



PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 39th cycle

Research Area n. 2 - Electronics

PNRR 118 PA Research Field: EMBEDDED AI SYSTEMS FOR HEALTH, ENVIRONMENT
AND SECURITY

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

Different applications of public interest, in particular in the field of diagnostic systems for health, systems for environmental monitoring, identifications systems for security are today exploiting new Artificial Intelligence (AI) techniques. This project aims to explore the opportunity to implement AI-based algorithms directly in electronics circuits or systems close to the components where the informations is acquired, typically the sensor (radiation detectors in particular). The opportunity to 'embed' part of the entire processing in compact electronics units would allow to improve the detection speed and trigger promptly the following actions once the information is acquired, with advantage to reduce the need to communicate with a processing unit far from the sensor and to save space and energy. Pilot applications of public interest will be considered to verify the succesful application of such approach.

Methods and techniques that will be developed and used to carry out the research

The research will implement AI-based algorithms either in electronics elaboration units like microcontrollers and FPGAs as well as it will explore in-silicon implementation in integrated circuits. Laboratory prototypes of intelligent sensors in pilot applications will be developed and tested also in the representative environment (e.g. diagnostic systems).



Educational objectives	The educational objectives regard first the survey of systems currently used in the field of medical diagnostic, environment monitoring and security which make use of AI-based algorithms and which could benefit of adoption of embodiment of such algorithms in electronics units, with the advantage of miniaturization and extended distribution of sensors networks. The activity will then regard and design and implementation of embedded AI electronics systems and development of prototypes demonstrators coupled to solid-state radiation detectors. Finally, application and verification of the adopted approach in pilot projects will conclude the research activity.
Job opportunities	Employment in research centers in the field of medical diagnostic, environmental monitoring, security as well as in related industries. Employment in technical offices in public administrations.
Composition of the research group	1 Full Professors 1 Associated Professors 1 Assistant Professors 12 PhD Students
Name of the research directors	Fiorini Carlo

Contacts	
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	INFN - Istituto Nazionale di Fisica Nucleare
By number of months at the company	6



Institution or company where the candidate will spend the period abroad (name and brief description)	MIT - Massachusetts Institute of Technology
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

The proposal aims to develop intelligent AI (Artificial Intelligence) based electronic systems to facilitate the digital transition in the public sector in the context of medical diagnostic systems, environmental monitoring systems and security systems based on radiation detectors. The adoption of embedded computing techniques in public interest applications can help acquire information more readily, more efficiently and with more simplified operating models. The adoption of enabling artificial intelligence technologies and solutions will be explored and introduced in pilot studies for public interest applications.

EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student
5.707,20 Euro per student

TEACHING ASSISTANTSHIP: availability of funding in recognition of supporting teaching activities by the PhD student There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.