Quantitative Interpretation Using a New Neural Network Approach: Testing on Real Data Cases

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Abstract

The goal of the paper is to show the effectiveness of a new Neural Network (NN) Classification approach as a new tool for seismic reservoir characterization. By applying such NN Classification using well information as target information during the training process, it has been possible to obtain relatively high-resolution lithological information from prestack seismic dataset. Multiple input attributes can be used to define the training set. It allows extracting valuable information using limited a-priori geological knowledge and does not require any wavelet extraction.

The approach was successfully tested on an offshore West African oil field (the first case study) and an offshore Asian gas field (the second case study). Neural Network was trained using VClay logs as target property. Non-linear process was able to find complex relationships between input attributes and targeted VClay property. The input seismic data correspond to a set of seismic angle substacks combined to a so-called “convergence attribute” highlighting facies and structural continuity.

The benefit of this structural attribute is to enhance the continuity and resolution of the predicted pseudo-VClay property inferred from seismic. In the first test performed on a West African dataset, the results obtained by this new NN Classification were compared with pre-stack inversion results. Blind well tests show that the output attribute is predictive away from the wells used in the training process. We present such blind well quality control. It demonstrates the improved resolution introduced by the neuronal approach. It also shows the slight benefice obtained in term of resolution and continuity when introducing convergence attribute. NN Classification managed to delineate additional thin sand layers near some wells. NN Classification was also able to recognize thin shaly layers in massive sand formation, which were not captured by prestack inversion.