

Deep Learning Seismic Inversion for Reservoir Facies- Data Driven Workflow

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Abstract

Delineation of reservoir facies in the sub-surface is one of the most important steps for successful exploration and development activity for any operator. Facies modeling from seismic data is a non-unique solution problem and it requires a numerous step to generate different facies distribution volume from seismic reflectivity data. Conventional seismic inversion is a time intensive process with associated uncertainties. While the above methodology of geophysical characterization has been the standard of the industry for decades, there is also an emerging methodology; Data Driven Machine learning models, this emerging methodology is more focused on data and less reliant on than human interpretation with its biased risk. Deep Learning Based Hybrid Seismic Inversion for Facies which can help to determine the feasibility of investing time and efforts to develop a full fledge technology deployment for the similar work within the organization. The learning will be based on the petrophysical facies interpretation on the log data and the prediction will be extended for the whole seismic 3D area. A data driven ML project ingests all this data and extracts geoanomalies using automated algorithms to generate AVA/AVO plots. It then develops models to categorize each anomaly with its probabilistic fluid presence. Once the ML model is properly trained, the resulting likelihood score of prospects by AI and ML can reduce your interpretation time cycle, adding further business value. The data driven approach will be used combinedly with physics driven model as per the requirement to achieve the desired accuracy. Any data -driven approach requires extensive utilization of all existing datasets based on process that includes;

- Data pre-processing and preparation for extending the learning (Deep Learning)
- Design and fine tune the solution algorithm that suit the problem statement and available data and its quality
- Predict the different facies and generate facies cubes