



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

Research Area n. 1 - Computer Science and Engineering

**PARTENARIATO PNRR Research Field: PROCESSING AND ANALYSIS OF STREAMING
DATA FOR ENERGY TRANSITION**

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**

The global energy sector is undergoing an unprecedented transformation to reduce carbon emissions. The so-called energy transition presents some of the most formidable challenges the energy sector has ever experienced, requiring a paradigm change that involves diverse players and heterogeneous concerns, including regulations, economic drivers, societal, and environmental aspects.

Central to this transition is the adoption of integrated systems and smart energy infrastructures to efficiently produce, distribute, store, and convert energy among different energy vectors.

A deep understanding and control of these systems is fundamental to harness the potential for energy savings and foster energy transition towards a low carbon future. Unfortunately, the inherent complexity of integrated energy systems makes them extremely difficult to analyze, understand, design, and optimize.

The objective of this PhD work is to design and develop a software platform to analyze the data continuously made available by smart energy systems with the goal of deriving useful information that could guide decision making or even enable automated control. The work will



	be carried out within the NEST (Network 4 Energy Sustainable Transition) extended partnership, which will provide an interdisciplinary context to capture the multiple facets of complex energy systems.
Methods and techniques that will be developed and used to carry out the research	The work will include: •The design of software architectures to effectively and efficiently capture and analyze heterogeneous data continuously produced by the different actors involved in complex energy systems. •The definition of proper programming abstractions to extract useful knowledge from the data under analysis. •The implementation of the proposed solutions within a prototype platform. •The validation on the platform within the NEST extended partnership. The research will be mainly carried out at Politecnico di Milano, but visits to other internationally recognized research centers will be possible.
Educational objectives	•Learn about state-of-the-art algorithms, programming abstractions, and software architectures to analyze streaming data at scale. •Learn about complex energy systems. •Advance the state of the art on approaches to automate the analysis and management of complex energy systems. •Learn how to validate a research idea through an empirical evaluation. •Learn how to write scientific papers in the area of streaming data management and analysis.
Job opportunities	Considering the central role of data analysis and energy systems today, we expect PhD graduates in this area to be successful in finding suitable job opportunities both in industry and academia.
Composition of the research group	2 Full Professors 1 Associated Professors



	1 Assistant Professors 3 PhD Students
Name of the research directors	Alessandro Margara

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

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
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. TEACHING ASSISTANTSHIP: 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. COMPUTER AVAILABILITY: individual use. DESK AVAILABILITY: individual use. This project research is in the framework NEST PARTENARIATO ESTESO NETWORK 4 ENERGY SUSTAINABLE TRANSITION - D43C22003090001 D.D. 1561 del 11/10/2022 D.D. 341 del 15/03/2022 Avviso pubblico per la presentazione di Proposte di intervento per la creazione di ?Partenariati estesi alle università, ai centri di ricerca, alle aziende per il finanziamento di progetti di ricerca di base? ? nell?ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 ?Istruzione e ricerca? ? Componente 2 ?Dalla ricerca all?impresa? ? Investimento 1.3, finanziato dall?Unione europea ? NextGenerationEU

