Funded by the European Union

Marie Skłodowska-Curie Actions

Green Field Data

Exceptional
36-months Double Degree PhD Scholarship

PhD in Land, Environment, Resources and Health (Italy)
PhD in Engineering and Technology Sciences (Poland)

Position-E

Optimizing images quality and deep learning methods for vineyard disease detection

EU Recruiting institutions	UniPD, Università degli Studi di Padova, Padua, Italy (18 months) PUT, Poznan University of Technology, Poznan, Poland (18 Months)
Keywords	Vineyard disease detection, Image quality optimization, Deep learning, Data augmentation, Precision viticulture, Robotics in agriculture, Digital agriculture

Exceptional benefits at a glance

- ***International PhD training excellence (here)***
- ***Renowned supervisors & top-tier labs***
- ***Interdisciplinary & multi sectoral research***
- ***Competitive MSCA salary & allowances***
- ***Global academic & industrial network***
- ***Non-academic secondments***

Salary

	Living Allowance	Mobility Allowance*	Family Allowance**
Gross amount (net salary + employee's taxes and contributions)	**3822**	**710**	**660**

Long Term leave allowance (if applicable)

Special needs allowance (if applicable)

*private mobility-related costs (e.g. travel and accommodation costs), not their professional costs under the action

**doctoral candidate has or acquires family obligations during the action duration, i.e. persons linked to him/her by (i) marriage, or (ii) a relationship with equivalent status to a marriage recognised by the legislation of the country or region where this relationship was formalised; or (iii) dependent children who are actually being maintained by the researcher, the family allowance must be paid to him/her as well

GreenFieldData Project at a glance

GreenFieldData: "IoRT Data management and analysis for Sustainable Agriculture" is a project funded under the action HORIZON Marie Sklodowska-Curie Action (MSCA) Joint Doctoral Network. **GreenFieldData** will train a new generation of researchers able to tackle digital and green transition challenges using a human-centric approach to ensure the robustness and relevance of the solutions responding to the specific needs of the EU market in a context of climate change and increasing socio-economic constraints. At a policy level, **GreenFieldData** outcomes will feed in directly to the aims of the HE Strategic Plan 2025-2027, EU

Partnership Agriculture of Data and Digital EU Program. **GreenFieldData** proposes a high-level interdisciplinary, inter-sectoral and international (triple 'i') research project and training network on new IoRT (Internet of Robotic Things) based solutions for sustainable agriculture. **GreenFieldData** will mobilize 14 Doctoral Candidates (DCs) enrolled in Double Degree Doctorate programmes with 12 academic main beneficiary partners, across 7 EU countries. Moreover, 21 non-academic associated partners, and 3 academic associated partners will provide support to the DCs. The partners form a high quality network, where Academic partners have previous research collaborations as outlined in a common vision paper. The ambitious project will provide the DCs with a unique toolbox of cutting-edge knowledge, tools and strategies which will boost their employability and benefit the next generation operational workforce (researchers, Digital Technologies (DTs) and agricultural stakeholders). The project results will also benefit EU innovation as the human-centric IoT devices & robotics, and data-based solutions tailored to EU context will enable the agricultural sector to assess and mitigate the impacts of climate change, and define new sustainable low input practices, thus increasing resilience and competitive-ness.

PhD Position E – Optimizing images quality and deep learning methods for vineyard disease detection

Context:

Viticulture is one of the most valuable agricultural sectors in Europe, but it faces increasing challenges from plant diseases that threaten both yield and quality. Early and reliable detection of vineyard diseases is crucial for ensuring sustainable production, reducing economic losses, and minimizing the use of chemical treatments. Current monitoring methods are often manual, time-consuming, and prone to inconsistencies, which limits their scalability and effectiveness. Recent advances in robotics, imaging technologies, and artificial intelligence offer transformative opportunities for vineyard disease detection. High-resolution imaging combined with deep learning models enables precise recognition of disease symptoms at early stages, supporting more targeted interventions. However, image quality and data consistency remain significant bottlenecks: uncontrolled field conditions, variability in light, weather, and plant growth stages introduce noise that hampers reliable model performance. This PhD project addresses these challenges by optimizing image acquisition and processing pipelines for vineyard monitoring, integrating advanced data augmentation techniques, and developing multimodal AI approaches that incorporate spatial variability factors. The outcomes will contribute not only to more robust and accurate disease detection systems but also to decision support tools that promote sustainable vineyard management. The research aligns with EU strategic priorities such as the Green Deal, Farm to Fork Strategy, and Digital EU Programme, bridging digital innovation with ecological sustainability in agriculture.

Objectives:

- Develop methods for early detection and classification of vineyard diseases using robotic platforms operating directly in the field.
- Optimize and automate vineyard image acquisition and processing pipelines to ensure consistently high-quality datasets, addressing challenges of illumination, weather conditions, and plant variability.
- Design and implement advanced data augmentation strategies to improve the robustness, generalization, and reliability of deep learning models for disease detection.
- Incorporate spatial variability factors (soil, microclimate, plant development stage) into detection frameworks by leveraging multimodal approaches that integrate imaging, sensor data, and contextual information
- Develop efficient data access and management mechanisms to support AI-driven queries and enhance the effectiveness of vineyard decision-support systems.

Work plan and task scheduling:

1) Months 1–3: Review state of the art on vineyard disease detection, imaging techniques, and deep learning approaches; identify key challenges in image quality, acquisition variability, and multimodal data integ-

ration. Define preliminary protocols for image collection in vineyards.

2) Months 3–6: Acquire knowledge on vineyard pathophysiology and symptom expression of major diseases; establish initial image acquisition pipelines using robotic platforms (RGB, multispectral cameras). Begin testing data augmentation strategies for heterogeneous datasets.

3) Months 6–9: Optimize field image collection methods, focusing on calibration, lighting normalization, and noise reduction. Conduct pilot studies in controlled vineyard environments to assess early detection of disease symptoms. Secondment at Up2E (Italy), 1 month — collaboration on algorithm development for early detection and classification of vineyard diseases.

4) Months 9–12: Integrate advanced imaging techniques and preprocessing pipelines to ensure high-quality, consistent datasets. Start training baseline deep learning models for classification and detection.

5) Months 12–18: Automate vineyard data acquisition workflows using robotic platforms; implement and refine advanced data augmentation methods to improve model robustness. Secondment at Up2E (Italy), up to 2 months — field-based validation of data collection methods in real vineyard conditions.

6) Months 18–24: Incorporate spatial variability and multimodal datasets (e.g., soil, weather, growth stage data) into disease detection models. Develop mechanisms for efficient data access and multimodal integration.

7) Months 24–30: Develop and evaluate multimodal deep learning models for robust disease detection. Benchmark performance against existing methods. Secondment at L-PIT (Poland), 2 months — research on optimization of image quality and AI-driven multimodal data management.

8) Months 30–36: Final integration of optimized image collection pipelines, augmented datasets, and multimodal AI models into a decision-support framework for sustainable vineyard management. Prepare scientific publications, disseminate results at international conferences, and complete PhD thesis writing.

Expected results

1. Novel methods for early detection and classification of vineyard diseases, with improved accuracy and robustness under real-world field conditions.
2. Development of optimized imaging pipelines and automated data acquisition techniques that ensure high-quality, consistent, and reproducible vineyard datasets.
3. Implementation of advanced data augmentation approaches, producing reliable training datasets that enhance the generalization capacity of deep learning models.
4. A multimodal disease detection framework that integrates imaging data with spatial and environmental variability factors, leading to more resilient and scalable AI models.
5. Creation of efficient data access and management mechanisms to support AI-driven queries and decision-support systems for vineyard health monitoring.
6. Automated vineyard monitoring techniques that significantly increase the efficiency, precision, and sustainability of disease detection and vineyard management practices.

References

1. Bimonte, S., Bellocchi, G., Pinet, F. et al. Data engineering for sustainable agriculture: developments, challenges, and case studies of a novel IoRT architecture. J Big Data 12, 195, 2025.
2. Kerkech M, Hafiane A, Canals R. Vine disease detection network based on multispectral images and depth map. Remote Sensing, 12(20):3305, 2020.
3. Zhang Q, Qiao Y, Guo P, He L. Deep learning based automatic grape downy mildew detection: YOLO v5 with coordinate attention. Frontiers in Plant Science, 13:934485, 2022.

4. Cap QH, Uga H, Kagiwada S, Iyatomi H. LeafGAN: An effective data augmentation method for practical plant disease diagnosis. arXiv preprint arXiv:2002.10100, 2020.
5. Carraro A, Saurio G, López-Maestresalas A, Scardapane S, Marinello F. Convolutional Neural Networks for the detection of Esca disease complex in asymptomatic grapevine leaves. In: ICIAP 2023 Workshops, Lecture Notes in Computer Science, vol 14365. Springer, Cham, 2024.
6. Sozzi M, Cantalamessa S, Cogato A, Kayad A, Marinello F. wGrapeUNIPD-DL: An open dataset for white grape bunch detection. Data in Brief, 43:108466, 2022.

PRACTICAL INFORMATION

Recruiting and host institutions	• UniPD, Università degli Studi di Padova, Padua, Italy (18 Months) (Recruiting institution) • PUT, Poznań University of Technology, Poznań, Poland (18 Months)
Doctoral schools	• Doctoral School Land, Environment, Resources and Health of the University of Padova, Padua, Italy • Doctoral School of the Poznań University of Technology, Poznan, Poland
Supervisors	• Prof. Francesco Marinello (TESAF, Università degli Studi di Padova, Padua, Italy) • Prof. Piotr Skrzypczyński (Poznan University Technology, Poznan, Poland)
Non-academic mentors	• Dr. Giovanni Didonna (Up2Eearth, Italy) • Dr. Piotr Nowak (Lukasiewicz-PIT, Poland)
Secondments (1 to 6 hosting months)	• Up2Eearth, Italy, up to 3 months, collaborate with the team to develop and test algorithms for early detection and classification of vineyard diseases and optimize data collection methods in real farming environments • Lukasiewicz-PIT, Poland, 2 months, work on optimization of image quality and deep learning methods for vineyard disease detection - exploring AI-driven techniques and multimodal data management to enhance disease detection accuracy.
Contact information	• francesco.marinello@unipd.it • piotr.skrzypczynski@put.poznan.pl

RECRUITMENT CRITERIA

General criteria

- MSCA Mobility Rule: researchers must not have resided or carried out their main activity (work, studies, etc.) in **Italy** for more than 12 months in the 36 months immediately before their date of recruitment
- All researchers recruited in a DN must be doctoral candidates (i.e. not already in possession of a doctoral degree at the date of the recruitment)

- An applicant must have received the equivalent of 300 ECTS with a major in computer science, from which at least 60 ECTS corresponds to a master degree. The master degree must be granted by a university recognized by the International Association of Universities.
- Scientific excellence to fit the PhD project
- Fluent (oral and written) English skills as the project operates in English language
- Knowledge of the language of the host country may be considered a merit
- Team-mindedness

Required skills

- Strong programming skills (e.g., Python, C++ or similar)
- Experience in machine learning and data engineering
- Proficiency in database management and optimisation methods
- Master's degree in Computer Science or related field
- Interdisciplinary mindset

APPLICATION

How to apply?

- **All information are provided [here]**

Deadline: **15th April 2026**

Other information

University of Padova (UNIPD)

The University of Padova is one of the **oldest and most prestigious universities in Europe**, founded in **1222**.

- **History and Prestige:** It is the second-oldest university in Italy and the fifth-oldest surviving university in the world, renowned for its motto, *Universa Universis Patavina Libertas* (Paduan Freedom is Universal for Everyone), emphasizing academic freedom. Key historical figures like **Galileo Galilei** and **Nicolaus Copernicus** were associated with the university, and it houses the world's oldest anatomical theatre and the oldest academic Botanical Garden (a UNESCO World Heritage Site).
- **Size and Scope:** Located in Padua, Italy, it is a large public research university with around 60,000-70,000 students, offering a wide range of multidisciplinary programs across **eight schools** and **32 departments**.
- **Excellence:** UNIPD consistently ranks among the best Italian universities, particularly excelling in **teaching quality** and **research**.

Department of Land, Environment, Agriculture and Forestry (TESAF)

The Department of Land, Environment, Agriculture and Forestry (TESAF - *Dipartimento Territorio e Sistemi Agro-Forestali*) is a key part of the University of Padova's School of Agricultural Science and Veterinary Medicine.

- **Focus:** TESAF is a **multidisciplinary structure** dedicated to the **understanding, effective management, and sustainable use of renewable agricultural and forest resources**.
- **Scope:** Its research and teaching activities cover a broad range of disciplines, including:
    - Forestry (Silviculture and Forest Engineering)
    - Agricultural and Forest Economics and Policy
    - Land and Environmental Appraisal and Planning
    - Hydrology and Water Resources Management
    - Phytopathology
    - Remote Sensing and GIS (Geographic Information Systems)
- **Location and Collaboration:** TESAF is primarily located on the **Agripolis Campus** in Legnaro (PD), a specialized center for agricultural and veterinary sciences, where it collaborates closely with other departments in the sector.
- **International Presence:** The department is highly active internationally, involved in numerous European and international research projects and hosting several international Master's and PhD programs, often with a focus on sustainable forest and land management in Europe and the Mediterranean.

Poznań University of Technology

Poznań University of Technology (PUT) is one of Poland’s leading technical institutions and an increasingly attractive destination for international PhD candidates in information technology, robotics, automation, and related engineering fields. The university combines a strong research culture with modern laboratories and an environment that encourages interdisciplinary collaboration. Foreign doctoral students benefit from working within well-established research groups specializing in areas such as artificial intelligence, autonomous systems, control engineering, mobile and industrial robotics, computer vision, and advanced computing. Many of these teams participate in European and global research projects, creating opportunities for joint publications, international mobility, and academic networking.

Doctoral studies at PUT are conducted entirely in English offering a clear research-oriented training program. Each PhD candidate develops an individual research plan under the supervision of experienced faculty members, gaining access to cutting-edge equipment and project infrastructure. The university emphasizes practical, application-driven research, often developed in partnership with industry, technology companies, and external research centers. This makes PUT a strong choice for candidates interested in applied robotics, machine intelligence, automation of complex systems, or computational technologies with real-world impact.

International PhD students also benefit from a supportive academic environment. PUT provides guidance on research methodology, scientific writing, and grant acquisition, as well as opportunities to participate in conferences, seminars, and collaborative laboratories. Living in Poznań—an innovative, student-friendly city with a strong tech sector—further enriches the doctoral experience. For candidates seeking a focused, research-intensive PhD in IT or robotics within a dynamic European setting, Poznań University of Technology offers a compelling and internationally oriented pathway.