Will A.I. Make Interpreters Obsolete? Enhancing Seismic Interpretation using Artificial Intelligence

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ABSTRACT

Artificial Intelligence (A.I.) is 'The capability of a machine to imitate intelligent human behavior.' This paper will show that current A.I. technology for fault, fracture, salt, and stratigraphy identification can compete with human interpreters.

Using existing A.I. technology on seismic data allows interpreters to: reduce the time consuming and tedious aspects of interpretation, enhance their understanding of the data they are interpreting, obtain clearer results with a more accurate representation of the structural geology, and clearly delineate complex faulting, fracturing, and channels nearly impossible to identify using conventional line-by-line interpretation methods.

In this paper, A.I. is utilized for post stack seismic processing. The A.I. applies algorithmic human interpretation methods to decision-based workflows. The A.I. also incorporates dynamic mathematical parameterization to equations commonly used for edge detection, filtering, and cross correlation. Seismic characteristics such as frequency, attenuation, dip, and texture of the seismic are intelligently factored during computation. An iterative learning feedback mechanism is also implemented to achieve the best solution possible for fault, fracture, channel detection, and fluvial system imaging.

For channel detection, an adaptive spectral decomposition algorithm dynamically adjusts frequency selection and filter size to 'tune' on channels based upon the nature of the seismic. Intelligently isolating frequencies by their amplitude content and distribution enables better distinction of seismic features while adaptive filtering preserves both minor and major elements. These methods combined with proper dip guiding provide a higher resolution output both vertically and laterally when compared to conventional approaches.

A case study will be presented showing methods used to interpret the A.I. results and identify features that standard interpretation methods would have missed. An assessment of economic benefit utilizing A.I. will be shown along with limitations of current technology.

There will also be a brief discussion about effects on analogous sciences such as radiology for cancer detection. (e.g., 'Radiologists who use A.I. will replace those who don't') along with A.I.'s role in the future of seismic interpretation.

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