PhD on the topic: Sustainable Intelligence at the Edge: Integrating Intermittent Computing and Neuromorphic Architectures

The REACT MSCA Doctoral Network 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 intelligent machines capable of supporting a wide range of everyday applications, from autonomous vehicles to innovative 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 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 that combines 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.

PhD opportunity

DC12: Sustainable Intelligence at the Edge: Integrating Intermittent Computing and Neuromorphic Architectures

The Microsystems Research Group at Newcastle University invites applications for a **fully funded, three-year PhD position within the REACT MSCA DN Project** on Sustainable Intelligence at the Edge: Integrating Intermittent Computing and Neuromorphic Architectures. This interdisciplinary opportunity is ideal for a motivated candidate eager to explore cutting-edge research at the intersection of low-power computing and neuromorphic systems.

The successful applicant will join Dr Domenico Balsamo's research team and will be supported by **MSCA DN funding for 36 months**. As part of the program, the DC candidate will participate in one or more secondments during the first three years of the project, gaining valuable international, industrial and cross-sector experience.

Description

In this project, we will explore the convergence of intermittent computing and neuromorphic systems to enable energy-efficient, resilient edge intelligence. Intermittent computing addresses energy scarcity by allowing systems to operate with sporadic power while retaining state across power failures, ensuring seamless execution. Integrating these with neuromorphic architectures, which mimic brain-like computation, allows for low-power, adaptive processing. Together, they will form a robust framework for always-on, intelligent sensing in constrained environments such as IoT or biomedical devices, where energy reliability is limited but context-aware operation is essential. This synergy promises breakthroughs in sustainable, autonomous edge computing.

Key Accountabilities

Essential Qualifications:

Solid foundation in digital design and computer architecture

Practical experience with FPGA development using tools such as AMD/Xilinx Vivado

Proficiency in RTL design with Verilog or VHDL

Programming experience in embedded systems using C/C++

Familiarity with microcontroller platforms like Arm Cortex-M or RISC-V

Good understanding of CPU peripheral integration and hardware-software co-design concepts

Competence in using debugging tools such as Integrated Logic Analyser (ILA) and logic analyzers for FPGA-based systems

Experience with microcontroller debugging via JTAG or SWD interfaces

Knowledge of standard SoC bus protocols such as AXI or AHB

Desirable Skills:

Experience with checkpointing, state retention, or intermittent computing systems

Hands-on work deploying soft-core processors on FPGAs

Familiarity with ASIC development processes, including synthesis and power analysis

Exposure to RISC-V architecture and open-source cores such as PicoRV32

Experience with power estimation tools, e.g., Xilinx Power Estimator

Ability to produce technical documentation or contribute to research publications

Understanding of non-volatile memory technologies, such as flash or FRAM

Qualification & Eligibility:

- Mobility Rule: Candidates must not have resided or carried out their main activity in the “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.
- Master's degree or equivalent in Electrical Engineering, Computer Science, or related field with excellent grades.
- Excellent English communication, presentation, and writing skills.
- Must be a team player.

Conditions of employment:

We offer:

- An Approximate Gross Living Allowance £3,558.52 (monthly) in line with the **REACT MSCA DN and UK regulations** will be offered based on a full-time position.
- A PhD training program is part of the agreement.
- **Intended start date:** November 1, 2025

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.

Our application period is **July 1 to October 31, 2025**. You must apply via the project website Vacancies – project-react.eu.

Applications will be evaluated as received.

Newcastle University strives to be a university where students and staff are respected and feel at home, regardless of differences in background, experience, perspective, and identity. We believe that working on our core values of inclusion and equality is a shared responsibility, and we are actively working to create a socially inclusive and safe environment. Diversity among students and staff members enriches academic debate and contributes to the quality of our teaching and research. We therefore invite applicants from underrepresented groups, particularly those from diverse backgrounds, to apply.

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

Information

For information, you can contact:

- Dr Domenico Balsamo, Domenico.balsamo@newcastle.ac.uk
- Dr Farhad Merchant, f.a.merchant@rug.nl

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