025 Dutch local time (CET) by means of the project website Vacancies – project-react.eu Applications will be evaluated as received.

Our selection procedure follows the guidelines of the Recruitment code (NVP): https://www.nvp-hrnetwerk.nl/nl/sollicitatiecode and European Commission's European Code of Conduct for recruitment of researchers: https://euraxess.ec.europa.eu/jobs/charter/code

Unsolicited marketing is not appreciated.

Information

For information you can contact:

- Professor Ahmed Hemani, hemani@kth.se

Please do not use the e-mail address(es) above for applications.