PhD Project Advertisement

Project No/title: FBS2026 43 Li br / *Development of an Innovative AI Models for Food Waste Transport in Airflow Systems, Brunel University of London & University of Reading In collaboration with Bucher Municipal Ltd.*

Lead supervisor: Dr Liang Li, College of Engineering, Design and Physical Sciences, Brunel University

Email: liang.li@brunel.ac.uk

Co-supervisors:

Prof. Hong Yang, University of Reading

Prof. Valentina Stojceska, Brunel University of London

Prof. Savvas Tassou, Brunel University of London

Project Details

Join a cutting-edge PhD project that brings together applied system research, AI, and practical industry challenges to drive progress in sustainable waste management. Food waste is increasingly transported using air-based systems that play a main role in waste collection, sorting, and processing. However, the models used to design these systems can not accurately predict how real, irregularly shaped food waste behaves in airflow.

At present, most models are based on simplified particle shapes that do not represent the true complexity of food waste, leading to limited accuracy and limiting opportunities for system improvements.

Recent advances in artificial intelligence (AI) offer new ways to analyse experimental data and improve how these interactions are represented in computer simulations. By combining hands-on experimental research, computer modelling, and AI, this project aims to develop a new generation of more accurate, realistic and sustainable modelling tools to support innovation across the food and waste sector.

Research aims: To develop data-driven and AI-enabled approaches for understanding how food waste moves through environmental transport systems, combining hands-on experiments, digital modelling and machine learning. The goal is to produce more accurate tools for predicting how real, irregular food waste particles behave in airflow, supporting better design and optimisation of food waste transport systems.

What you will do: You will work on a real-world sustainability challenge, combining hands-on experiments, data analysis and AI tools to understand and improve how food waste is transported in practical systems. They will begin by setting up experiments to measure how air interacts with different food waste particles. These tests will produce data about forces and motion in airflow. You will then use computer simulation tools to model food waste movement and compare results with experimental data. Artificial intelligence methods will be used to learn patterns from the data and improve model accuracy. Later stages of the project will focus on testing the new models under a wider range of conditions and comparing results with real-world systems. The student will also work with an industry partner to explore practical applications and share findings through presentations, conferences and research papers.

References:

1. Ren, B., Zhong, W., Chen, Y., Chen, X., Jin, B., Yuan, Z. & Lu, Y. 2012, "CFD-DEM simulation of spouting of corn-shaped particles", Particuology, vol. 10, no. 5, pp. 562-572.
2. Azmir, J., Hou, Q. & Yu, A. 2020, "CFD-DEM study of the effects of food grain properties on drying and shrinkage in a fluidised bed", Powder technology, vol. 360, pp. 33-42.
3. Szpicer, A., Bińkowska, W., Wojtasik-Kalinowska, I., Salih, S.M. & Półtorak, A. 2023, "Application of computational fluid dynamics simulations in food industry", European food research & technology, vol. 249, no. 6, pp. 1411-1430.

Student profile

Essential for project: A background in one or more of the following: data science, computer science, environmental studies, food science, design and technology or a related subject, with an interest in real-world problem solving and applied research.
Desirable for project: Experience or knowledge in one or more of data analysis, modelling, experiments, computational approaches, fluid mechanics or CFD; training will be provided for applicants without experience in these areas.
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 project-specific training in laboratory and digital methods linked to food waste research. This includes training in experimental measurement of airflow forces and motion using specialist equipment at Brunel University of London. You will receive hands-on training in computer simulation methods used to model fluid and particle movement. You will also be trained in artificial intelligence methods for analysing experimental data and improving model accuracy at University of Reading. As part of the project, you will undertake a placement with a non-academic partner, Bucher Municipal Ltd. This will provide experience of testing models in practical settings and understanding how research tools are used in real systems. This combined training will equip you with comprehensive skills applicable to careers across academia, industry, and the wider agri-food sector.

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 be supported through a structured and collaborative supervision plan. The lead supervisor, Dr Liang Li, will hold weekly one-to-one meetings with the student to monitor progress, provide technical guidance, and address research challenges. The student will also attend fortnightly lab group meetings to discuss results, share updates, and receive peer feedback within Brunel's research community. The wider supervisory team—including Professor Valentina Stojceska, Professor Savvas Tassou, and Professor Hong Yang—will meet with the student every two months to review progress, provide multidisciplinary input, and plan upcoming work. Formal review meetings will take place every nine months, aligned with Brunel University's doctoral monitoring requirements.Feedback on written work such as reports, draft chapters, or publications will normally be provided within two to three weeks.

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 £22,780 (including London Allowance) 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.