AI Seismic Method Reveals Hidden Details in Complex Giant Carbonate Field

Mujeeb Oke

ADNOC Onshore

Abstract

This presentation highlights process and successful outcome from applying Artificial Intelligence method to extract high resolution stratigraphic information from seismic data in a complex giant carbonate field spanning from platform to basin.

Pre-Stack Time Migrated (PSTM) seismic data was used as primary input. Various geometrical and trace attributes were extracted. Multivariate attributes analysis was carried out, and principal components estimated. Unsupervised Neural-Net classification was subsequently carried out iteratively, using varying input and process parameters. Outputs were compared with well data at every iteration to determine degree of fit. From platform to basin, the project outcome was able to provide 3D representation of different subsurface facies. Platform, shelf and basin stratigraphic features were clearly identified on stratal slices and vertical sections, and were seen to match observation in the few wells available for the field. It was observed that the outcome was not only influenced by the combination of seismic attributes used, but also by the parameters used in deriving the input seismic attributes to begin with, with multi-scale extraction of the same attribute playing an important role in the success of the study. Thus, whereas the number-crunching to generate outputs was done entirely by the computer, reasonable outputs were only guaranteed by human-controlled skilled selection of input elements and parameters. Artificial Intelligence method applied in this case was able to delineate subsurface facies from seismic independent of well data as an input.

Once validated with well data, the output provided valuable guidance for 3D geological modelling to optimize well placements, reduce development risks, and optimize reserves estimates.