UNIVERSITY OF LEEDS

CANDIDATE BRIEF

Research Fellow in Machine Learning in Carbon Capture Utilisation & Storage, Faculty of Engineering and Physical Sciences

Salary: Grade 7 (£41,064 – £48,822 p.a.)

Reporting to: Professor Richard Barker

Reference: EPSME1205

Closing date: Tuesday 28 April 2026

Fixed Term (up to 36 months - Starting from 01 June 2026 and to end by 31 May 2029 - to complete specific time limited work)

Location: Leeds main campus

We are open to discussing flexible working arrangements

Research Fellow in Machine Learning in Carbon Capture Utilisation & Storage,
Institute of Functional Surfaces,
School of Mechanical Engineering.

Do you have a strong technical background in Machine Learning and Numerical Modelling? Are you interested in working with industry to develop Machine Learning methodologies and protocols needed to deliver resilient, interoperable and safe CO_2 transport infrastructure in Europe?

Overview of the Role

Carbon Capture Utilisation and Storage (CCUS) is a key element in the European strategy for carbon neutrality by 2050. The University of Leeds is part of a large consortium of 24 partners from 7 European countries, consisting of leading international universities, research organisations and leading international energy companies, including bp, EDF, Equinor and Shell, working to ensure a sustainable CCUS industry at scale. The overall goal is to ensure that the transport infrastructure is capable of handling CO_2 streams at different flow rates, pressures and states and with different compositions and impurities without posing unacceptable risks for the infrastructure, the environment and populations.

The aim of this project is to develop numerical models and Machine Learning and AI methodologies, including Physics Informed Neural Networks (PINNs) and Symbolic Regression tools, to predict chemical reactions, impurity evolution along pipelines and associated corrosion threats in dense phase CO_2 streams with impurities. Working with regulators, standardisation and certification bodies, technology developers and industry, the models will be used to determine optimal pipeline operating conditions and develop guidelines for pipeline operation, providing practical recommendations for impurity concentrations ensuring safe and efficient transport of dense phase CO_2.

Main duties and responsibilities

- Developing numerical models of chemical reactions and corrosion processes in CO2 streams with impurities;
- Carry out a literature review on impurity reactions mechanisms and pipeline corrosion rates in supercritical CO2 systems and integrate this will non-publicly information supplied by project partners;
- Develop methodologies for embedding physical laws, such as thermodynamics and kinetic properties, into computational algorithms and machine learning models;
- Develop a Physics-Informed Neural Network (PINN)-enabled methodology to predict impurity concentrations and corrosion rates in dense phase CO2 streams;
- Carry out uncertainty analyses using Monte Carlo and/or Symbolic Regression methods;
- Use Machine Learning models to predict safe pipeline operating conditions/windows that minimise both unfavourable impurity reactions and excessive corrosion;
- Use Machine Learning models to develop guidelines for pipeline operation that ensure safe and efficient transport of dense phase CO2;
- Carefully documenting the methods and results obtained;
- Independently writing reports and presentations;
- Delivering presentations to key stakeholders;
- Working within and applying the standard operating procedures, health and safety regulations and quality assurance procedures of the School, Faculty and University;
- Contributing to the training of other researchers, where appropriate;
- Contributing to the research culture of the Institute and the School, where appropriate;
- Generating and pursuing independent and original research ideas in the appropriate subject area;
- Developing research objectives and proposals and contributing to setting the direction of the research project and team including preparing proposals for funding in collaboration with colleagues;
- Evaluating methods and techniques used and results obtained by other researchers, and to relate such evaluations appropriately to your own research;


- Making a significant contribution to the dissemination of research results by publication in leading peer-reviewed journals and by presentation at national and international meetings;
- Working both independently and also as part of a larger team of researchers, both internally and externally, to develop new research links and engage in knowledge transfer activities where appropriate;
- Maintaining your own continuing professional development and acting as a mentor to less experienced colleagues as appropriate;
- Contributing to the training of both undergraduate and postgraduate students, including assisting with the supervision of projects in areas relevant to the project.

These duties provide a framework for the role and should not be regarded as a definitive list. Other reasonable duties may be required consistent with the grade of the post.

Qualifications and skills

Essential

- A PhD (or have submitted your thesis before taking up the role) in a relevant discipline such as engineering, materials science, chemistry, computer science, applied mathematics or a closely allied discipline;
- Strong computer programming skills;
- Experience of developing numerical models of physical systems;
- Experience of using Physics-Informed Machine Learning;
- Good time management and planning skills, with the ability to meet tight deadlines and manage competing demands effectively without close support;
- A developing track record of peer-reviewed publications in international journals;
- Excellent communication skills both written and verbal, and the ability to communicate your research at national and international conferences;
- A proven ability to work well both independently and in a team;
- A strong commitment to your own continuous professional development.

Desirable

- Experience of working on industry projects;
- Experience of Physics-Informed Neural Networks;

- Python programming skills;
- Experience of pursuing external funding to support research;
- Experience of applying Machine Learning within a science and/or engineering context.

How to apply

You can apply for this role online; more guidance can be found on our How to Apply information page. Applications should be submitted by **23:59** (UK time) on the advertised closing date.

Contact information

To explore the post further or for any queries you may have, please contact:

Prof Richard Barker, Professor in Corrosion Science and Engineering
Tel: +44 (0)113 343 2206
Email: R.J.Barker@leeds.ac.uk

Working at Leeds
We are a campus-based community and regular interaction with campus is an expectation of all roles in line with academic and service needs and the requirements of the role. We are also open to discussing flexible working arrangements. To find out more about the benefits of working at the University and what it is like to live and work in the Leeds area visit our Working at Leeds information page.

A diverse workforce
As an international research-intensive university, we welcome students and staff from all walks of life and from across the world. We foster an inclusive environment where all can flourish and prosper, and we are proud of our strong commitment to student education. Within the Faculty of Engineering and Physical Sciences we are dedicated to diversifying our community and we welcome the unique contributions that individuals can bring, and particularly encourage applications from, but not limited to Black, Asian and ethnically diverse people; people who identify as LGBT+; and people with disabilities. Candidates will always be selected based on merit and ability.

The Faculty of Engineering and Physical Sciences are proud to have been awarded the Athena SWAN Silver Award from the Equality Challenge Unit, the national body that promotes equality in the higher education sector. Our equality and inclusion webpage provides more information.

Information for disabled candidates
Information for disabled candidates, impairments or health conditions, including requesting alternative formats, can be found under the 'Accessibility' heading on our How to Apply information page or by getting in touch by emailing HR via hr@leeds.ac.uk.

Criminal Record Information
Rehabilitation of Offenders Act 1974
A criminal record check is not required for this position. However, all applicants will be required to declare if they have any 'unspent' criminal offences, including those pending.

Any offer of appointment will be in accordance with our Criminal Records policy. You can find out more about required checks and declarations in our Criminal Records information page.

Salary Requirements of the Skilled Worker Visa Route
Please note that this post may be suitable for sponsorship under the Skilled Worker visa route but first-time applicants might need to qualify for salary concessions. For more information, please visit the Government's Skilled Worker visa page.

For research and academic posts, we will consider eligibility under the Global Talent visa. For more information, please visit the Government's page, Apply for the Global Talent visa.