

Research Associate in Enabling CO₂ storage using Artificial Intelligence

Edinburgh, Midlothian, United Kingdom

JOB DESCRIPTION

Salary: Grade 7 (£35,308 - £43,155)

Contract: Full-time (35 hours per week), Fixed Term funding available until the 31st of March 2025.

We have the opportunity for 2 Research Associates to join this research project. Interviews are due to take place on the W/C 17th of July 2023.

The successful candidates are expected to develop cutting edge deep learning models for multi-scale flow modelling of CO₂ in subsurface reservoirs. Two aspects are of special interests (a) pore-to-core scale upscaling (b) upscaling of reactive flow processes. In addition, the successful candidates will contribute to a wide range of AI applications in subsurface flow modelling including (a) stochastic generation of porous media realizations using deep generative models (b) deep learning based property prediction using various architectures (c) Deep learning based proxy modelling with physics based losses and built-in model constrains (e) Effective optimization techniques for physics constrained implicit neural models (f) Efficient coupling of deep learning models to numerical solvers for hybrid CO₂ flow modelling. The developed machine learning techniques will be open-sourced and be validated across a wide range of applications and on experimental data and direct numerical simulations generated by the project team.

The successful candidates will be part of a large multidisciplinary research project on maximising CO₂ storage in deep geological formations. The candidates will benefit from interactions with the project team across Heriot-Watt university and Imperial College London:

- Institute of GeoEnergy Engineering (IGE) at Heriot-Watt University
- Lyell centre at Heriot-Watt University
- Institute of Mechanical, Process and Energy Engineering (IMPEE) at Heriot-Watt University
- School of Mathematical and Computer Sciences (MACS) at Heriot-Watt University
- Department of Earth Science and Engineering (ESE) at Imperial College London
- Department of Chemical Engineering at Imperial College London

Key Duties & Responsibilities

The successful candidate will be expected to undertake the following:

- **Develop deep learning models for upscaling two-phase fluid flow in porous media.**
- **Develop uncertainty aware emulators for reactive flow models.**

- **Disseminate research results in peer reviewed journals and interdisciplinary conferences.**
- **Publish open-source code repositories demonstrating all developed techniques and associated computational notebooks, blogs and presentation materials.**
- **Organize and lead Hackathons as a part of ECO-AI project activities.**
- **Participate in regular project meetings with team members and project sponsors.**

About the Team

The School of Energy, Geoscience, Infrastructure and Society (EGIS) at Heriot-Watt university (HWU), Edinburgh, Scotland has an opening for two PDRA positions to work on the project ECO-AI (Enabling CO2 storage using Artificial Intelligence techniques). These posts will be based at the Institute of GeoEnergy Engineering (IGE) and are funded EPSRC. Further details about ECO-AI are available at the project webpage https://ai4netzero.github.io/ecoai_project/

Education, Qualifications and Experience

Qualifications

- A PhD degree in computational science & engineering, applied mathematics, physics or in a related computational field.

Essential Criteria

- Prior experience in developing deep learning models using open-source libraries (e.g., pytorch).
- Prior experience in computational fluid dynamics using open-source software packages (e.g., OpenFOAM).
- Strong track record of publications in high impact scientific journals.
- Working experience in modern software development techniques (version control, continuous integration, software testing, etc).
- Excellent verbal and written communication skills, and ability to write professional reports.

Desirable Criteria

- Experience in developing nonlinear optimization algorithms.
- Experience in deep generative modelling.
- Work experience with HPC, multi-GPUs systems and/or TB scale datasets

When applying, please include a **cover letter** addressing these selection criteria.

How to Apply

Applications can be submitted until midnight on the **13th of July 2023**.

Please submit via the Heriot-Watt on-line recruitment system (1) Cover letter describing their interest and suitability for the post; (2) Full CV
Potential candidates who wish to discuss the post informally can contact project leader: Prof. Ahmed H. Elsheikh (a.elsheikh@hw.ac.uk) or the work-package leaders Dr Kamaljit Singh (k.singh@hw.ac.uk) and Dr Hannah Menke (h.menke@hw.ac.uk).

Apply online using the following link (deadline: 13th of July):

enzj.fa.em3.oraclecloud.com/hcmUI/CandidateExperience/en/sites/CX/job/3076