Marie Skłodowska Curie (MSCA) European Postdoctoral Fellowships

If you are looking to grow in your research profile, keen to boost your career prospects and ready to be part of our thriving research environment, Coventry University invites you to get in touch about suitability for the following MSCA postdoctoral European fellowships at our Coventry campus.

The Marie Skłodowska-Curie actions (MSCA) aim to enhance the career development and training of researchers through international and intersectoral mobility and offer a 1-2 year fellowship position.

Explore Coventry University a global university with great opportunities for researchers to work on excellent science with impact (https://www.coventry.ac.uk/research/)

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Potential supervisors are looking for fellows in these areas:

Computational Science and Mathematical Modelling
Future Transport and Cities
Fluid and Complex Systems
Environment
E-Mobility and Clean Growth
Business in Society
Learning and Education

Your eligibility

Be in possession of a doctoral degree (or have successfully defended your doctoral thesis) by the call deadline.

Have a maximum of 8 years full-time equivalent research experience (there are extensions to the criteria).

Cannot have resided or carried out their main activity (work, studies, etc.) in the country of the host institution (the UK) for more than 12 months in the 3 years immediately before the call deadline .

Any nationality.

How to express your interest

Please email MSCA2024@coventry.ac.uk before midnight on April the 26th and include the following details:

- Include MSCA2024 in the subject line.
- Clearly state in your email which potential fellowship from the following slides you are interested in.
- Include a short (2 page maximum) CV.
- State you have checked and fulfil the eligibility criteria from the previous slide.

We look forward to hearing from you.

Computational Science and Mathematical Modelling

1. Computational Neuroscience & Deep Learning

Introduction:
Neurodegenerative diseases affect tens of millions of people worldwide and cause a heavy economic burden on societies. Early diagnosis and an accurate characterization of disease progression are critical for treatment and improving patients' quality of life. However, current methods rely on expensive and time-consuming mental status examinations and neuroimaging scans, which are often inaccurate. In this Fellowship, we would like to explore the use of electrophysiological signals as a non-invasive and economical alternative technique for detection of neurodegenerative diseases. My research group has been developing nonlinear systems and deep learning approaches for the diagnosis of neurological disorders over the years. For more information about my research group, please visit: https://feihelab.github.io

About the potential fellowship

Currently, Electroencephalography (EEG) analysis methods focus on time-domain and frequency-domain features of single or selected EEG channels. EEG signals also have a spatial structure that can provide valuable information about brain activity and can be important in characterising neurodegenerative disease. In this project, we will explore the use of advanced signal processing and deep leaning techniques for quantifying spatial-temporal EEG dynamics and, therefore, the diagnosis of neurodegenerative diseases, such as Alzheimer’s Disease and Parkinson’s Disease.

2. Optimising Computation and Communication in Connected and Autonomous Vehicles (CAV)

Introduction: CAVs are the future of transportation which requires acquiring and processing streams of sensor data, communicating them with the neighbouring vehicles and the cloud in a secure way in the real-time. However, currently there are many open questions like, how to process data with limited resources in the vehicle, route selection to the destination, and level of compression/encryption. Depending on the urgency, it may be cheaper to process the data in a neighbouring CAV, the edge, or the cloud. Transferring data may also take several routes like direct connection, using terrestrial and non-terrestrial network, or via another vehicle. Against this background, we propose to optimise the usage of communication and computation resources for vehicles CAVs. Reinforcement Learning /Machine Learning (RL/ML) methodologies will be explored to solve the resulting multi-objective optimisation problem.

About the potential fellowship: The fellowship would try to achieve these research objectives:

1) Conduct a survey on automotive Internet of Things (IoT) devices and their computational and communication requirements. The emphasis will on understanding which applications that are mandatory or optional, delay tolerant or non tolerant, offloadable or non offloadable etc. In terms of communication routes, different routes to different destinations in Automotive IoT, their advantages and disadvantages.

2) Develop model to simulate various autonomous driving scenarios for multiple vehicles including rural/ urban environment, lack of terrestrial network etc. For each vehicle simulate the resource usage and cases when the resources can be stretched.

3) Develop intelligent and robust algorithms to optimise the vehicles in terms of computational efficiency, energy usage, network usage and cyber security.

3. The Integration of Symbolic Computation and Satisfiability Checking (with Matthew England)

Introduction

- **Symbolic Computation** refers to the algorithmic determination of exact solutions to many complex mathematical problems. Such algorithms are traditionally created within computer algebra systems which support calculation with symbols and mathematical objects.
- **Satisfiability Checking** means to determine whether a logical formula is satisfiable (whether values may be assigned to the variables to allow an evaluation to true). Search based algorithms that learn from conflicts have led to highly efficient SAT/SMT-solvers for the task.

Dr England was an investigator with the EU H2020 SC-Square Project and the UK EPSRC DEWCAD Project which led to collaborations that not only integrated these technologies but also developed new algorithms influenced by both domains [1], [2].

About the potential fellowship:

Possible research objectives for a fellowship may include:

- Extending prior work to include automated proofs of unsatisfiability for non-linear real constraint problems.
- Work on new integrations between SAT/SMT and computer algebra software in unexplored domains.
- Optimising existing tools for new application domains.
- The use of SC-Square technology in economic reasoning building on work such as [3].

The exact objectives would of course be developed with the potential fellow based on their interests and experience.

[1] J. Nalbach, E. Abraham, P. Specht, C.W. Brown, J.H. Davenport, and M. England. Levelwise construction of a single cylindrical algebraic cell. Journal of Symbolic Computation, 123, Article Number 102288. Elsevier, 2024. Digital Object Identifier: 10.1016/j.jsc.2023.102288.

[2] E. Abraham, J.H. Davenport, M. England and G. Kremer. Deciding the Consistency of Non-Linear Real Arithmetic Constraints with a Conflict Driven Search Using Cylindrical Algebraic Coverings. Journal of Logical and Algebraic Methods in Programming, 119, 100633, Elsevier, 2021. Digital Object Identifier: 10.1016/j.jlamp.2020.100633

[3] C. Mulligan, J.H. Davenport, M.England. TheoryGuru: A Mathematica Package to apply Quantifier Elimination. In: Mathematical Software, pp. 369-378. (LNCS 10931). Springer, 2018. Digital Object Identifier: 10.1007/978-3-319-96418-8_44

4. The Use of Data Science and AI for Optimisation and Discovery in Computational Mathematics (with Matthew England)

Introduction:

Symbolic Computation refers to the algorithmic determination of exact solutions to many complex mathematical problems. The field prioritises exact results and so is an unlikely domain for Data Science and Artificial Intelligence methods based on Machine Learning which are rarely correct in all cases. However, in reality most algorithms in this domain come with parameters and decisions which do not effect the mathematical correctness of the result but can be decisive to the output presentation, resource requirements, or even tractability. Dr England was the first to combine these technologies in [1], led the UK EPSRC ML4QE Project in this area, and now hosts a project in this area sponsored by a commercial software company. He is interested to apply this work more generally in computational mathematics.

About the potential fellowship:

Possible research objectives for a fellowship may include:

- Methods for data generation suitable for the mathematical domains involved, following work such as [2].
- Explainable/interpretable AI for mathematics discovery, following work such as [3].
- New testing paradigms to understand level of model fit.
- The use of Generative AI for new algorithm development.

The exact objectives would of course be developed with the potential fellow based on their interests and experience.

[1] Z. Huang, M. England, D. Wilson, J.H. Davenport, L.C. Paulson and J. Bridge. Applying machine learning to the problem of choosing a heuristic to select the variable ordering for cylindrical algebraic decomposition. In: Intelligent Computer Mathematics, pp. 92-107. (LNCS 8543). Springer, 2014. Digital Object Identifier: 10.1007/978-3-319-08434-3_8
[2] R. Barket, M. England and J. Gerhard. Generating Elementary Integrable Expressions. In: Computer Algebra in Scientific Computing, pp. 21-38. (LNCS 14139). Springer, 2023. Digital Object Identifier: 10.1007/978-3-031-41724-5_2
[3] L. Pickering, T. Del Rio Almajano, M. England and K. Cohen. Explainable AI Insights for Symbolic Computation: A case study on selecting the variable ordering for cylindrical algebraic decomposition. Journal of Symbolic Computation, 123, Article Number 102276. Elsevier, 2024. Digital Object Identifier: 10.1016/j.jsc.2023.102276

5. Intelligent control of wind turbines in cold climates

Introduction

Around a quarter of the world's wind turbines are installed in cold climates, where icing can damage turbines, cause dangerous break-off ice and significantly reduce annual power output. However, there are no commercially available or widely accepted solutions to address the icing problem, which costs the industry hundreds of millions of pounds every year. The most common approach operators take is to shut turbines down when ice forms on the blades. The best operational decision for a wind turbine during a cold weather event remains a highly complex problem and depends on the type, duration and frequency of an icing event. New ice sensors and heating systems are being developed to make better operational decisions and improve wind turbine performance. The aim now is to demonstrate that intelligent wind turbine decision-making algorithms can be applied effectively to reduce the icing problem, thus enabling wider global use of wind energy and lowering energy costs for consumers.

About the potential fellowship

This project aims to discover how intelligent decision-making algorithms can be applied by wind turbine operators to increase performance in cold climates. To achieve this research aim, the following research questions need to be explored:

Q1: Can wind turbine, metalogical and ice sensor data be used to enable AI-controlled anti-icing protection systems?

Q2: Can ice formation and wind turbine performance be predicted to improve electricity trading?

Q3: What trade-offs need to be made between optimisation accuracy and easy of embedded solutions for wind turbine control?

To answer these questions, the following tasks will be performed:.

1: Prepare wind farm cold climate data using Scada datasets for multiple different wind farm sites operating in cold climates.

2: Evaluate and verify alternative machine learning techniques to detect and predict ice accretion

3: Build a wind turbine simulator to model the impact of icing and annual output under different AI-informed cold climate control strategies

4: Evaluate overlays for wind turbine control architecture, such as model-based predictive controllers (MBPC) using physics-informed machine learning, and investigate if they can outperform conventional PID controllers for a range of different wind turbine cold climate scenarios

6. Application of Computer Algebra in the Life Sciences (with AmirHosein Sadeghimanesh)

Introduction

I am interested to work with fellows on projects at the intersection of algebra and dynamical systems.

Consider studies utilizing parametric ordinary differential equations to model phenomena such as the impact of chemotherapy on cancer treatment, or the spread of diseases in a pandemic. In these scenarios, the system comprises species, such as molecules, cells, or humans; and reactions representing interactions among these entities. The variables in the ODE model indicate the quantities of these species, which change over time due to the reactions. The parameters of the model are the rates at which these reactions take place.

About the potential fellowship

In the real world, measuring all values of all the variables at any given time is not feasible: if estimating a parameter requires missing data, using this model for the rest of the study becomes challenging. Determining whether a model's parameters can be estimated based on experimental measurements is known as parameter identifiability.

I propose a project employing computational algebraic methods to address identifiability issues, reducing the algorithmic complexity of these methods. The aim is developing techniques leading to more useful models that assist collaborators in microbiological labs to push forward research in the life sciences.

E-Mobility and Clean Growth

7. Physics informed machine learning for extending battery lifetime

Introduction: Lithium-ion batteries are widely deployed, and their high-performance operation, e.g. fast charging/discharging, are highly desired. However, these generally lead to the accelerated inevitable deterioration of batteries, or even safety hazards. Battery degradation is complicated, non-linear and path dependent, with different aging factors driving diverse degradation pathways, which is attributed to the coupled complex electrochemical, mechanical, and thermal processes within batteries. This poses the grand challenge to predict battery degradation, resulting in the significant uncertainty around prolonging battery lifetime.

About the potential fellowship: There are two specific research questions:
1. How to effectively diagnose/predict battery degradation? Current machine learning based methods can work but it needs a large number of experimental aging data.
2. Which derating control can efficiently prolong battery lifetime? Current derating techniques are developed based on the prior knowledge or plenty of experimental aging tests and they are not well optimized.

To address these questions, this project aims develop a physics-informed machine learning to understand battery degradation towards optimizing battery operation to extend battery lifetime, with specific two objectives:
1. Develop a physics-informed machine learning that integrates battery physics into artificial intelligence approaches to reduce the requirement of experimental dataset, for efficient battery health evaluation.
2. Formulate advanced derating control strategies that considers identified aging information to adaptively optimize the operational parameters in the full lifecycle for maximizing the overall performance and lifetime of batteries simultaneously.

Future Transport and Cities

8. Mixed Reality Vehicle In the Loop (VIL) Testing for Advancing the Development and Validation of Connected and Autonomous Vehicle (CAV)

Introduction: Mixed Reality Vehicle In the Loop (VIL) Testing is an innovative approach that blends the virtual and real worlds to create new environments where physical and digital objects co-exist and interact in real-time. This method is particularly transformative in the automotive industry, providing a cutting-edge platform for the development and validation of connected and autonomous vehicles (CAVs). The utilization of VIL Testing in CAV development accelerates the advancement of vehicle technologies by allowing for the testing of vehicle responses to virtual stimuli, such as other virtual vehicles, pedestrians, or unexpected events, while still maintaining a controlled physical environment. This is critical for ensuring the safety and reliability of CAVs before they hit the road. Through proposed research, we aim to to enhance the processes involved in developing and testing CAV software by leveraging mixed reality environments, ensuring these processes are not only technologically advanced but also safe, reliable, and in line with emerging regulatory standards.

About the potential fellowship: To Develop Interoperable Testing Environments: Investigate and establish methodologies for achieving seamless integration and interoperability between pure virtual, mixed virtual, and real-world testing environments. This includes exploring data transfer protocols, simulation fidelity, and synchronization techniques.

1. To Optimize Mixed Reality Environments for Realistic Simulations: Enhance the realism of mixed reality environments in simulating real-world scenarios. Focus on advancing simulation technologies, improving environmental modelling, and integrating realistic traffic and pedestrian behaviour for more accurate CAV testing.
2. To Identify and Mitigate Residual Risks in Mixed Reality Testing: Develop frameworks for the identification, quantification, and mitigation of residual risks arising from errors or inefficiencies in mixed-reality testing. This involves creating robust testing protocols, error analysis mechanisms, and risk mitigation strategies to ensure the safety and reliability of CAV software.
3. To Align Mixed Reality Testing with Regulatory Standards: Investigate how mixed reality testing can align with and contribute to the development of regulatory standards for CAVs. This includes collaborating with regulatory bodies, participating in standard-setting initiatives, and ensuring that mixed reality testing methodologies are compliant with and informative to emerging regulations.

9. PRORAN-CAVs: AI-driven PRogrammable Open RAN for Connected and Autonomous Vehicles

Introduction: Connected and autonomous vehicles (CAVs) are increasingly relying on advanced connectivity. With the advent of the fifth generation (5G) of wireless networks, automotive connectivity has evolved from traditional one-size-fits-all solutions (e.g., Wi-Fi and 4G networks) to logical instances of the network (aka "network slices"), tailored to the specific needs of target use cases. However, the progress made to customise these slices has been mainly on the core network (CN) (i.e., network infrastructure acting as gateway for accessing other networks) without much focus on the radio access network (RAN) (i.e., radio base stations connecting user devices to the CN). This is due to the limited quality of service/experience (QoS/QoE) support and lack of programmability of the RAN, which remain the key barriers to meeting the requirements of the most demanding automotive use cases (e.g., coordinated driving and perception sharing).

About the potential fellowship:

This project aims at leveraging the openness and reconfigurability offered by the emerging Open RAN paradigm to support the specific needs of CAVs. To this end, the following research objectives (ROs) will be pursued:

- RO1: Develop a set of Open RAN AI/ML-driven functionalities that collectively perform an automated closed-loop optimization of the RAN to serve the specific needs of CAVs.
- RO2: Integrate the developed functionalities into the Open RAN architecture. The integration 'touch points' will be examined from the performance, security, and resilience perspectives.
- RO3: Build an experimental future-proof setup to implement the proposed components in a real-world environment. This will make use of available commodity hardware (e.g., software-defined radios and x86 laptops) and open-source solutions.
- RO4: Demonstrate the contributions of the proposed approach in supporting the requirements of CAVs. This will make use of two research experimentation vehicles, which will significantly increase the practicality of the developed solutions.

10. NTNs-CAVs: Non-Terrestrial Networks for Connected and Autonomous Vehicles

Introduction: Non-terrestrial networks (NTNs) (e.g., drones and satellites) are being integrated into beyond 5G (B5G) and 6G wireless networks to provide fast and reliable connectivity in areas that are not covered by traditional base stations (aka terrestrial nodes (TNs)). Such ubiquitous connectivity is particularly needed for connected and autonomous vehicles (CAVs), for which loss of connectivity may have outrageous consequences. NTNs could offer fast connections to CAVs to support their operational and tactical functions. However, such real-time operation comes with several challenges (e.g., Doppler effects, additional latencies, severe interference levels, and complex handovers) that are difficult to overcome due to the joint mobility of users (i.e., CAVs) and NTN nodes.

About the potential fellowship:

This project aims at integrating TN and NTN nodes to serve the specific needs of CAVs. To this end, the following research objectives (ROs) will be pursued:

- RO1: To construct a hierarchical 5G/6G integration framework, where NTN and NTN nodes are jointly exploited to provide ubiquitous connectivity to CAVs.
- RO2: To tackle the unique challenges (e.g., additional latencies, severe interference levels, and complex handovers) associated with the joint mobility of CAVs and NTN nodes.
- RO3: To build a future-proof experimental B5G/6G NTN setup, based on commodity hardware (e.g., software-defined radios, drones and x86 laptops) and open-source solutions, to implement the proposed mechanisms in a real-world environment.
- RO4: To demonstrate the benefits of the proposed framework for significant drone-assisted use cases in the automotive industry. This will make use of research experimentation vehicles and off-the-shelf drones, which will significantly increase the practicality of the developed solutions.

11. AI/ML-based Modelling for Integrated Sensing and Communication Channels in Future Intelligent Vehicular Networks

Introduction: The integration of communication and radio sensing in the same spectrum is likely to be one of the key features in B5G/6G vehicular communication systems. A joint design of both services will improve the spectrum or energy efficiency and reduce hardware or signal processing costs through operating as a sensor for recognising surrounding environments or objects (i.e., sensing) as well as for delivering packets (i.e., communication) with a single device or a single network infrastructure. Recent advances in millimetre wave, Terahertz, massive multiple-input and multiple-output, and machine learning, among others, are making this vision possible, but many technical challenges still remain for the success of integrated sensing and communication (ISAC) in B5G/6G vehicular network. One of the most critical issues is that this (back)scattering characteristics (from the object and its surrounding) observed in sensing channel are not supported in the existing communication channel models. Moreover, there is a lack of solid models taking into account the unique features and the real-world physical wave propagation characteristics of ISAC channels in B5G/6G vehicular networks.

About the potential fellowship: The proposed project will use a methodology that integrates mathematical analysis, fundamental laws of wave propagation, stochastic geometry, electromagnetic theory, and information theory, with aiming to enable improvements in sensing and communications for B5G/6G vehicular networks by addressing the following **research questions (RQ)**:

RQ1. Which channel parameters provide the best basis to model (back)-scattering characteristics observed in ISAC channel for obtaining a fundamental understanding of unique features and the real-world physical wave propagation?

RQ2. In what ways can AI/ML techniques help us to develop context-aware models for ISAC channels which consider both sensing and communication channels simultaneously?

The proposed project has the following **measurable technical objectives (TO)**:

TO1: To identify suitable models for sensing channels and communication channels in B5G/6G vehicular networks

TO2: To gain a greater insight into ISAC channel characteristics encountered in B5G/6G vehicular networks through simulations to understand its unique features and the real-world physical wave propagation characteristics

TO3: To develop a novel AI/ML-based model for ISAC channels and empirically validate its versatility

TO4: To provide the performance analysis for B5G/6G ISAC channels

12. King's Ransom: Effect of cybersecurity on road user behaviour, attitudes and safety (with William Payre)

Introduction

Connected and automated vehicles (CAVs) are vulnerable to cyberattacks and data theft because they are equipped with numerous sensors and computers. This raises concerns as any vehicle can become connected to a network through smart phones with access to the internet. Consequently, the risks of privacy breaches and cybersecurity failures are real and their effects on road users and safety need to be addressed from a human factors perspective. Overlooking the effects of cybersecurity and security issues on users' attitudes and driving performance is likely to impede acceptance of CAV and diminish their effectiveness, slowing down its adoption and development. Therefore, it is crucial to further the understanding of the cybersecurity, privacy and safety issues associated with CAVs to inform automotive in-vehicle device design and transport policies.

About the potential fellowship

The scope of this post doctoral fellowship is road transportation. Although cybersecurity in transport is a well-covered topic from an engineering perspective, it remains largely unexplored in the realm of human and social sciences. In this project, cybersecurity includes security of computer systems, use of data, data sharing, confidentiality, and anonymity. The research question of this post-doctoral fellowship is how cybersecurity, or lack thereof, influence behaviour, attitudes, safety and the physiology of connected and automated vehicles (CAV) users. The objective of this fellowship is to collect empirical evidence to further the comprehension of cybersecurity in road transport from a user and road safety perspectives. The majority of studies examining attitudes towards cybersecurity and CAV technology are questionnaire-based. Thus, it is necessary to conduct complementary studies collecting objective, behavioural data (e.g. driving performance, safety, distraction, use, disuse, misuse and abuse of CAV technology). The present research will bridge this gap by undertaking a series of driving simulator and virtual reality studies. Results from this research are expected to inform good practices on in-vehicle device design, data collection, sharing and utilisation to support the acceptance and safe use of CAV.

Business in Society

13. An optimal plan for EV charging

Introduction

Due to climate change, sustainable transportation has become a critical topic that requires investigation. This research aims to explore various possible EV charging options at strategic and operational levels while considering uncertainty. Additionally, this study will develop a mathematical model for last-mile delivery at both strategic and operational levels, as well as an efficient solution algorithm based on Matheuristics. The main concerns of stakeholders will be taken into account during the research. Finally, the effectiveness of the identified solution will be investigated as part of this study.

About the potential fellowship

The main objective of this research is to identify all concerns and issues related to EV charging mainly during a last-mile delivery and then address them in a mathematical model to design a proper network. It is expected that the fellow to have knowledge on Mathematical modelling and then develop a matheuristic solution algorithm. As uncertainty is one of the main challenges of this research, knowledge of dealing with uncertainty would be a part of this study. The fellow should have knowledge and experience in Python coding.

Fluid and Complex Systems

14. Tornado-like vortices in Rainy-Bénard convection

Introduction

Tornadoes are the most intense atmospheric vortices and have been observed on all of Earth's continents (except Antarctica). The most dangerous tornadoes develop within the mesocyclone of supercell thunderstorms. But what makes a mesocyclone tornadic or not remains one of the greatest mysteries of tornado research, with less than 25% of mesocyclones spawning tornadoes (Wurman et al., Bull. Am. Meteorol. Soc. 93(9), 2012). Our team proposed that the explicit consideration of centrifugal buoyancy may hold the key to solving that mystery. We showed that tornado-like vortices (TLVs) are self-consistently generated in the idealised system of Coriolis-centrifugal convection (Horn & Aurnou, J. Turbul. 22, 2021). However, one shortcoming of this approach was that moist convection was not included, whereas, in an atmospheric context, buoyancy is provided by the condensation of water vapour.

About the potential fellowship

The MSCA fellow shall implement a model for moist convection (e.g. Rainy-Bénard, Vallis et al., J. Fluid Mech. 862, 2019) into our in-house convection code. The research questions to be answered using numerical simulations are: How much does the generation of the TLVs and their properties depend on the properties of the parent mesocyclone? What determines the strength and emergence of naturally occurring tornadoes? What is the impact of moist convection? What causes the interior of the tornado to be dry despite surrounding rain?

Answering these questions can be a decisive step in predicting the occurrence of tornadoes and mitigating their often devastating impact.

Learning and Education

15. Obstinate Memory - Exploring the use of Participatory Film Methodologies as radical research practice.

Introduction

Obstinate Memory (Fero.K, 2021) is an approach that employs a participatory form of research with communities of interest. It functions through the methodology of a ‘documentary of force’. The Fellowship will explore how obstinate memory operates within education in conflict and post-conflict societies and other contentious scenarios. The focus would be around its use as an interdisciplinary tool to explore suppressed narratives. The use of obstinate memory seeks to extend practices of testimony and documentation within academic research so that engagement with research participants has stronger ethics, inclusivity and more powerful impact.

About the potential fellowship

The Fellowship is designed to support a Post-Doctoral Researcher to radically expand their engagement in 'film as research' and who have demonstrable interest in the important role that education can play in the subject areas of social or military conflict, resistance movements, liberation struggles or community organising for example. Within these areas Fellows may want to explore how film imagery created within social media platforms is produced and consumed and its impact on dominant narratives socially and politically. How can film practice intervene as education to help to sustain the heritage of suppressed nations or communities? How can education - whether it is formal, informal, transient, migratory – use image making to sustain hope in areas of crisis? These or similar themes will be considered, outputs will be a mixture of film practice and written work.

Obstinate memory also questions the power relations between researcher and participant by positing a more collective mode of inquiry where *researcher participants* take a central role. The Fellowship advocates an organic intellectual approach and so we are keen to support candidates who have emerged from, and are able to connect with, relevant communities of interest.

16. COIL as a pedagogical vehicle for collaborative action, public engagement, and socio-political change (with Katherine Wimpenny)

Introduction:
With focus on the urgent need for universities to respond to society's major challenges, including the education of displaced learners, climate change, prejudices, poverty and inequalities facing our globally interconnected communities (Wimpenny et al, 2024), this fellowship will invite applicants to carry out a critique of how universities are responding to the Internationalisation of Higher Education for Society (Brandenburg, 2020) with particular focus on internationalisation at home (IaH) and within that Collaborative Online International Learning (COIL). COIL is examined as part of transformative engagements between students, faculty, and communities towards enhancing universities' responsiveness to local and global societies. As a pedagogical approach COIL aims to 'experientially stretch students understanding of the world and their place within it' (Rubin, 2016:76).

About the potential fellowship:
This fellowship will adopt a Critical COIL lens (e.g., Hauck, 2023) to examine how COIL pedagogy as part of IaH can respond to societal concerns and co-create solutions with knowledgeable partners.
Key questions include:

- How can COIL promote co-creation as a way of implementing new knowledge and action-oriented global citizenship learning as part of public engagement, and with what impact?
- How can COIL open 'otherwise' learning spaces to critique entrenched discourses and imbalances of power, voice, and agency which can obstruct the ability to question and appreciate local and global inequalities?
- How are educators supported to prepare students and community partners to learn with and from one another (adopting critical pedagogies of social justice, uncertainty, risk and hope) and how might these pedagogies find a place in COIL?

Environment

17. Unveiling Environmental Challenges in Electric Vehicle Transition

Introduction:
Transitioning to electric cars presents both environmental benefits and challenges, with a primary concern being the environmental impact of battery production and disposal. While electric vehicles (EVs) contribute to reduced greenhouse gas emissions compared to traditional internal combustion engine vehicles, the manufacturing of lithium-ion batteries, a key component in EVs, has notable environmental consequences. For example, poly- and perfluorinated alkyl substances (PFAS) or “forever chemicals”, a class of emerging contaminant used in batteries production to enhance the performance and safety of batteries.
PFAS are known for their persistence in the environment, bioaccumulation, and potential adverse effects on human health.

About the potential fellowship:
The main aim of this project is to study the variability and potential risk that battery wastes and their recycling pose to chemical safety in urban environments, which is essential for the circular economy and public health. The novelty of this project is the focus on assessing the potential for environmental contamination by “forever chemicals” from these materials and recommend methods to mitigate their transfer to the overlying environment. The project involves conducting a life cycle assessment of batteries, from raw material extraction and production to use and disposal and assessment of the overall environmental impact.
The applicant will benefit from the unique opportunity of using the powerful instruments (including high resolution mass spectrometry) available at Centre for Agroecology, Water and Resilience.
Academic qualifications: PhD in Chemistry (in Analytical, Environmental or Physical subject) or Chemical Engineering.
Technical skills and expertise: Background in mass spectrometry, liquid chromatography, environmental chemistry and energy materials characterisation, and statistical tools are beneficial.