

- Project

Improving the performance of the VISAGE linear solver for coupled IX-VISAGE simulation in context of CCS

Carbon Capture and Sequestration (CCS) plays a key role in the decarbonization of hard to abate industries. A major challenge for any CCS project is to assess the risk of potential CO₂ leakages from subsurface reservoirs. Coupled geomechanics-reservoir simulation is one of the key instruments to assess and potentially retire risk. As it stands, coupled VISAGE-INTERSECT simulations have significant runtime due to several reasons, of which the linear solver in VISAGE is by far the most time-consuming component.

In this internship the candidate will study a set of linear systems that are representative of the systems encountered in a range of VISAGE cases. The candidate will benchmark the existing solver, compare to state-of-the-art linear solvers from the public domain as well as commercial solvers that are available under license. Moreover, the candidate will use the latest insights from the research community to investigate the improvement potential and advise on an optimal linear solver for VISAGE.

- Logistics
 - 9 months MSc research
 - 3 months literature study / writing thesis
 - 6 months paid internship @ AbTC (= Abingdon, UK)
- References
 - Linear solvers, Preconditioners, Conjugate Gradient methods
 - Direct linear solvers
 - (Smoothed Aggregation) Algebraic Multigrid, Deflation
 - Trilinos/PETSc/Hypre/MUMPS
 - <https://github.com/trilinos/Trilinos>
 - <https://petsc.org/release/install/>
 - <https://github.com/hypre-space/hypre>
 - <https://github.com/bootcmatch/BootCMatch>
 - GPUs vs CPUs