POLITECNICO DI MILANO

PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 41st cycle

THEMATIC Research Field: AI AND DIGITAL TECHNOLOGIES FOR DATA-DRIVEN MONITORING SYSTEMS FOR CRITICAL INFRASTRUCTURES PERFORMANCE OPTIMIZATION AND MANAGEMENT - PROGETTO SMARTEYE-CUP B49J25000950005

Monthly net income of PhDscholarship (max 36 months)
1600.0 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	In recent years, the protection of critical infrastructures such as energy production plants, power distribution lines and mobility systems has become a matter of growing concern for both public and private institutions. Ensuring the security of such strategic assets requires not only continuous monitoring but also the capability for fast and effective intervention in the case of potential threats. Moreover, the need to reduce the reliance on human personnel in complex environments is becoming more urgent, both for economic reasons and for technical issues.In this context, the use of computational intelligence techniques and data-driven technologies, integrating HW and IoT devices, enable to design decision support systems.The main objectives of this PhD project are the following: •**Design and development of data analytics techniques**, with the goal of enabling reliable services which integrate SW and HW sensing platforms; •**Exploitation and optimization of in-field sensing data aggregation** to support decision-making and situational awareness in critical infrastructure management and control; •**Integration and application of data-driven and computational intelligence techniques**, in order to enhance overall system energy efficiency and reduce

	environmental impact. The proposed research aims to contribute to the creation of innovative, sustainable and technological frameworks for monitoring systems, capable of operating efficiently in critical infrastructure management. Agevolazione a valere sul D.M. MiSE 31/12/2021 CUP B49J25000950005 - COR: 24363643 SMARTEYE - Prog n. F/310276/03/X56 - WHM4RIST01
Methods and techniques that will be developed and used to carry out the research	To achieve the aforementioned objectives, the PhD candidate will make use of a multidisciplinary set of advanced methodologies, combining both theoretical and applied approaches.In particular, the research will involve: •**Data analytics and neuro-fuzzy techniques**, for processing and pattern recognition of heterogeneous data acquired from sensors, with the aim to enable system supervision, pattern recognition and classification; •**Evolutionary optimization algorithms**, to support system design choices and management strategies with KPI definition in terms of energy consumption and related impacts. •**Monitoring systems and control frameworks**, to coordinate multiple tasks and technical KPIs (benchmark, unit normalisation, error management, data consistency and system robustness). These techniques will be explored both through simulation environments and through experimental activities, possibly in collaboration with industrial, research or institutional partners involved in the research project.
Educational objectives	The PhD program aims to provide a solid and interdisciplinary education in key areas relevant to modern monitoring systems and critical infrastructure management and control, such as advanced data analytics, neural and sensor systems, and hybrid AI algorithms.
Job opportunities	Successful fulfilment of the research programs associated

	with these Scholarships will provide PhD candidates with the qualifications required to seek employment in diversified industry and university sectors in the Energy fields, and other sectors (Transportation, Environment, etc.)
Composition of the research group	4 Full Professors 3 Associated Professors 1 Assistant Professors 0 PhD Students
Name of the research directors	Prof. Riccardo Zich, Prof. Francesco Grimaccia

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	800.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities: Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and computer, etc.. This amount is equal to 10% of the annual gross amount, for 3 years. ***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. *Computer availability:* individual use. *Desk availability:* individual use.