Exceptional
36-months Double Degree PhD Scholarship
Position-H
Phd in Agricultural Sciences from UCD &
PhD in Agricultural Sciences and Biological Engineering from ULiege

Monitoring of grazing animals using sensors and data science

EU Recruiting institutions	**Liège University, Gembloux Agro-Bio Tech, Gembloux, Belgium (18 Months)** **University College Dublin, National University of Ireland, Dublin (18 Months)**
Keywords	**Wearable sensors, grassland science, Data Science, ML & AI, Digital Agriculture, Remote Sensing (IoT and IoRT), Data warehouses and analytics,**

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	EUR 4010	EUR 710	EUR 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 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 competitiveness.

PhD Position H – Monitoring of grazing animals using sensors and data science

Context: Grasslands cover a significant share of the world's ice-free land mass and are at the heart of the most criticized as well as most sensitive livestock farming systems. Adequate management is of utmost importance to maintain pasture health and allow the grasslands to provide these ecosystem services in the best possible way contrariwise, poor management leads to depletion of the forage resource with a whole cascade of negative effects for both the grazier and the environment. Grazing is a process that has declinations at multiple scales in space and time ranging from the whole paddock over a grazing season to the smallest unit of the grazing process, i.e. the grass-severing bite, that covers a couple of cm². Herbivores continuously sense the ever-changing grazing environment in order to adapt their decisions. Short-term decisions made at the level of each individual bite have consequences on the efficiency of the grazing process, the performance of the herbivores and the health of the grasslands. As theorized by Charnov & Orians, herbivores are optimal foragers able to consume forage at higher rates than what the average sward structure would allow them to. Hence, starting from a favourable sward structure, the efficiency of the grazing process usually decreases with grazing down level: the lower animals get in the vegetation, the lower the harvest per bite. As a consequence, herbivores will increase the amount and/or the frequency of bites, will change the duration of their meals and will gradually have to cover higher areas during their meal sessions to look for these optimal structures until the sward is so depleted that they don't waste time looking for better sward structures that they consider are no more present on the paddock. Therefore, a better continuous monitoring of the perception of the animal behaviour on field is an open door to develop tools to spot animal or grassland health problems or to analyse reactions to specific structural elements in grasslands to innovate in grazing management.

Over the past decades, many studies have documented the potential of sensing technology to monitor the grazing behaviour of domestic herbivores which served as the first bases during the implementation of this project. Accelerometers and Inertial Measurement Units (IMU) combine practicality and good sensing performances for the inference of a wide range of behaviours, activities and postures, possibly down to the level of the bite. Other sensors, such as microphones and pressure sensors have been explored but present some limitations in the range of behaviour they can supply and situations where they can be used. Global Navigation Satellite Systems (GNSS) combined to real-time kinematics (RTK) technology give complementary information to accelerometers and have been frequently used to monitor free-ranging animals. The location of the device on the animal also varies. While most works locate the sensors on halters, close to the jaws or on the neck, farmers are used to put collars on their stock and not halters. But

most importantly, the weaknesses that have been evoked in the conclusion of most work is the unverified or lack of adaptability of models developed in specific case studies to new environment.

Objectives: The PhD research will contribute 1) to the analysis methods and metrics for understanding the complex interactions between forage resource and dynamics; 2) to develop Machine Learning methods for analysing sensor data on animal movement and behaviour, adapting methods to different animals and environments; 3) to develop methods for cleaning and integrating data from different types of sensors

Work plan and task scheduling:

1. Conduct a literature review on the data collection techniques, data preparation and characterization, and machine learning techniques that can be used to analyse the data [Month 1—6].
2. Familiarize with databases consist of synchronized video-taped animals ("ground truth") and wearable sensor-based data (GNSS, 3-D inertial measurement units) worn by grazing herbivores in the framework of grazing studies. [Month 6 – 12]
3. Develop a machine learning model and train it on the existing datasets, [Month 12 – 18].
4. Collect more data, during the project from one or two grazing experiments to complement the datasets with key conditions that will have been identified as missing in the existing databases. This will help improve the quality of the datasets and therefore of the learning model. [Month 12 – 30].
5. Implement the system and validate its performance on two different datasets coming from different regions of the continent. Assess its prediction reliability. [Month 24 – 33]

Expected Results 1) Methods for analysing sensor data on animal movement and behaviour; 2) Standardized data storage format established; 3) Methods for addressing data inconsistency from various sources through cleaning

References

- Charnov, Eric, and Gordon H. Orians. "Optimal foraging: some theoretical explorations." University of New Mexico (1973). : https://digitalrepository.unm.edu/biol_fsp
- Andriamandroso, Andriamasinoro, Jérôme Bindelle, Benoît Mercatoris, and Frédéric Lebeau. "A review on the use of sensors to monitor cattle jaw movements and behavior when grazing." Biotechnologie, Agronomie, Société et Environnement 20 (2016).
- Andriamandroso, Andriamasinoro Lalaina Herinaina, Frédéric Lebeau, Yves Beckers, Eric Froidmont, Isabelle Dufrasne, Bernard Heinesch, Pierre Dumortier, Guillaume Blanchy, Yannick Blaise, and Jérôme Bindelle. "Development of an open-source algorithm based on inertial measurement units (IMU) of a smartphone to detect cattle grass intake and ruminating behaviors." Computers and electronics in agriculture 139 (2017): 126-137.
- Li, Yongfeng, Hang Shu, Jérôme Bindelle, Beibei Xu, Wenju Zhang, Zhongming Jin, Leifeng Guo, and Wensheng Wang. "Classification and analysis of multiple cattle unitary behaviors and movements based on machine learning methods." Animals 12, no. 9 (2022): 1060.
- Grace C, Boland TM, ..., Sheridan H, et al. The effect of increasing pasture species on herbage production, chemical composition and utilization under intensive sheep grazing. Grass Forage Sci. 2018; 73: 852–864. https://doi.org/10.1111/gfs.12379
- Rivero M. Jordana, Sheridan Helen, et al., (2021) Key traits for ruminant livestock across diverse production systems in the context of climate change: perspectives from a global platform of research farms. Reproduction, Fertility and Development 33, 1-19. https://doi.org/10.1071/RD20205
- Chergui, N., Kechadi, M. Data analytics for crop management: a big data view. J Big Data 9, 123 (2022). https://doi.org/10.1186/s40537-022-00668-2

PRACTICAL INFORMATION

Recruiting and host institutions	• Liège University, Gembloux Agro-Bio Tech, Gembloux, Belgium (18 Months) **(Recruiting institution)** • University College Dublin (UCD), National University of Ireland, Dublin, Ireland (18 Months)
Doctoral schools	• SPI @ Liège University, Gembloux, Belgique • UCD SGS @ UCD, National University of Ireland, Dublin, Ireland
Supervisors	• Prof. Jérôme Bindelle (GxABT, ULiège, Gembloux, Belgium) • Prof Helen Sheridan, (University College Dublin, Ireland) • Prof Tahar Kechadi, (University College Dublin, Ireland)
Non-academic mentors	• Dr. Olivier Debauche (AWé, Belgium) • Mr. Mark Connolly (M2Geo, Ireland)
Secondments **(1 to 6 hosting months)**	• AWé, Ciney, Belgium month 12th, 2 months. Work and train the challenges related to the portability of algorithms for the automated detection of animal behaviours based on data acquired through wearable sensors • M2Geo, M. Connolly, 24th month, 3 months, identification of most appropriate methods and technological solutions used in industrial for data collection practices, multimodal data analytics.
Contact information	• jerome.bindelle@uliege.be • helen.sheridan@ucd.ie • tahar.kechadi@ucd.ie

RECRUITMENT CRITERIA

General criteria

- MSCA Mobility Rule: researchers must not have resided or carried out their main activity (work, studies, etc.) in **Belgium** 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 or agricultural engineering or equivalent, from which at least 120 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 (French and English)
- Team-mindedness

Required skills

- Programming , database management, machine learning skills,
- Interdisciplinary work
- Master degree in Computer Science and/or digital agriculture and/or Agricultural Engineering or equivalent
- A taste for animal science and field monitoring is essential
- A taste for sensors and electronics is an asset.

APPLICATION

How to apply?

- **All information are provided here**

Deadline: **15th April 2026**

Other information

UCD

University College Dublin (UCD) is **Ireland's largest university** and one of Europe's leading **research-intensive** institutions.

- **Established:** Founded in **1854** by John Henry Newman as the Catholic University of Ireland, it is one of Ireland's oldest universities.
- **Location:** Its main campus, **Belfield**, is a large, modern, and beautiful parkland estate spanning 133 hectares, located about six kilometres south of Dublin's city centre.
- **Size:** UCD hosts over **38,000 students**, making it the largest university in Ireland. It has a significant international presence, with students from over 150 countries.
- **Academics & Reputation:** It's consistently ranked within the **top 1% of higher education institutions** worldwide. UCD is highly regarded for its commitment to research and its graduates' **employability**, ranking #1 in Ireland for this metric.
- **Affiliation:** It is a constituent college of the **National University of Ireland (NUI)**.

UCD School of Computer Science

The UCD School of Computer Science is the **largest computer science department in Ireland** and is known for its strong emphasis on both the principles and practice of the field.

- **Location:** The school is primarily located within the state-of-the-art **UCD Science Centre (also known as the O'Brien Centre for Science)**, on the Belfield campus.
- **Programs:** It offers a comprehensive range of programs, including a 4-year **BSc Honours degree in Computer Science** (with specialisation options like Data Science & AI), various Masters degrees (MSc) for both Computer Science graduates and conversion students, and a Structured PhD program.

- **Research Excellence:** The school is a hub for high-impact research, contributing to Ireland's national research efforts. Key research areas include:
    - **Data Science, Machine Learning & AI**
    - **Computer Security** (including Digital Forensics)
    - **Digital Health**
    - **Human-Computer Interaction (HCI)**
    - **Software Engineering and Distributed Systems**
- **Research Centres:** It is a co-host for major Science Foundation Ireland (SFI) Research Centres, notably the **Insight Centre for Data Analytics** (Ireland's largest data research centre) and the **CeADAR** (Centre for Applied Data Analytics & AI), which links applied research with commercial deployment

ULiege

Doing a PhD at ULiège, Gembloux Agro-Bio Tech
Why do a PhD at the University of Liège?
At the University of Liège, doing a PhD means working in a large public university that treats research as a core mission and backs it with clear values and strong support. ULiège highlights an open, respectful academic culture, grounded in academic freedom, pluralism, inclusion, wellbeing, and responsible research practices (https://www.uliege.be/cms/c_9247584/en/working-at-uliege). Doctoral candidates are considered early career researchers, encouraged to develop their careers through training, mobility, and professional growth opportunities inside an institution that is internationally engaged and closely connected to societal challenges.
What kind of research environment will you find at Gembloux Agro-Bio Tech?
Choosing Gembloux Agro-Bio Tech for your PhD lets you experience that ULiège spirit in a campus that is both human scale and globally connected. Gembloux offers an integrated approach to life sciences and technologies, across bioengineering, agroecology, landscape and food innovation, with a 165-year long tradition of teaching and research excellence. The Doctoral College in Gembloux is the largest at ULiège, creating a dense, international community of more than 40 different nationalities where PhD students meet daily across biology, agronomy, chemistry, forestry, environmental sciences, and sustainable food system transitions.
What makes the Gembloux campus a great place to live and work every day?
The green campus is located right in the heart of the small town of Gembloux, so labs, offices, experimental fields, libraries, housing, and everyday services are close and walkable. This gives doctoral researchers a rare combination of calm green surroundings and real town life a few minutes away (https://www.gembloux.uliege.be https://www.visitgembloux.be).
How do TERRA strengthens your PhD experience?
TERRA is a key asset for PhD students in Gembloux, it is ULiège's international teaching and research centre on campus dedicated to the agriculture and life sciences of tomorrow, and it brings together interdisciplinary teams and shared platforms across four complementary CAREs, AgricultureIsLife, FoodIsLife, EnvironmentIsLife, and ForestIsLife (https://www.terra.uliege.be/cms/c_4054766/en/terra). This structure helps doctoral researchers work at the interfaces between disciplines and scales, from fundamental mechanisms to field innovation. AgricultureIsLife provides real world experimental farms, long term trials, and innovation platforms to test sustainable solutions from plot to territory, EnvironmentIsLife is anchored by the Ecotron and other high end infrastructures to study ecosystems under realistic present or future conditions, and ForestIsLife focuses on temperate and tropical forests through biodiversity monitoring, ecosystem dynamics, sustainable management, and valorisation of forest resources, supported by observatory and experimental forest networks, databases, and specialised equipment. Together with FoodIsLife's strengths in food, bioprocesses, and bioproducts, TERRA gives PhD students exceptional access to facilities, data, expertise, and scientific communities that make their research rigorous, interdisciplinary, and tightly connected to major societal and environmental challenges.
How central and well connected is Gembloux for an international PhD life?
Gembloux sits in a very central location in Belgium and in Europe, with easy reach of Brussels, Namur, Liège, Charleroi, and the major airports. The train station is only a short walk from the campus, and runs frequent

national and international connections, making travel for conferences, collaborations, or weekend breaks straightforward. Indeed Gembloux is very well connected to major cities such as Brussels (40-min), Namur (20-min), Liège (70-min), Paris (3 h), Amsterdam (3h30) or Köln (2h10) trough an efficient network of public transport. This “heart of Europe” positioning is one of the quiet advantages of doing your doctorate here: you can build a global research network while living in a compact, friendly, and accessible town (https://www.belgiantrain.be).

What is the overall promise of a PhD in Gembloux?

A PhD at Gembloux Agro-Bio Tech combines the resources and values of a major European university with the daily feel of a close knit, interdisciplinary life sciences campus. You do ambitious research in an environment designed for good science and good living, while being embedded in TERRA, a community built to turn excellent doctoral work into concrete advances for sustainable agriculture, food systems, and the environment.