Enhancing Reservoir Characterization with Machine Learning

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Why Change? Traditional vs. AI-Powered Workflows

- Traditional workflows are still reliable but could be slow, subjective, labor-intensive.
- ML is accelerating subsurface analysis

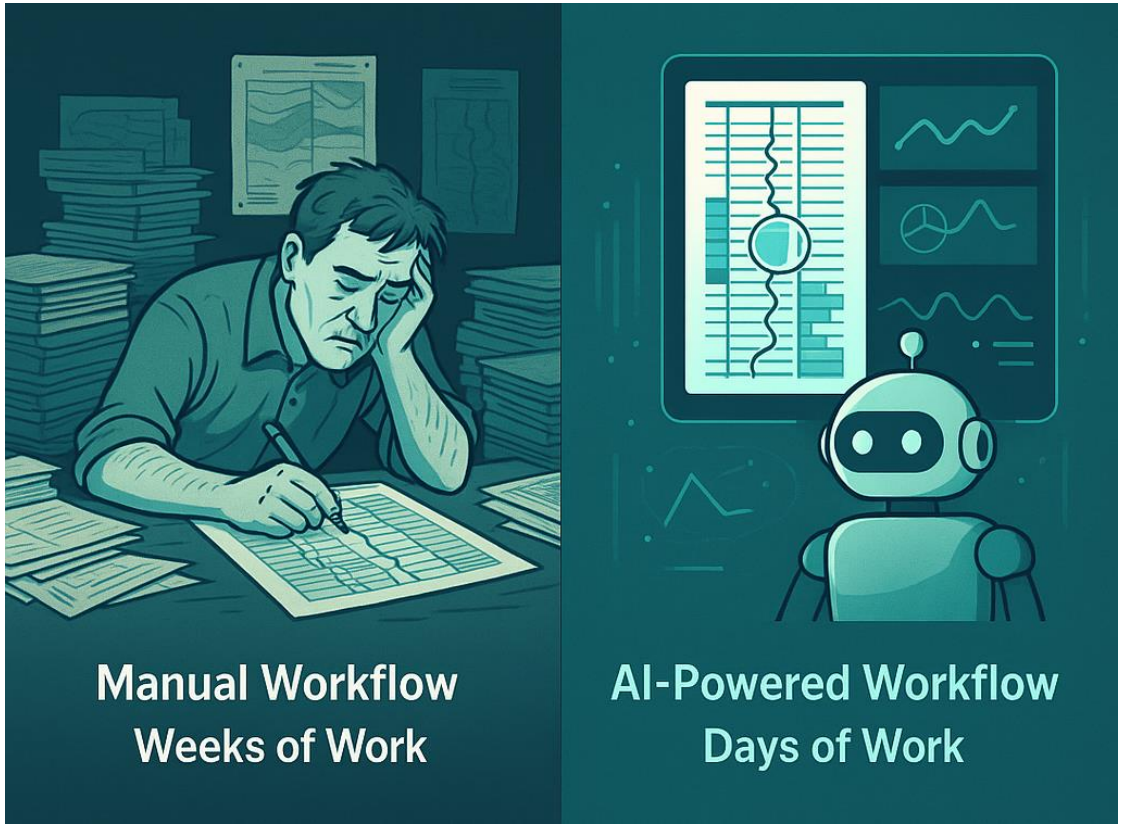
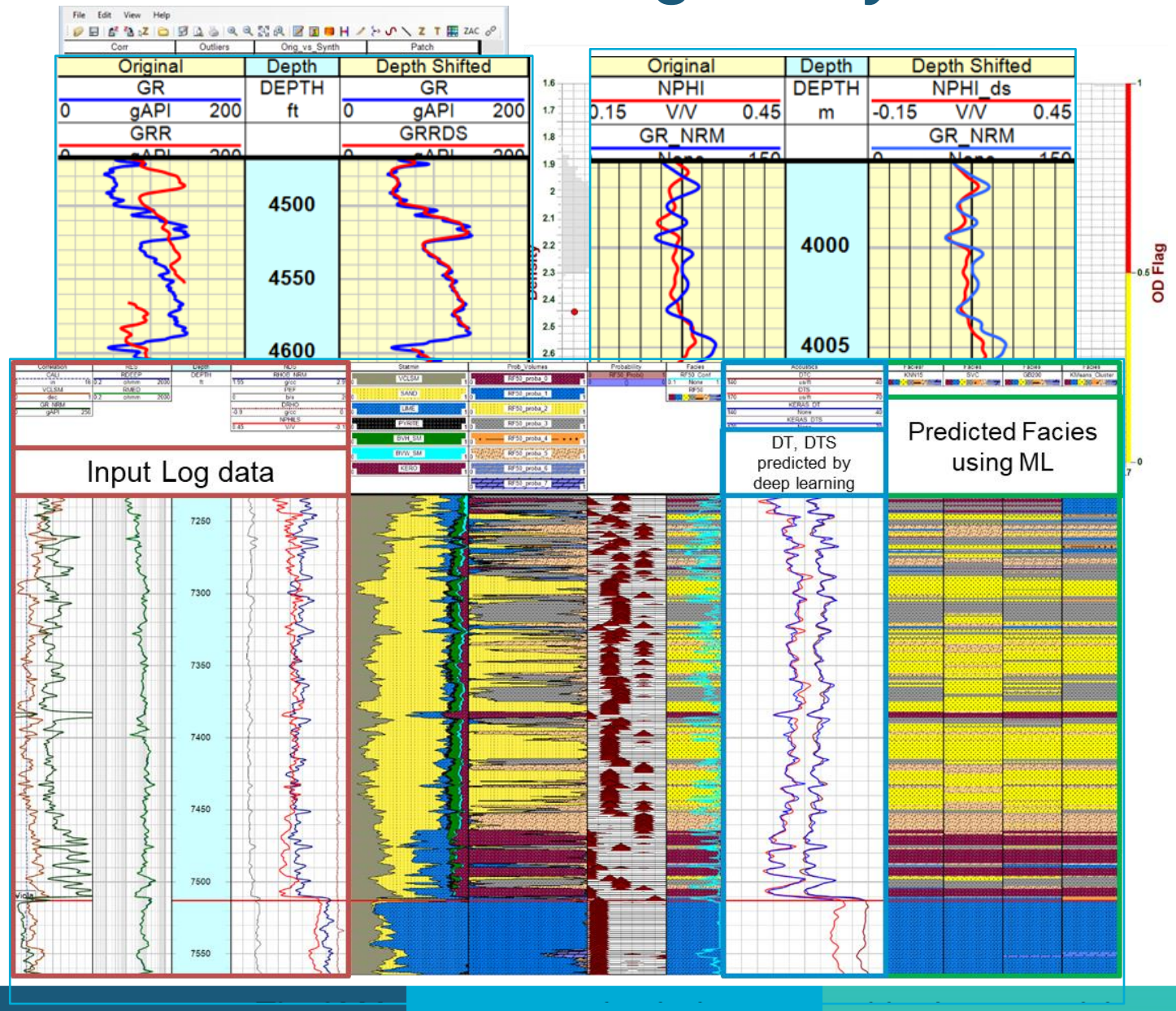


*Image generated using ChatGPT

AI-Powered Log Analysis in PowerLog



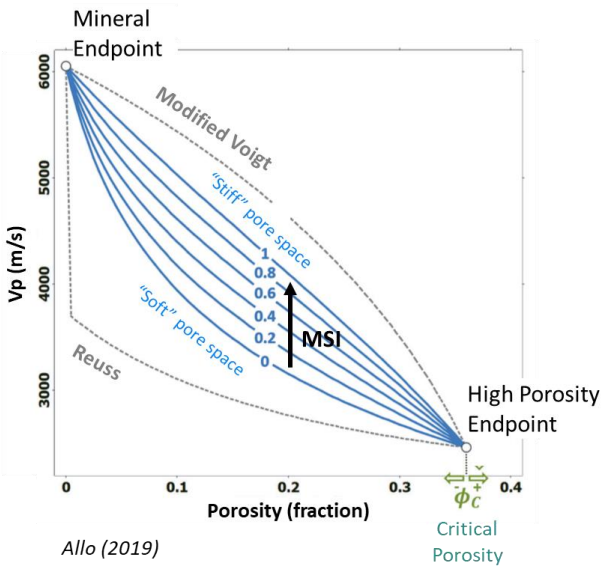
- Automated Log QC & Conditioning: Detect outliers, auto-patch bad data, depth-align logs.
- ML Predictions for Missing Logs: Neural networks fill in missing or corrupted curves seamlessly.
- Advanced Lithology Classification: Supervised & unsupervised facies identification with confidence estimates.
- Python Integration = Unlimited Flexibility: Use cutting-edge algorithms (TensorFlow, scikit-learn, etc.) from Google/Microsoft via scripting.

Practical AI in Geophysics - Rock Physics-Driven ML

Challenge: ML normally needs lots of high-quality data – but we often have only a few wells.

Solution: Integrate rock physics modeling with statistical augmentation to generate realistic synthetic data.

Result: Even small real datasets become effective training sets. ML predictions stay robust despite limited field data.



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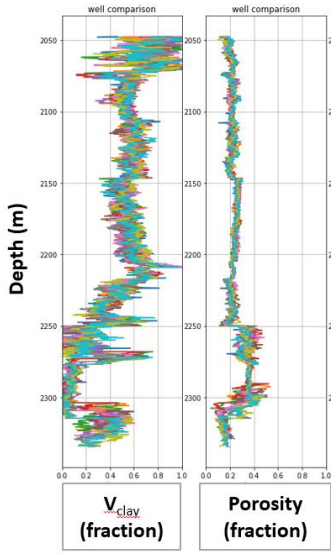
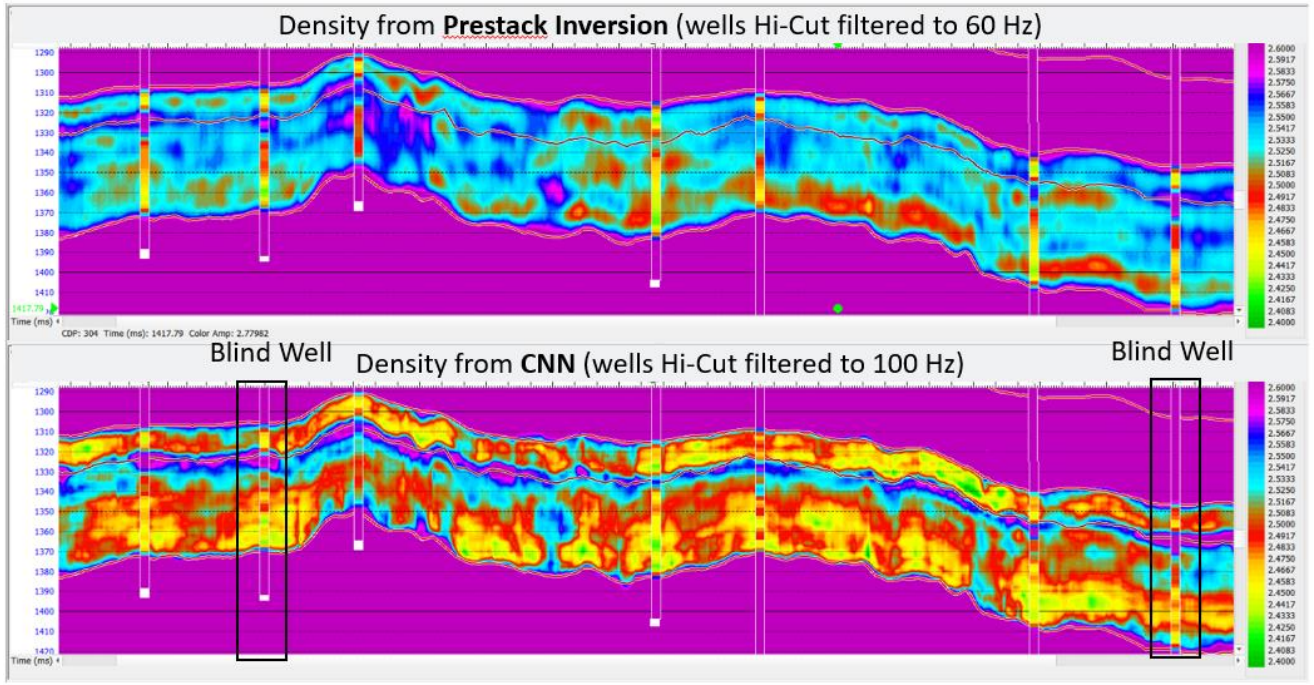




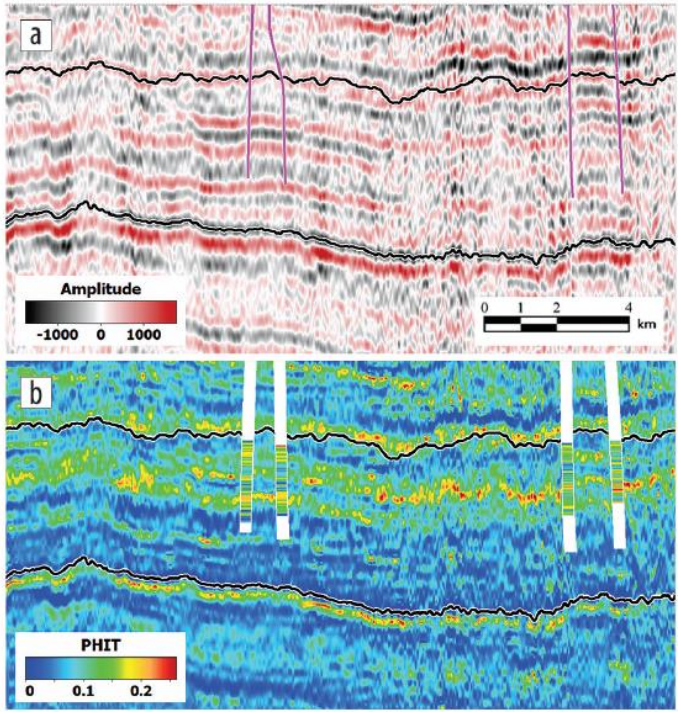
Beyond Hydrocarbons – Wider Energy Applications

These ML workflows extend to geothermal reservoirs, carbon capture & storage (CCS) sites, and even offshore wind farm site characterization – not just oil & gas.

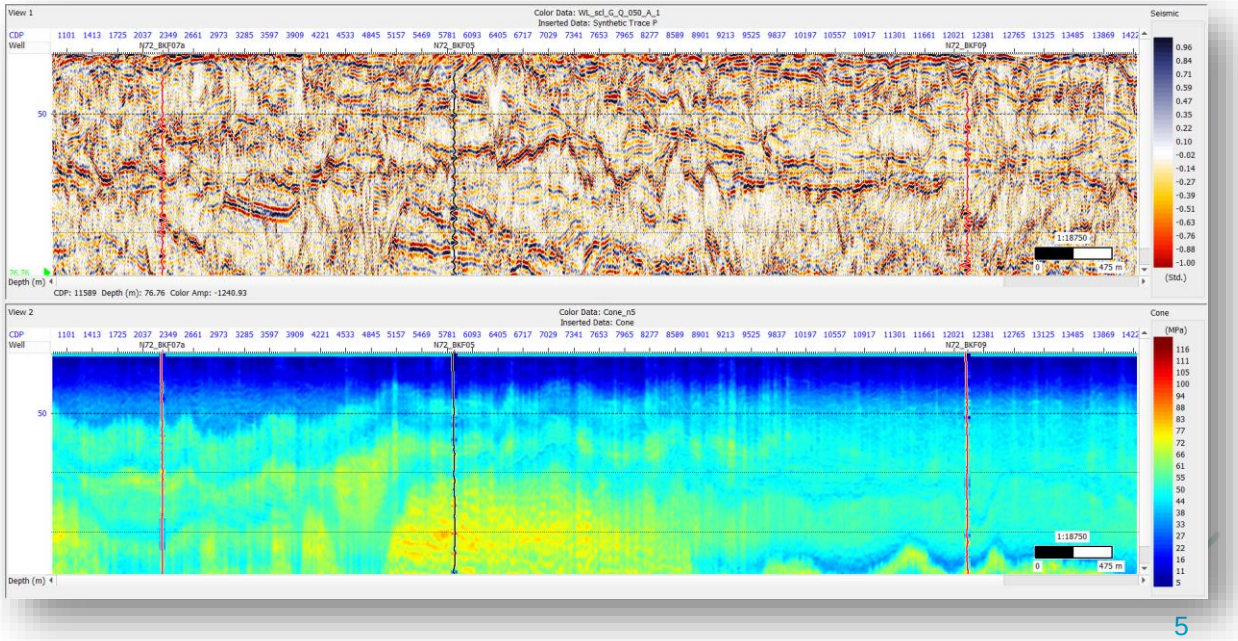
GeoSoftware's AI-driven technology provides quick results, high data reliability, and reduced subsurface risk across all energy projects.

(a) Input seismic section crossing the study area from west to east. The top horizon represents the top of the Dogger Formation. The bottom horizon corresponds to the top of the marls.

(b) Estimated total porosity showing porous layers in the upper part of the Dogger Formation, which correlates with logs from nearby wells.



Deep Neural Network predictions for cone resistance



Conclusions

- AI handles tedious tasks and refines results, so experts can focus on high-level decisions.
- Reduce risks. Better predictions mean fewer drilling surprises and more efficient reservoir development.
- ML-based approaches adapt and improve with new data, ensuring long-term value as challenges evolve.
- Partner with GeoSoftware – Leverage our expertise in subsurface ML to drive your next project's success. (We're ready to help!)

*Image generated using ChatGPT