Data-centric AI for Efficient fault interpretation workflow using interactive deep learning – Polheim Subplatform

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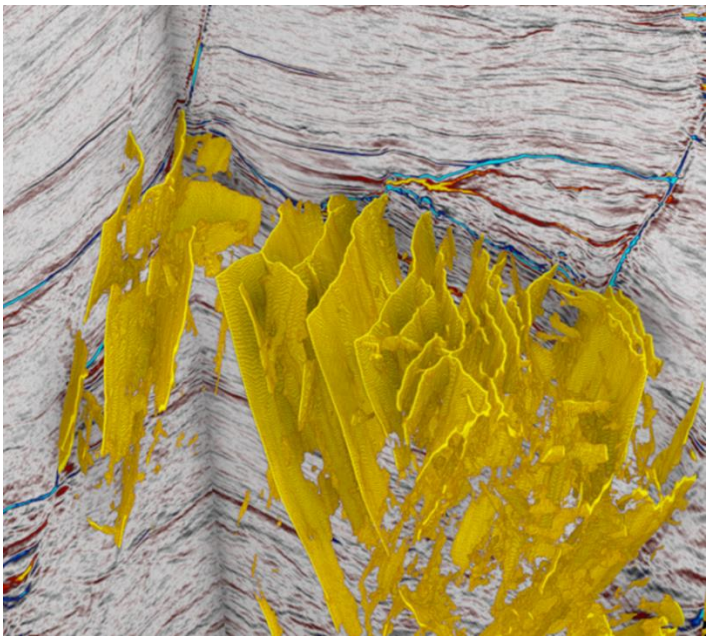
The Polheim Subplatform in the south-western Barents Sea is characterized by a complex fault pattern resulting from widespread rifting between Norway and Greenland in late Middle Jurassic to Early Cretaceous, accompanied by strike-slip adjustments with inversion along old structural lineaments. In order to address the complexity of the fault patterns, we have applied interactive deep learning to a sub-volume of the LN17001 dataset.

This survey made significant seismic imaging improvements with increased spatial and vertical resolution by acquiring the data using a source-over-spread configuration and triple gun-arrays. The complexity of the subsurface required full reprocessing of the data in 2019.

In this study we apply an interactive, data-centric approach to deep learning by focusing on the quality of the input fault labels rather than relying on global, pre-trained models as those would not be able to honor the full subtleties of the structural styles.

Fault labeling/classification, network training, and class predictions happen simultaneously. In this complex geological setting this enabled the identification of different classes of faults, with different seismic expression. Regional faults are sometimes expressed with a reflector on the fault plane while small scale faults can be seen as minor breaks in the reflector pattern. Masking and validation methods were used to focus training on relevant data and mitigate overfitting.

Using both vintages of the seismic survey, we explored various combinations of the labeling, training and probability cube output, aiming at a more probabilistic approach to fault definition.



Inline/crossline from seismic survey LN17001 with fault probability cube