

PhD on the topic: Neuromorphic System Reliability investigations

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 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.

Organization:

Politecnico di Torino (PTO) is a prestigious technical university participating in this project mainly through the Department of Control and Computer Engineering (DAUIN), which is very active in research activities on AI reliability, and embedded systems, including trustworthy system designs. DAUIN includes about 80 faculty members and more than 200 temporary members (PhD and post-doc students). About 40 students receive their PhD degree each year from the Department, which is currently involved in more than 20 EU-funded projects and many others with companies. Individual projects of the supervised Doctoral Candidates (DCs) will benefit of these projects and industrial contacts.

Inside the Department of Control and Computer Engineering (DAUIN) of Politecnico di Torino, the Electronic CAD & Reliability Group is one of the most active groups in the department. Its mission is to support, through techniques, tools, and services, the designer of electronic circuits and systems. The research conducted by the group spans the whole spectrum of classical computer-aided design topics, with particular emphasis on system reliability, testing, fault tolerance, and validation of digital circuits and systems described at various levels of abstraction. Currently, the CAD group counts with

14 faculty members and 30 PhD students and young researchers. The CAD group is one of the most active groups of the department regarding publications, research and industrial collaborations with Italian and European companies and universities. Additionally, the group offers a set of in-house developed tools addressing reliability, test and safety-related problems, especially in the area of AI-based systems.

In particular, the DC will become a member of the CAD group under the supervision of Professors Ernesto Sanchez and Annachiara Ruospo. The position is funded by MSCA DN for 36 months. The offered position, will be available within the PhD program in Computer and Control Engineering offered by the Department of Control and Computer Engineering, and it is part of the third-level offer of the Doctoral School of the Politecnico di Torino.

Research Area:

Neuromorphic systems are gaining increasing attention in modern applications due to their intrinsic ability to mimic brain-like behavior in terms of processing capacity, resilience, self-learning, and self-repair. In recent years, technologies based on emerging memory devices such as RRAM, FeRAM, and MRAM have reached a reasonable level of production maturity, enabling their integration into practical applications. However, their sensitivity to manufacturing process non-idealities makes them prone to in-field faults that can significantly compromise reliability.

This PhD project focuses on addressing the reliability challenges associated with AI applications that utilize modern neuromorphic technologies. The research will investigate how manufacturing process variations impact the actual reliability of the final devices and explore mitigation strategies tailored to specific memory technologies. The scope of the project includes the study of existing fault models, reliability assessment methods, and techniques for ensuring in-field dependability of neuromorphic systems.

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.
- Master degree or equivalent in Electronic Engineering, Computer Science, or related field with excellent grades.
- Excellent programming and scripting skills, for example in programming languages such as C, C++, Python.
- Solid understanding of computer hardware design and synthesis tools (ASIC, FPGA development).
- Good knowledge on Computer Design and Modern Architectures
- Basic knowledge of hardware testing methodologies and reliability analysis is a plus.
- Good background in machine learning, deep learning and AI modeling.
- Knowledge of computing-in-memory and emerging non-volatile memory technologies is an added advantage.
- Excellent English communication, presentation, and writing skills. It is necessary to count with an English B2 certification as described here:

<https://www.polito.it/en/education/phd-programmes-and-postgraduate-school/admissions-to-phd-programmes/admissions/procedure-and-requirements-for-admission>

- Strong teamwork and collaboration skills are highly valued.

Conditions of employment:

We offer an Italian contract in accordance with the regulations of **Italian Universities** and in line with the MSCA ND recruitment standards.

- Gross salary: € 54378,6 per year.
- *Additional details about the contract will be available in the following months.*
- **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](https://project-react.eu/vacancies).

- A cover letter motivating your application and detailing the motivation to apply for this specific PhD project (1 page max).
- An academic CV, including for your Bachelor and Master degrees these documents:
 - The syllabus, course description and official transcript of records
- 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 (**DC11**) until 31 October 11:59pm / before 1st November 2025 local time (CET) by means of the project website [Vacancies – project-react.eu](https://project-react.eu/vacancies) Applications will be evaluated as received.

Our selection procedure follows the guidelines of the Recruitment code under the National regulations

<https://www.polito.it/en/education/phd-programmes-and-postgraduate-school/the-doctoral-school/regulations> and European Commission's European Code of Conduct for recruitment of researchers: <https://euraxess.ec.europa.eu/jobs/charter/code>

We provide career services for partners of new faculty members moving to Torino, Italy.

Unsolicited marketing is not appreciated.

For information you can contact:

- Ernesto Sanchez, ernesto.sanchez@polito.it

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