# Training a machine learning model to predict subsurface properties based on geophysical data from the Stenlille aquifer gas storage facility

## "ML Geophysical Predictions @ Stenlille"

*Project type*: *ECS – Early Career Support*
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**Summary**

The adoption and application of machine learning (ML) techniques has through recent years been demonstrated to address a range of geoscientific problems. The field of ML applications within geoscience and other subjects receive increasing attention due to its ability to extract more, and sometimes new, information from existing (and new) data, and the technology is maturing rapidly.

In this project, we propose implementing and testing some new open-source ML tools to address the seismic inversion problem, where the aim is to derive elastic properties (output) from seismic amplitudes (input) and correlated with nearby well measurements. For this we will use the comprehensive dataset from the Stenlille aquifer gas storage facility, which is also under consideration for being exploited as a potential CO2 demonstration site. Stenlille has therefore received increasing attention and research activities, including acquisition of 2D lines in 2022 as part of the CCS data campaign, planning of new CO2 injection wells, and a state-of-the-art reprocessing of an existing 3D seismic cube from 1997 that will be available later in 2023. In other words, the geophysical data content at Stenlille has and will continue to increase significantly, which creates a big potential to test some new ML tools.

**Opsummering**

Indførelsen og anvendelsen af maskinlæringsteknikker (ML) har gennem de seneste år vist sig at løse en række geovidenskabelige problemer. Området for ML-applikationer inden for geovidenskab og andre fag får stigende opmærksomhed på grund af dets evne til at udtrække mere, og nogle gange ny, information fra eksisterende (og nye) data, og teknologien modnes hurtigt.

I dette projekt foreslår vi at implementere og teste nogle nye ML-værktøjer til at løse det seismiske inversionsproblem, hvor målet er at udlede elastiske egenskaber (output) fra seismiske amplituder (input) og korreleret med nærliggende brøndmålinger. Til dette vil vi bruge det omfattende datasæt fra Stenlille gaslager, som også overvejes at blive udnyttet som et potentielt CO2-demonstrationssted. Stenlille har derfor fået stigende opmærksomhed og forskningsaktiviteter, herunder anskaffelse af 2D-linjer i 2022 som en del af CCS-datakampagnen, planlægning af nye CO2-injektionsbrønde og en moderne reprocessering af en eksisterende 3D seismisk kube fra 1997 som vil være tilgængeligt senere i 2023. Med andre ord har og vil det geofysiske dataindhold hos Stenlille stige markant, hvilket skaber et stort potentiale for at teste nogle nye ML-værktøjer.

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