

## Oferta de Proyecto de Tesis

*(vigente durante el año natural 2025)*

### Título orientativo de la Tesis Doctoral

*Frugal Distributed and Decentralized Coordination with Edge-Cloud Optimization in Collaborative Agricultural Robot Fleets*

### Área de Conocimiento\* / Línea de Investigación

Ingeniería y Arquitectura / Ciencia de la Computación e Inteligencia Artificial

(Distributed Artificial Intelligence, Distributed Optimization, Agentic AI)

### Resumen de la Tesis Doctoral (máximo 300 palabras)

#### Join a Cutting-Edge Research Team Shaping the Future of Sustainable Agriculture!

We invite applications for a fully funded PhD researcher position hosted within a vibrant interdisciplinary research environment at URJC. Join us in revolutionizing agricultural robotics to create resilient, low-impact, and intelligent farming systems that work in harmony with nature. This is your chance to contribute to climate-smart agriculture, biodiversity preservation, and the future of food systems while developing as a leading researcher in the fields of Distributed AI and Autonomous Systems.

The thesis will focus on four key areas:

1. **Frugal Multi-Agent Coordination:** Development of lightweight, resilient orchestration models enabling autonomous decision-making in robot fleets, ensuring semantic interoperability and alignment with agroecological values.
2. **Decentralized Task Allocation and Routing:** Design of scalable, real-time algorithms for dynamic scheduling and routing, supporting context-aware and cooperative task execution in heterogeneous fleets.
3. **Edge-Cloud Continuum Optimization:** Implementation of hybrid computing architectures that distribute AI inference between robots (edge) and cloud platforms, reducing latency, improving robustness, and minimizing energy consumption.
4. **Field Validation and Ecological Feedback Integration:** Experimental deployment of a multi-robot fleet in agricultural testbeds to implement and manage diversified intercropping systems. Real-time feedback (e.g., soil health, biodiversity, crop status) will be used to optimize robot behaviour and system sustainability.

This research will deliver both novel theoretical contributions and deployable software frameworks, validated through real-world field experiments. It aims to advance sustainable, transparent, and adaptive farming technologies, aligned with the EU Green Deal and the transition toward biodiversity-friendly, autonomous agriculture.

You will join a pioneering team at the intersection of Distributed AI, autonomous robotics, and agroecology, contributing directly to the future of sustainable food systems.

**¿Está asociado el desarrollo de esta tesis a la ejecución de algún proyecto de investigación? En caso afirmativo, proporcione detalles del proyecto (título, entidad financiadora y plazo de ejecución)**

The doctoral research is embedded in the proposed DRIACyPS “Distributed Robotic Intelligence for Agricultural Cyber-Physical Systems” Project (currently under review for funding), which focuses on the development of frugal, distributed agentic AI technologies for collaborative agricultural robot fleets. The project brings together cutting-edge research in multi-agent systems, edge-cloud computing, and cyber-physical systems to address the real-world challenges of agroecological farming.

**Perfil Académico del Estudiante (máximo 200 palabras)**

**What we’re looking for:** We seek a highly motivated, talented individual who is passionate about AI, robotics, and sustainability. The ideal candidate will have:

- A master’s degree in computer science, operations research, robotics, AI, or a related discipline.
- Strong programming skills in Python.
- Experience or interest in multi-agent systems, decentralized algorithms, or robotic systems.
- Familiarity with tools such as ROS/ROS 2, MQTT/DDS, or edge computing frameworks is a plus.
- Proficiency in English (written and spoken); Spanish is a bonus but not required.
- A collaborative mindset, creativity, and an interest in interdisciplinary and field-driven research.

**What We Offer:**

- A 3-year full-time contract with a competitive salary and full social security benefits.
- Enrolment in a PhD program at URJC with active mentoring and participation in international conferences and workshops.
- Integration in a leading Spanish research consortium working at the intersection of AI, robotics, sustainability, and agroecology.
- Opportunities to publish in top-tier venues, collaborate with farmers and stakeholders, and contribute to open-source software.
- Access to experimental agricultural testbeds and state-of-the-art robotics labs.

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