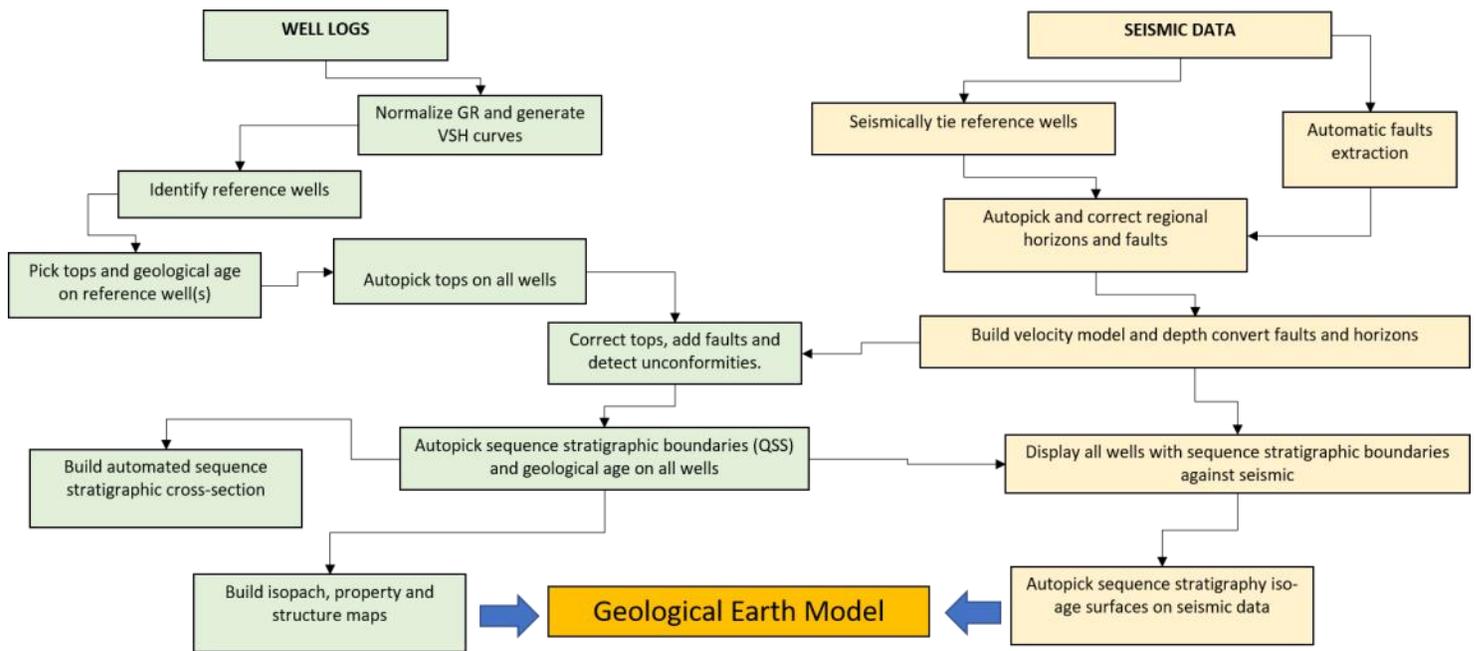


Automated Sequence Stratigraphy Interpretation

Deep Machine Learning and Quantitative Techniques are Applied for the Full Sequence Stratigraphic Interpretation of a Large Dataset

Automated Sequence Stratigraphy Workflow



Well data

Creating Log Database

To start successfully any project the database for .las files is created. The database has statistical information on type of logs, logs with GR/SP, as well as tops available for each logs in Excel format to facilitate quick access to required file.

Normalize GR and Generate VSH curves

All GR (SP) logs are resampled, and normalized. Vsh curves are created using various conversion equations (Linear, Larionov, Steiber, and Clavier).

Identify Reference Well(s)

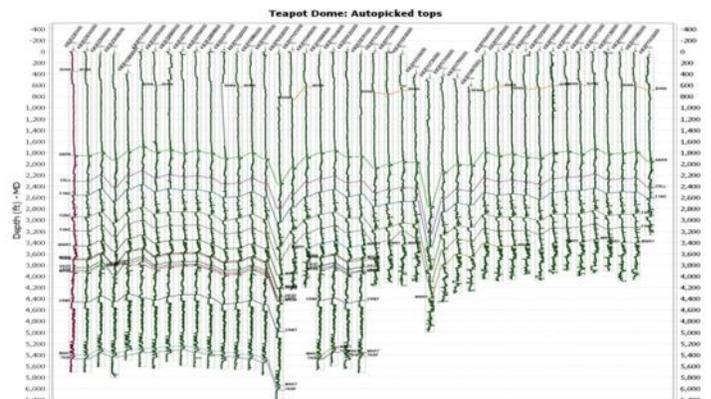
Reference well(s) representing large dataset of wells are identified automatically using similarity of log motives and availability of data (age and logs).

Picking Tops and Assigning Geological Age to Reference Well(s)

Using tops received from the client or picking tops manually for each reference well. Then, assigning absolute geological age for every tops, thus creating lithostratigraphic column for each reference well.

Autopick Tops on All Wells

Applying log correlation and dynamic time warping techniques the tops are picked for the large dataset automatically using tops of reference wells.

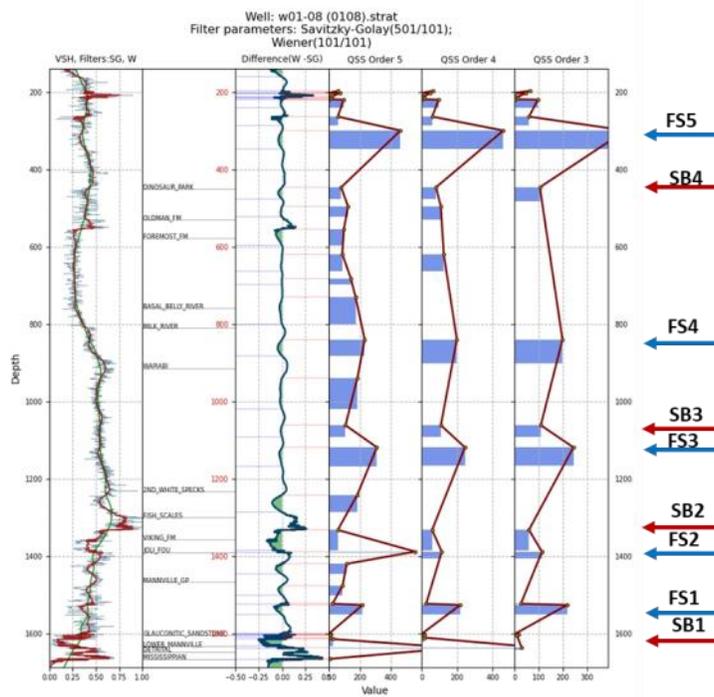
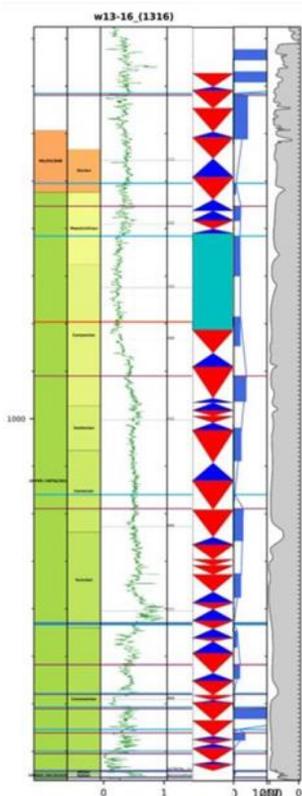


AUTOMATED SEQUENCE STRATIGRAPHY INTERPRETATION

Autopick Sequence Stratigraphic Boundaries (QSS) and Geological Age on All Wells

Following the Ainsworth, 2018 research paper on Quantitative Sequence Stratigraphy (QSS), sequence stratigraphic surfaces boundaries (MFS and SB), identification of stratigraphic order's ranking, along with absolute geological age are assigned to each well automatically.

Reference Well Output

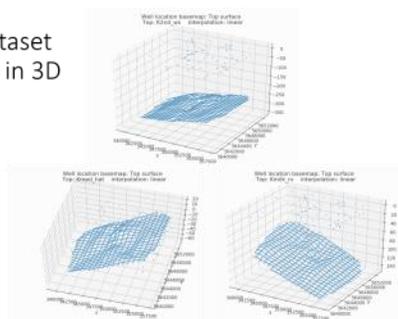


Left—reference well (Blackfoot data) output (from left to right): geological age, Vsh curve, tops picked, identification of sequence stratigraphic surfaces (MSF and SB) by two methods (one is manual—triangles showing coarsening/fining upward and aggradation; another is automatic, and local sea level curve (Miller et.al., 2005).

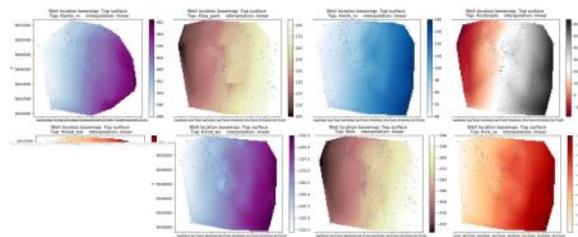
Right—sequence stratigraphic surfaces (MFS and SB) of different depth ranking (from 5th order to 3rd order)

Building Isopach, Property, and Structure Maps

Blackfoot dataset
Top surfaces in 3D



Blackfoot dataset: Top surfaces plotted in random color palettes



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