

PhD in SCIENCE, TECHNOLOGY AND POLICY FOR SUSTAINABLE CHANGE - 39th cycle

PARTENARIATO PNRR Research Field: AI AND GIS APPLICATIONS FOR ENVIRONMENT AND BIODIVERSITY MONITORING

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 PA and the policy makers are facing a challenge induced by the accelerated technological evolution. This demands a rapid renovation of the regulation policies and of the processes and services offered to the citizens. The digitalization of the society also creates a unique opportunity, due to the unprecedented amount of data that now available in all sectors, which can boost the delivery of more accurate and timely responses to the citizens' needs. Reaping the benefits of the digital society requires highly skilled personnel and a redefinition of the competences, organization, strategy and processes of policy makers and PA staff. This cultural and organizational shift can be supported by highly qualified staff, most notably by PHD laureates trained in a multidisciplinary context. A specific sector where the change of pace is needed is environment monitoring, especially with respect to the biodiversity health status in urban and peri-urban contexts, where most of the world's population concentrates. In this field, the last decade has witnesses the massive deployment of monitoring technologies, from remote sensing to near field data collection. Such a wealth of data can dramatically impact the capacity of regulators to design policies that take into account the technologic progress and of the PA to monitor the environment status in real time and respond to hazards in a timely and effective manner. The proposed research is motivated by the need to assist

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	policy makers and public administrations in the design, planning and execution of policies and intervention procedures for environment and biodiversity protection. Al and computer vision (CV) applied to multi-modal data (satellite and drone images, environmental sensor streams) hold the promise to reduce the effort and the cost of monitoring the phenomena of interest, be enabling the effective diagnosis of critical scenarios, the prioritization of remediation actions, and the definition of the optimal trade-off in presence of competing objectives. Examples of scenarios motivating the research are the monitoring of large-scale territories by means of the analysis of multi-modal data to assess the vegetation health status, detect the presence of dangerous pollutants putting human and vegetation health at risk, the identification of optimal locations for implementing urban biodiversity improvement actions.
Methods and techniques that will be developed and used to carry out the research	The research will reuse, improve and develop AI and computer vision algorithms capable of delivering geospatial intelligence capacity, turning Earth Observation practices and products into tools for territory monitoring and policy making. Techniques such as machine learning and deep learning models for multi-modal data analysis will be assessed and improved when necessary, to address such tasks as image classification, semantic segmentation and object detection. Specific focus will be placed on developing approaches for reducing the effort and cost of data labeling, through data augmentation, semi-supervised, unsupervised, and weakly-supervised procedures. Furthermore, the research will investigate the integration of AI predictive models and open source GIS in order to simplify the IT architecture for easier uptake also by non- specialist users such as PA operators.
Educational objectives	The educational objectives are: 1) understanding the requirements and objectives of policy making in the field of environment and biodiversity protection; 2) acquiring a scientifically sound methodology for applying AI and CV technology to support public administrations and policy makers in the assessment of large-scale scenarios and in



	the design of decision support systems.
Job opportunities	The doctor will be able to deploy the acquired skill not only in the public administration and policy making consultancy companies but also in the industry. Target employers are the environment agencies of the PA and the data hungry industries such as the enterprises servicing the Earth Observation, agriculture, construction and logistics sectors
Composition of the research group	2 Full Professors 2 Associated Professors 2 Assistant Professors 2 PhD Students
Name of the research directors	Piero Fraternali

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

teaching assistantship: There are various forms of financial aid for activities of support to the teaching practice. PhDs are encouraged to take part in these activities, within the limits allowed by the regulations.

computer availability: PhDs have their own computer for individual use. They will also have access to **CFDHub** (www.cfdhub.polimi.it), an Interdepartmental laboratory of PoliMi, with a state-of-the-art infrastructure and scientific computing system.

desk availability: PhDs have their own desk, cabinet, and locker.

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campioni nazionali di R&S su alcune Key Enabling Technologies da finanziare nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Componente 2 Investimento 1.4 Potenziamento strutture di ricerca e creazione di campioni nazionali di R&S su alcune Key Enabling Technologies finanziato dall'Unione europea ? NextGenerationEU