

## PhD Project Advertisement

**Project No/title:** FBS2026 17 Del Duchetto Iq / *BroilerBot: Autonomous Robotics for Animal Welfare and Environmental Monitoring*

**Lead supervisor:** Dr Francesco Del Duchetto, School of Engineering and Physical Sciences, University of Lincoln

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**Co-supervisors:**

Prof Niamh O'Connell, Queen's University Belfast

Prof Marc Hanheide, University of Lincoln

### Project Details

Broiler chickens are typically reared in large group systems and this can pose challenges in animal welfare and environmental monitoring. Manual inspections are labour-intensive while existing automatic approaches can only provide information about the entire flock, not at bird level. This project addresses the urgent need for "Precision Livestock Farming" by developing an autonomous mobile robot to navigate inside commercial chicken sheds. This robot will act as a roaming sensing platform, using advanced sensors to monitor environmental conditions (such as ammonia levels and light) and individual bird health. With the automation of these checks, the project aims to significantly improve animal welfare standards. The project is supervised by a multi-disciplinary team: Dr Del Duchetto (Lincoln) with expertise in Robot Interactions and Perception, Prof. Niamh O'Connell (Queen's Belfast) with expertise in animal behaviour and welfare, Prof. Marc Hanheide (Lincoln) with expertise in agri-robotics and long-term autonomy. Industrial support is provided by Pilgrim's Europe.

**Research aims:** The primary aim is to develop an autonomous robot that navigates safely through chicken flocks to monitor birds and environmental conditions. Key research questions focus on robust robot navigation in dynamic environments and using thermal/visual data to detect welfare indicators, such as heat stress, at the bird level.

**What you will do:** You will design and test autonomous navigation algorithms (SLAM) that allow a robot to move safely among thousands of birds without causing stress. You will integrate a suite of sensors—including LiDAR, thermal cameras, and environmental probes—onto a mobile platform. Crucially, you will be developing Machine Learning/Computer Vision models to analyse data in real-time to detect welfare issues and provide spatio-temporal maps of environmental conditions. The project includes lab-based software development with extensive data collection and field testing at our commercial partner's farm. You will deploy the robot in a real-world setting, evaluating its ability to improve flock management and well-being compared to traditional methods. You will advance the state-of-the-art in safe robot navigation for animal interactions and multimodal perception in dynamic environments, while addressing animal welfare concerns in food production. Results will be published in peer-reviewed journals/conference proceedings in the areas of: Human-Robot Interaction, Mobile Robotics, Animal Welfare.

### References:

1. Özentürk, Uğur, et al. "Robotics for poultry farming: Challenges and opportunities." *Computers and Electronics in Agriculture* 226 (2024): 109411.
2. Mavrogiannis, Christoforos, et al. "Core challenges of social robot navigation: A survey." *ACM Transactions on Human-Robot Interaction* 12.3 (2023): 1-39.

## Student profile

**Essential for project:** A background in robotics, computer science, engineering, or a related quantitative discipline. Proficiency in programming (preferably Python or C++) is essential. An interest in animal welfare.

**Desirable for project:** Prior experience or knowledge of computer vision, machine learning, Robot Operating System (ROS). Knowledge/experience of animal welfare/animal behaviour.

**Minimum requirements for all FoodBioSystems applicants:** An upper 2nd class degree (or equivalent) in a subject relevant to the project. Candidates with a lower class of Bachelors degree, but merit or above at Masters level will also be considered. Demonstrable skills in problem-solving, team-working, communication and time management.

## Training

**Project specific training opportunities:** You will receive comprehensive technical training in mobile robotics (ROS, SLAM, social navigation), computer vision, deep learning frameworks (PyTorch/TensorFlow), and data analysis. These will be available as part of our Computer Science/Robotics and Artificial Intelligence programmes modules at the University of Lincoln, or externally provided where needed. Uniquely, this project bridges computer science and biology, offering specialist training in animal behaviour and welfare assessment protocols through regular visits to the second supervisor at Queen's University Belfast. You will gain substantial industry experience through fieldwork from year 2, learning to deploy advanced technology in commercial agricultural environments. General research skills, including academic writing and project management, will be supported by the University of Lincoln's doctoral training programme alongside the supervisory team.

**FoodBioSystems training opportunities:** Throughout their studentship, all FoodBioSystems doctoral researchers participate in cohort training that covers four key themes: food systems, big data (data analytics and modelling), business, and research fundamentals. All doctoral researchers complete a placement: either project-related with a non-academic (CASE) partner, or unrelated to the project and outside the academic environment (PIPS). Details of training are available on the DTP website: <https://research.reading.ac.uk/foodbiosystems/training/>.

## Project supervision style

The student will have weekly one-to-one meetings with the lead supervisor, Francesco, to discuss progress, address challenges, set short-term goals. Monthly meetings will be held with the full supervisory team (Profs. Hanheide and O'Connell) via video conference or in-person to review overall project direction, research strategy, and interdisciplinary aspects. An open shared communication channel (likely via Teams) will be setup to enable asynchronous communication between the student and the supervisors and to enable the resolution of small issues quickly (such as clarifications, fixing software bugs, etc). Quarterly meetings with the industry partner will be scheduled. The student will be integrated into the Lincoln Centre for Autonomous Systems (L-CAS) research group, attending regular lab meetings and seminars. The supervisory team is committed to providing timely and constructive feedback on written work and reports, with an expected maximum turnaround time of two weeks (or sooner if close to a submission deadline).

## Stipend (Salary)

FoodBioSystems DTP students receive an annual tax-free stipend (salary) that is paid in instalments throughout the year. For 2025/26 this is £20,780 and it will increase slightly each year at rate set by UKRI.

## Equity Diversity and Inclusion

The FoodBioSystems DTP is committed to equity, diversity and inclusion (EDI), to building a doctoral researcher (DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the [FoodBioSystems DTP website](#) and include:

- Offering reasonable adjustments at interview for shortlisted candidates who have disclosed a disability or specific learning difference.
- [Guaranteed interview](#) and [applicant mentoring](#) schemes for applicants, with UK home fees status, from eligible under-represented ethnic groups who also meet academic eligibility criteria and the student profile essential for the project.

These are opt-in processes.

Our studentships can be offered to home students on a part-time basis, and studentship end date and stipend payments will be amended to reflect the part-time registration. The minimum registration for DTP funded part-time students is 0.5 FTE (studying an average of 20 hours per week over 8 years). We regret that part time registration is not available to international students due to complexities of visa restrictions.

## Funding note

We welcome applications from candidates with Home/ROI fees and international fees status. This studentship is funded by UKRI and covers stipend, fees at Home/ROI rate, and research costs. The host university will not charge UKRI funded international students the difference between Home/ROI fees and international fees.

**Costs that must be found from other sources or met by the individual student include:** visa fees, healthcare surcharge, relocation costs and guarantor services.

**For up to date information on funding eligibility, studentship rates and part-time registration, please visit the [FoodBioSystems website](#).**