AI Seismic Interpretation: A Deeper Understanding of the Earth

Luis Gomez Martinez, Peter Szafian, Mark Brownless, James Lowell

Geoteric

Abstract

Examples from onshore and offshore settings will be shown to demonstrate the practical application of AI Seismic Interpretation from regional reconnaissance to field development and drilling risk assessment.In every exploration and development project time is a critical element. The maximum amount of information must be extracted from the seismic data, on time for decision making. The past few years have seen exponential increase in the amount of seismic volumes which the traditional interpretation workflows cannot keep pace with. Thus, decisions will be based on imperfect and simplified information, potentially leading to disastrous results. These years have also brought huge improvements in AI techniques which, when correctly applied, can significantly enhance the speed and quality of the interpretation of the subsurface. With their help we can rapidly identify and extract faults, horizons and geobodies upon delivery of new seismic data in unprecedented detail and accuracy. The time saved on manual interpretation can be used to entirely understand the geology and analyse feasible scenarios, enabling regional and field assessment to benefit from the most up to date information and ensuring high-quality exploration and development decisions. The central element of the AI Seismic Interpretation workflow is the geoscientist: they provide the training examples for the algorithms and QC their output. We have developed a deep learning framework and additional machine learning solutions which are closely aligned with the interpreters' way of working, allowing tightly coupled interaction as appropriate for the dataset and the individual interpreter, making AI seismic interpretation a reality. This enables the retention and transference of an individual's experience between geographical areas, and the transference of company knowledge between interpreters, assets and basins, thus allowing rapid (re)interpretation of horizons, faults and geobodies in different vintages and varieties of seismic data. The first step of the presented workflow is an analysis by the AI network to quickly identify geological features. The next step, if necessary, is fine-tuning using a limited amount of interpretation to adjust the network and account for geologic details specific to the dataset. Lastly the AI delivers the final results which can then be combined with other high-fidelity attributes, eventually arriving at greater structural and stratigraphic understanding of the subsurface.