Integration of geotechnical and seismic data for improved subsurface modeling of offshore windfarm areas

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Background and Motivation

- Reliable ground modeling for de-risking pile installation
- Estimation of pile design relevant parameters at unexplored positions
- Integration and correlation of geotechnical and seismic data

Challenges

- Sparse Data and large areas
- Variable Geology
- Vertical vs horizontal resolution
- Ground truth vs Seismic data
- Time-depth conversion
- (…)

Desk study  Acquisition  Processing  Interpretation  Modeling  Design
Subsoil Models in the Planning and Development Process

**Geophysical & Geotechnical data**
- 2D Seismic profiles (site-wide)
- Geophysical BH data (local)
- Geotechnical CPT profiles (local)

**Geological Ground Model**

**Integrated Ground Model (IGM)**
- Virtual, interpolated CPT profiles
- At any location of interest (with no directly explored data)

**Interpolation Synthesis**

**Derived Geotechnical Parameters**
- Parameters of interest (pile design)
- At any location of interest (defined by Windfarm layout)

**Site-specific correlations**

**Geotechnical Laboratory data**
Integration of Geotechnical and Seismic Data

Date Input

- 2D/3D Multichannel Seismic
- Cores
- CPT
- Borehole Logs
- GIS data- Basemaps
- Laboratory testing
- Object Detection
- (...)

Glacial tunnel valleys
Neogene delta sands
Late-glacial deposits
Interglacial fine-grained deposits
Area Wide Parameter Prediction

Different level of data integration

- No Integration
  (Ground truth only)
- Structural Integration
  (Seismic horizons)
- Full Integration
  (Seismic traces)
Integrated Quantitative Ground Model

- Geological Model
- Integration of geotechnical and seismic data
- CPT Interpolation
- Ground Truth Information
- Uncertainty Quantification
- Potential Turbine Locations
- Design Parameter Prediction

Integration of geotechnical and seismic data
Thanks a lot for your attention!

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