



How Machine Learning Can Aid Seismic Interpretation and Find Oil and Gas

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ABSTRACT

The process of statistically analyzing multiple seismic attributes using a SOM (Self-Organized Map) algorithm has been around for several decades. However, advances in computing power, coupled with the many new attributes developed in the last 20 years, has made this type of analysis extremely powerful. In the past, SOM has been used on only one attribute at a time, and using the seismic wavelet as the basis for the neural analysis. The approach in this presentation is using SOM on multiple seismic attributes at one time, and in a sample-based, not wavelet, format.

Multi-attribute machine learning using SOM (which is an unsupervised learning process) can be shown to reveal details in the data not previously identified and which can be interpreted to be lithologic in nature. The detail comes with the statistical analysis of the data based on information on each sample on each trace in the data. The result of this sample-based statistical analysis is that one can interpret thin-bed resolution well below conventional wavelet tuning. This in turn, helps with very accurate reservoir prediction when one ties the information to existing production or in the estimation of new reserves in exploration plays.

The key to the presentation is showing examples of problems in the every-day interpretation of data which can be solved by the neural analysis (classification) of multiple seismic attributes. These problems could be reservoir delineation, exploration and exploitation for new reserves, interpretation of complicated stratigraphic sequences, or basic interpretation when the data is less than optimal. Highlighted will be several case histories where the use of SOM has resulted in the discovery of hydrocarbon reserves, and the estimation of the accumulation potential resulting from drilling.