Automated seismic interpretation

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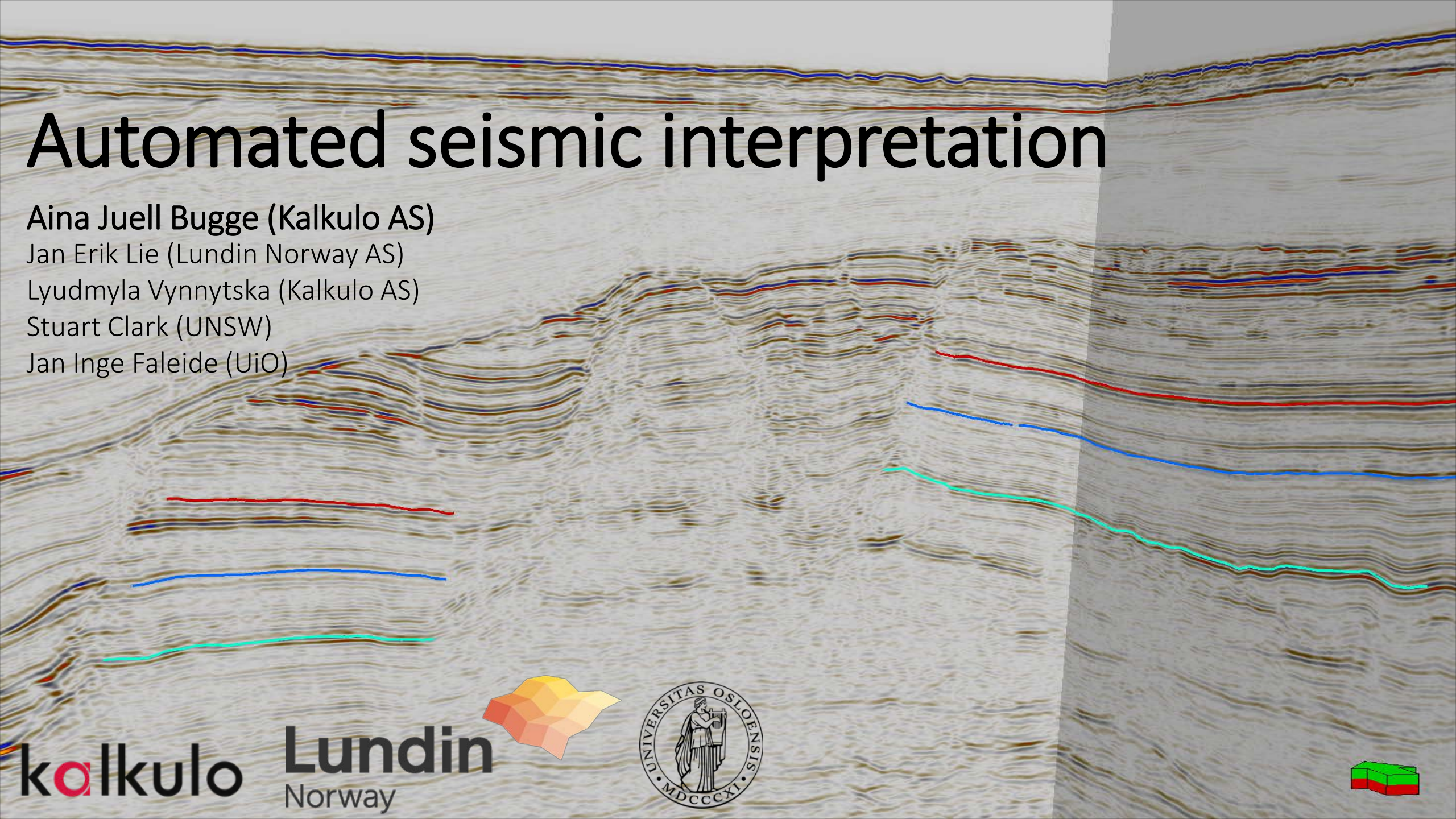
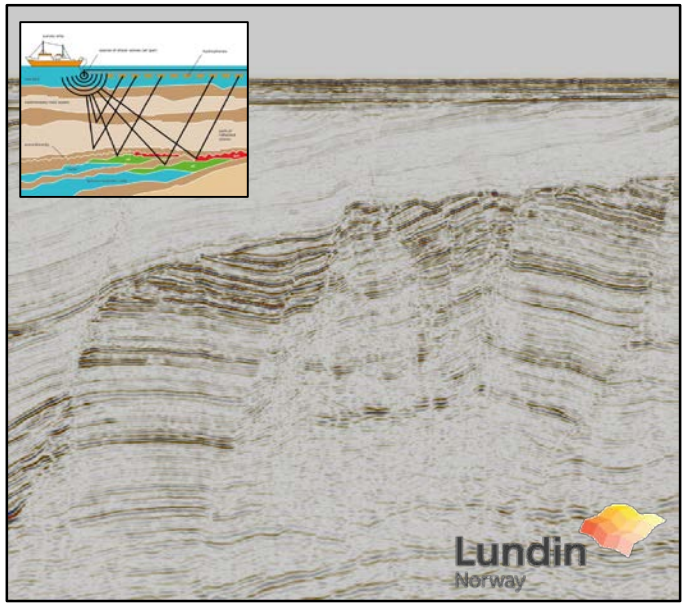
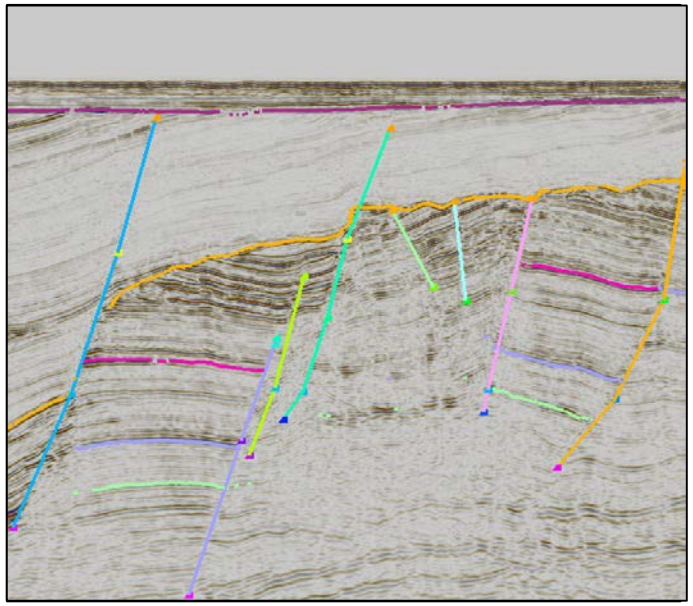


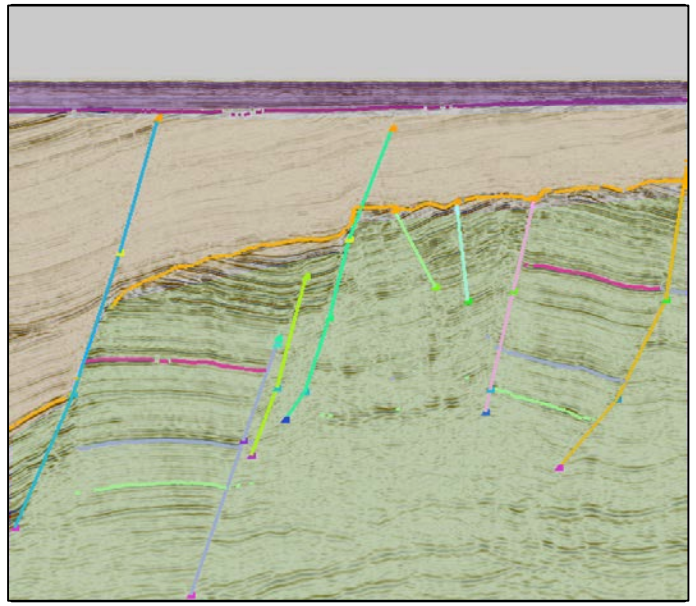
Seismic interpretation is usually a tedious process where geoscientists interpret geological features and build geological models *manually*



Acquire and process seismic data



Interpret geological features



Build a geological model

Automated seismic interpretation

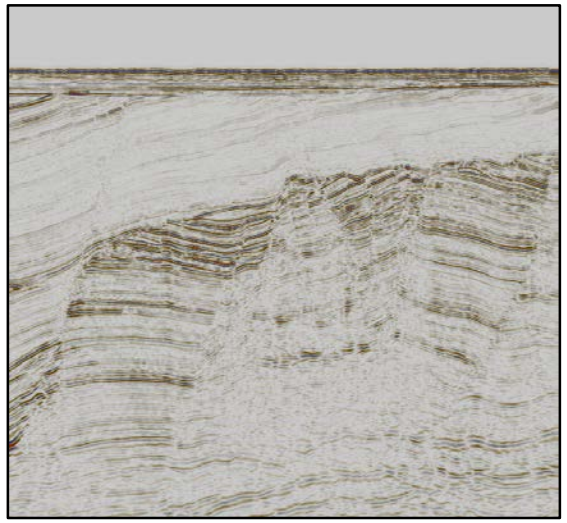
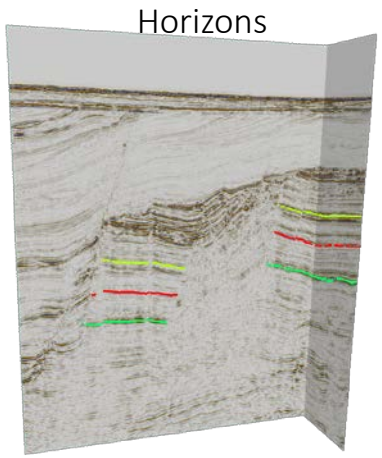
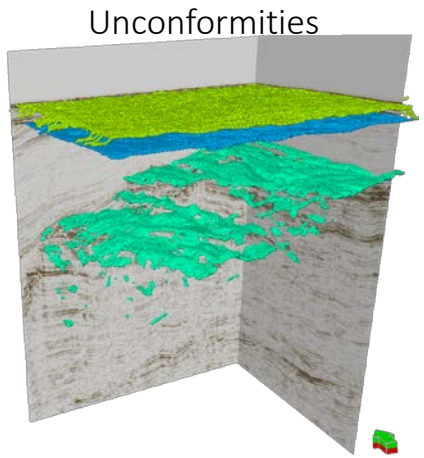
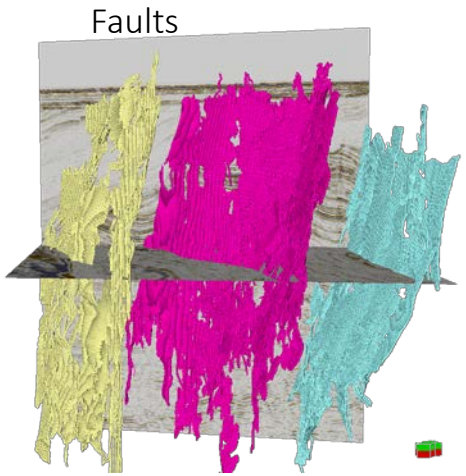


Image processing
Signal processing
Machine learning



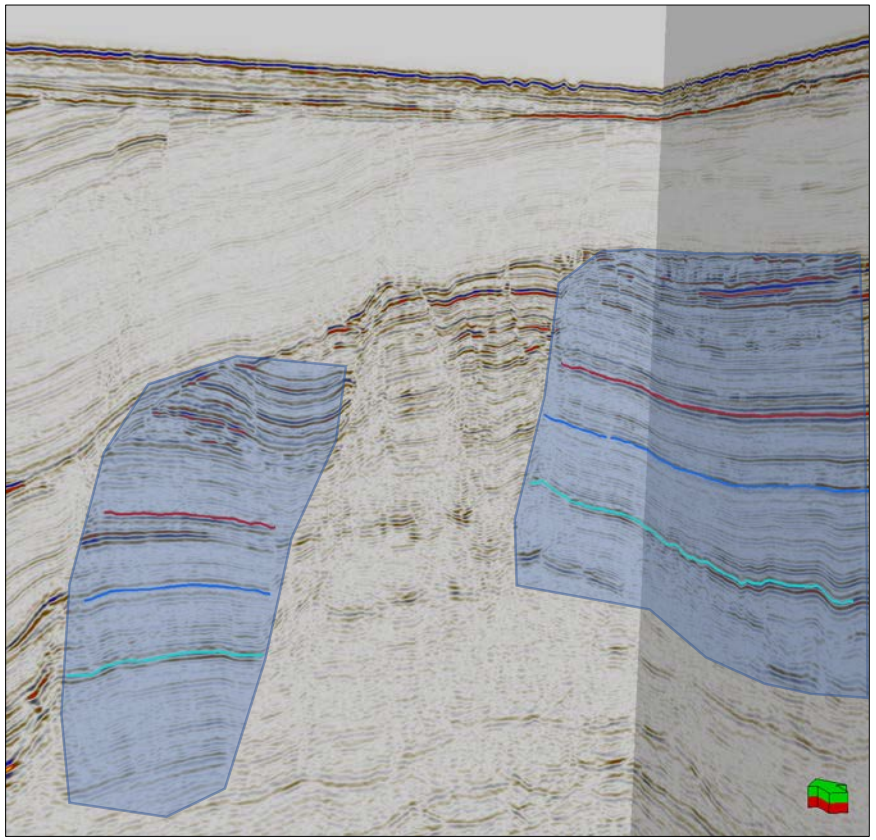




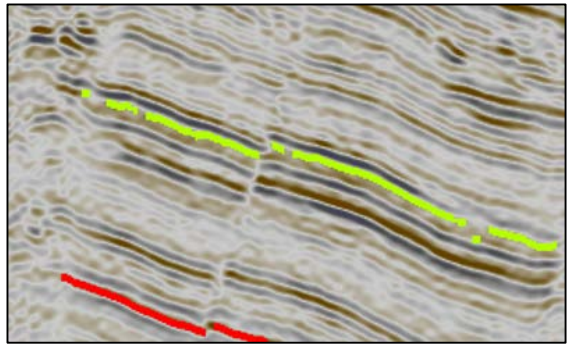
kalkulo

Lundin Norway

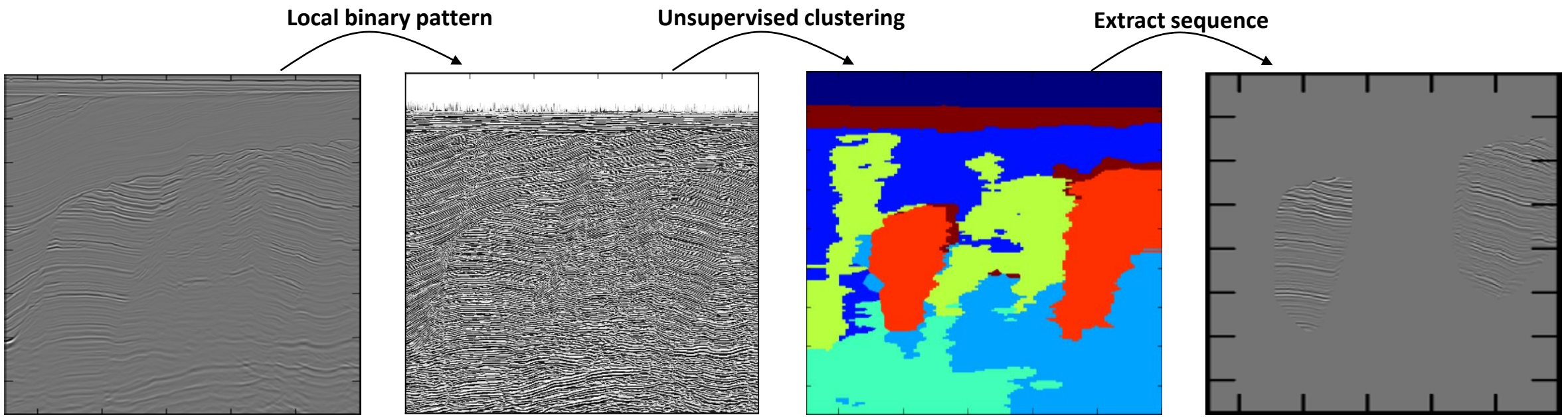
Data-driven 3D horizon tracker for structurally complex seismic



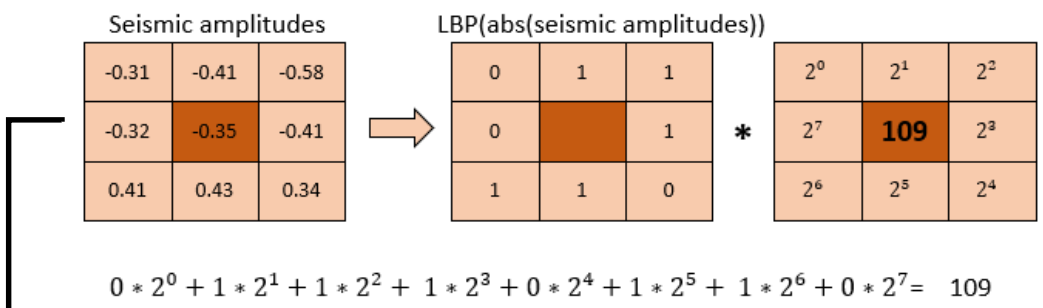
- No geological knowledge or interpretive experience
- Correlates across faults / fault zones
- Operates within given seismic sequences
- Area of interest: fault blocks



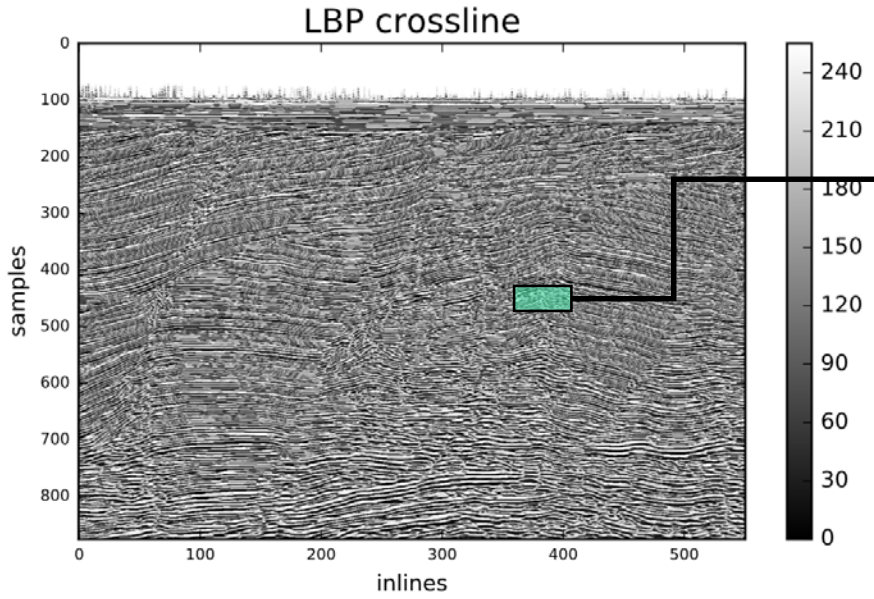
Seismic sequences can be classified with the use of a texture descriptor (LBP) and unsupervised clustering

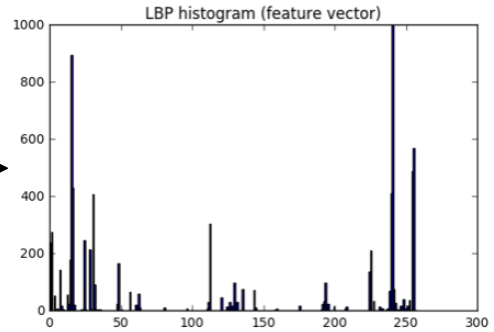


Local binary pattern (LBP) is a texture descriptor that quantifies the texture around pixels in seismic images

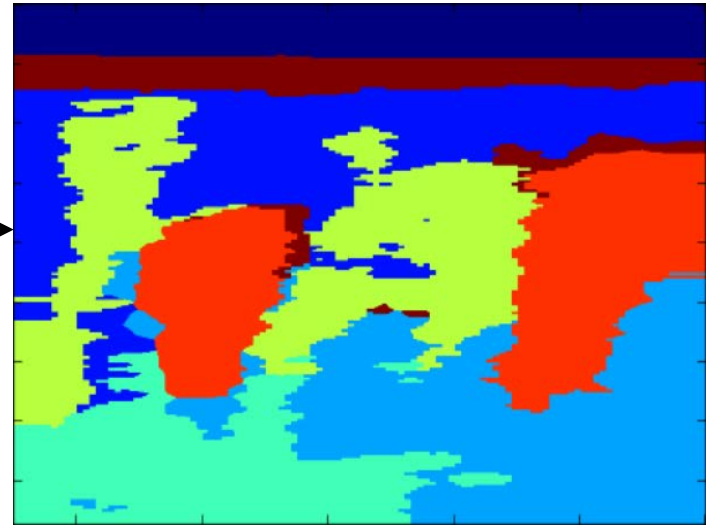


$0 * 2^0 + 1 * 2^1 + 1 * 2^2 + 1 * 2^3 + 0 * 2^4 + 1 * 2^5 + 1 * 2^6 + 0 * 2^7 = 109$





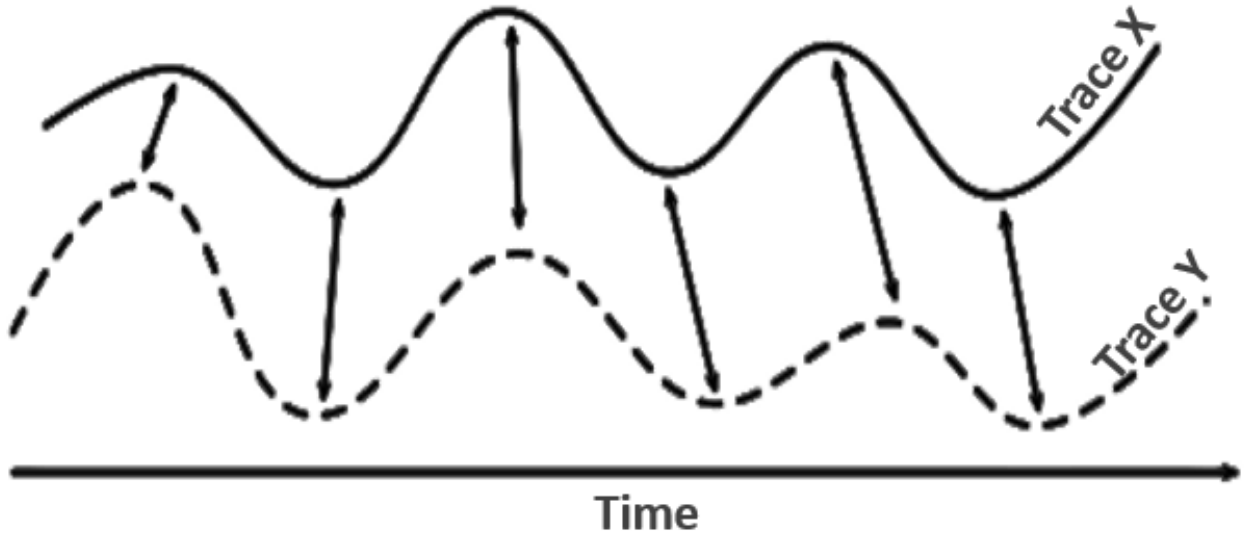
Extract feature vectors from LBP cube



Cluster feature vectors to classify textures in seismic data

(Ojala and Pietikäinen 1999; Ojala et al. 2002).

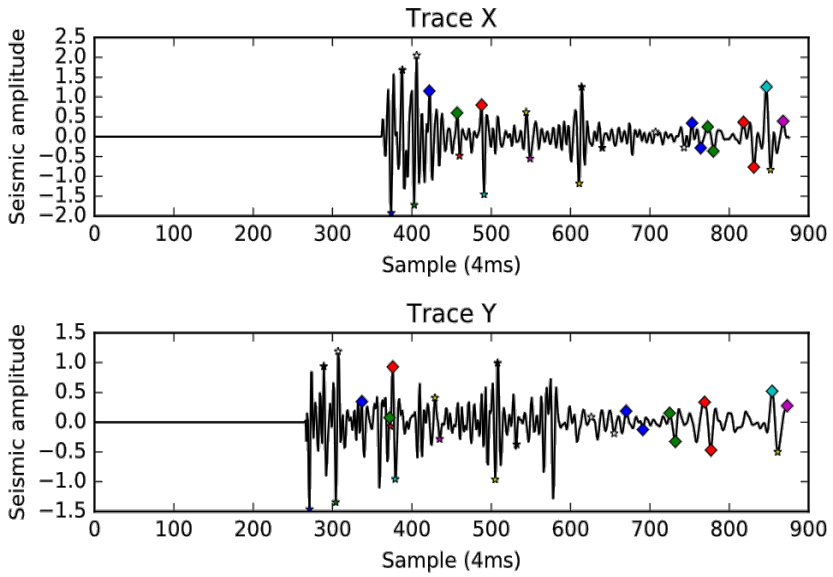
We use dynamic time warping to track seismic horizons completely automatic and in 3D - within given seismic sequences

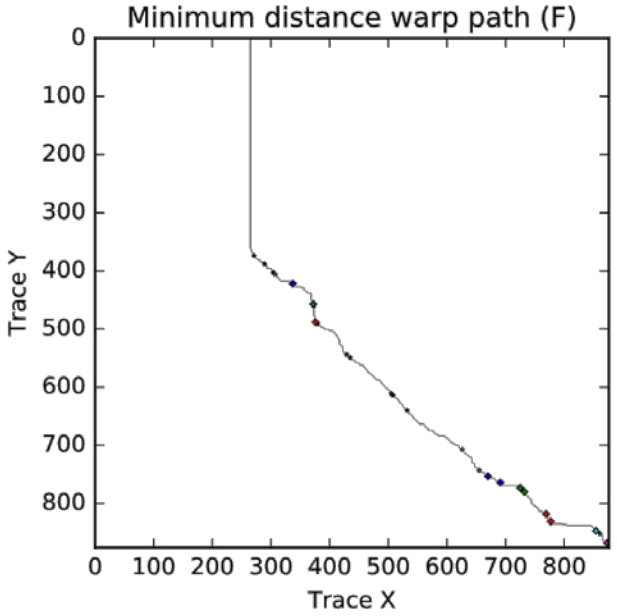


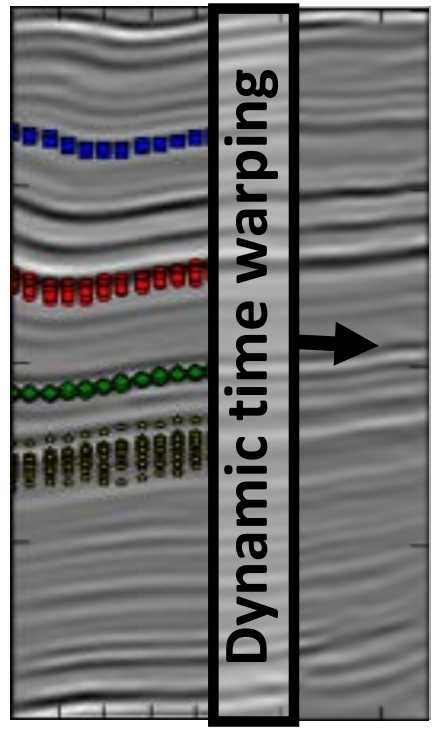
Dynamic time warping:
A pattern matching algorithm for time series with non-linear fluctuations along the time axis

(Sakoe and Shiba, 1978)

Techniques from speech recognition can be used to compare the shape of seismic signals and automatically track seismic horizons

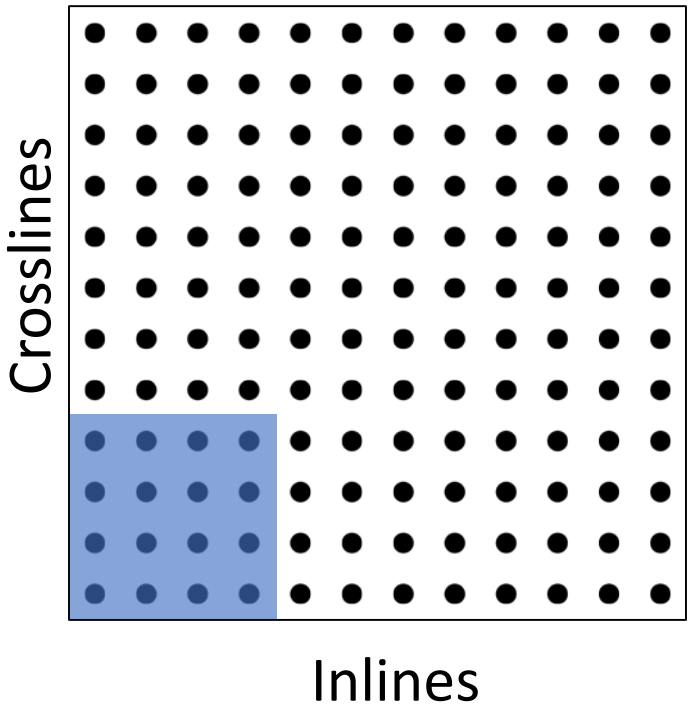


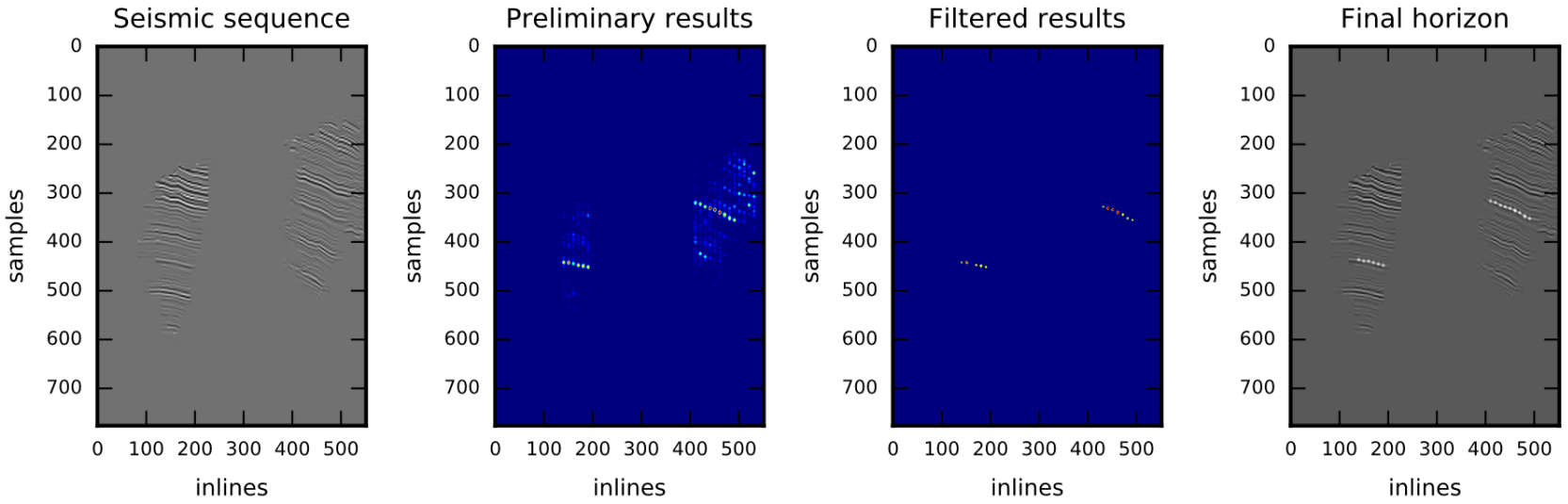




- This approach allows us to track multiple horizons simultaneously.
- The tracker is insensitive to amplitude changes along horizons.

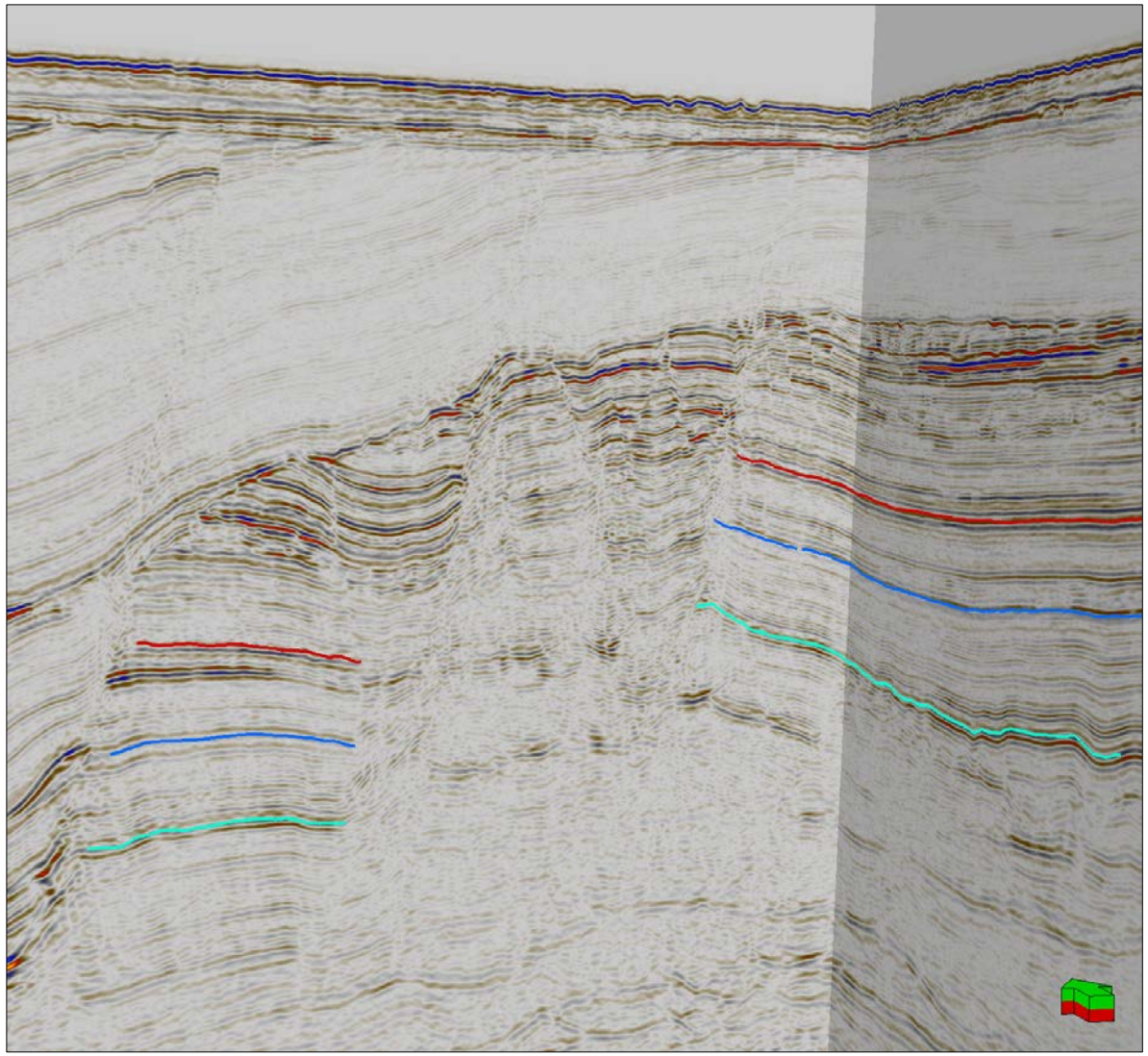
Automatic horizon tracking using a 3D dynamic time warping grid

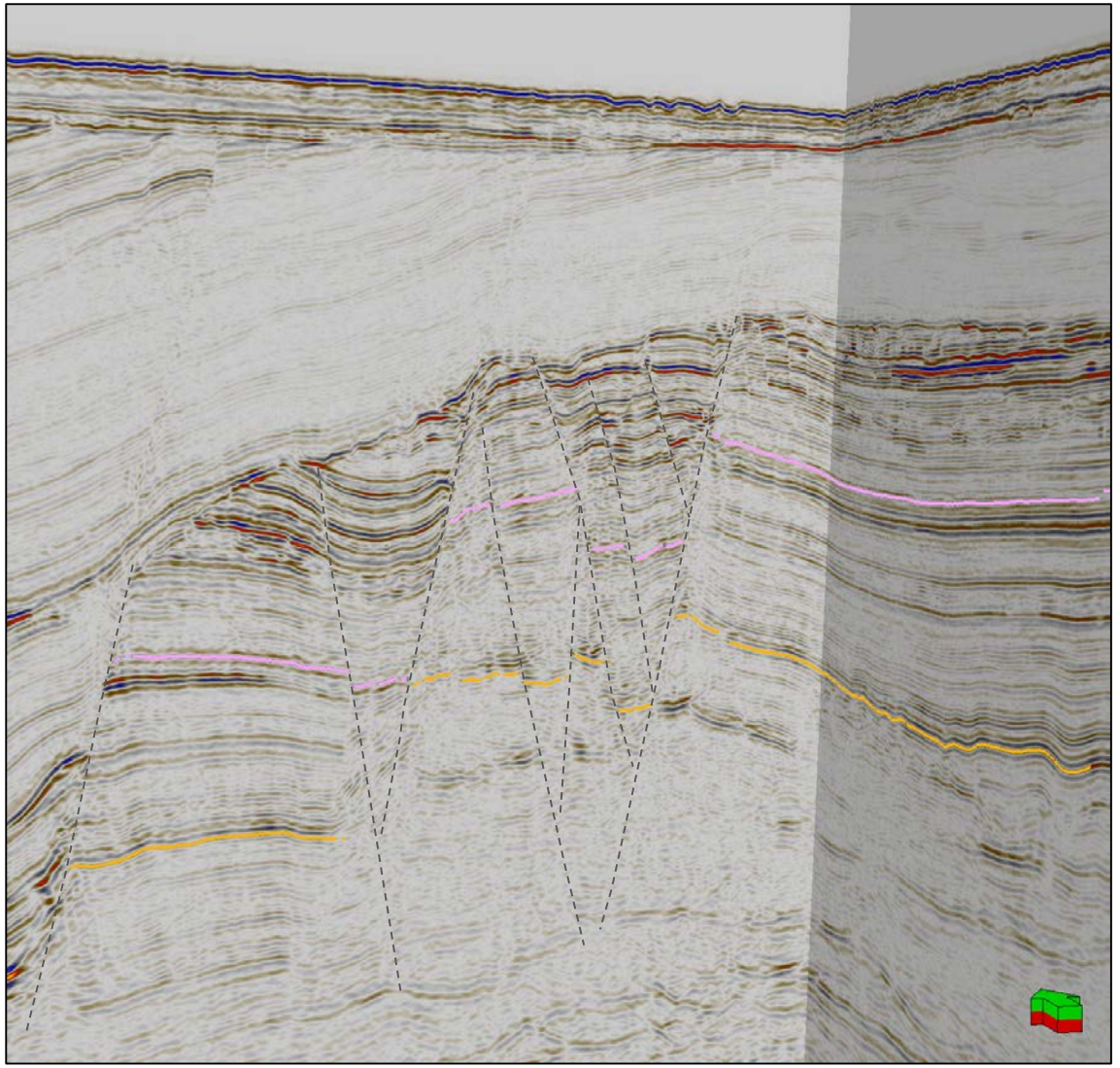




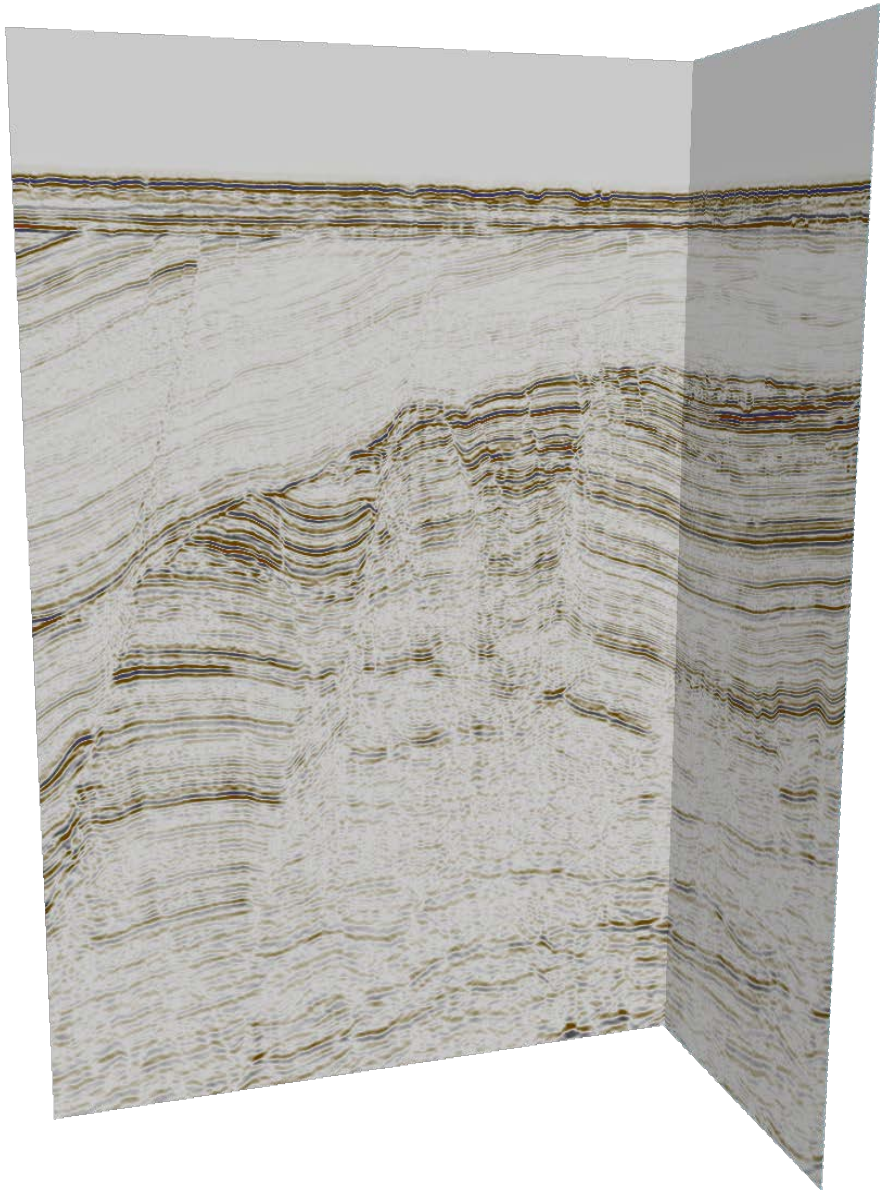
The grid allows us to track in 3D and to record a measurement of uncertainty while tracking

How does the tracker compare to manual interpretation?

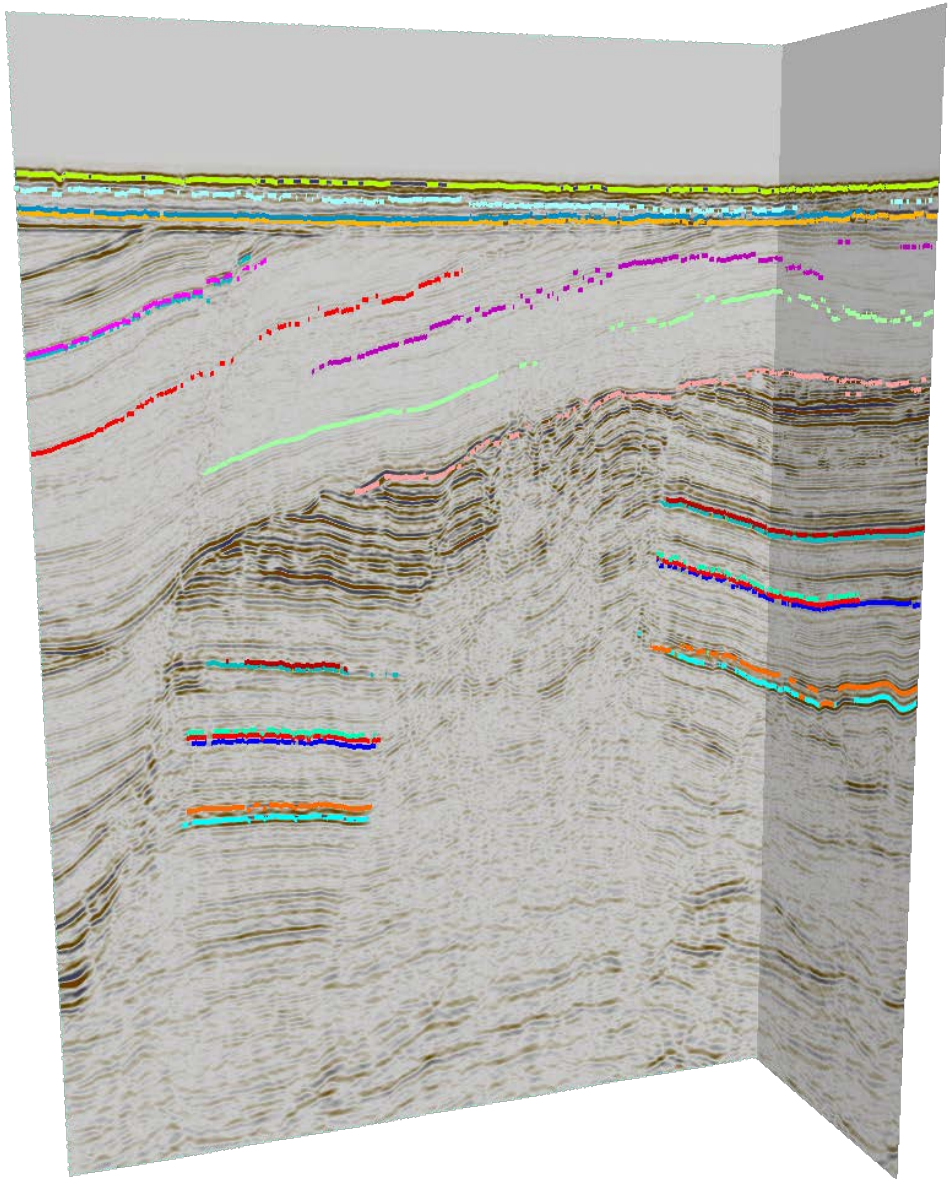




How can we improve?




Start




Thank you!
Aina Juell Bugge