



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 38th cycle

Research Area n. 1 - Computer Science and Engineering

**PARTENARIATO PNRR Research Field: AUTONOMOUS MULTIMODAL PERCEPTION FOR  
PRECISE AND SUSTAINABLE MANAGEMENT OF AGRICULTURAL SYSTEMS**

**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**

This research project is in the framework of  
CENTRO NAZIONALE DI RICERCA AGRITECH  
CUP D43C22001350001  
Decreto di Concessione D.D. 1032 del 17/06/2022

The research project aims at devising innovative multi sensor solutions (on-plant, proximal and remote), to generate and integrate data flows related to critical aspects of crop production. The long-term goal is to foster the adoption of smart digital tools for the execution of cultural practices by machines and robotic systems. These tools span from the development of autonomous robotic systems to the development and implementation of AI and Big Data solutions tailored for agriculture. The research will lead to the acquisition and analysis of multi and hyper-spectral signals and images with artificial intelligence techniques for phenotyping and optimization of agricultural production. Techniques will be developed, based on machine learning and deep learning algorithms optimized for innovative sensors to recognize phenotypic characters and properties of interest in agricultural productions. The ultimate goal is to create, also through advanced localization and mapping techniques, high-resolution reconstructions in which each individual plant is recognized and monitored over time in order to build a



	digital twin in the "internet of plants". The results will be validated through data acquisition campaigns in dedicated test fields to compare the results of the sensors analysis with the agronomic outcomes from the field.
<b>Methods and techniques that will be developed and used to carry out the research</b>	Tools coming from the fields of Machine Learning and Big Data Analysis to perform integration and processing of data from heterogeneous sources (e.g., weather series, satellite data, local data from field robots, and IoT sensors). Robotics techniques for sensor data acquisition, fusion and interpretation, as well as for self-localization, mapping and navigation with a specific interest in multisensory and multimodal simultaneous localization and mapping. Artificial Intelligence techniques for multi-agent planning, optimization and uncertainty management.
<b>Educational objectives</b>	The proposed PhD program offers the highest level of formation, leading to strong interdisciplinary expertise in the chosen field, along with a training in the latest topics of research explored by the scientific community. The PhD student will be offered the possibility of matching scientific research to the real issues of an actual domain with strong potential for technological advancement, thus stimulating her/his capability for innovation.
<b>Job opportunities</b>	PhD graduates will have an excellent qualification for a range of careers spanning from academia (where studied topics are gaining importance) to industry (where the need for technological advancements in agriculture is widely acknowledged) to qualified scientific and technical advice to policymaking (increasingly needed due to ongoing and oncoming global challenges).
<b>Composition of the research group</b>	2 Full Professors 0 Associated Professors 1 Assistant Professors 4 PhD Students
<b>Name of the research directors</b>	Matteo Matteucci

<b>Contacts</b>
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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

5.707,13 Euro

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

D. D. 3138 del 16/12/2021 rettificato con D.D. 3175 del 18/12/2021 "Avviso pubblico per presentazione Proposte di intervento per il Potenziamento di strutture di ricerca e creazione di "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"