

Heuristic Validation of Probabilistic Neural Network in Reservoir Property Estimation from Seismic

Widyantoro, Adi, Chevron IndoAsia Business Unit, Duri, Indonesia

Interpreters increasingly rely on neural network methods to predict reservoir properties at locations far from existing wells. When it is done in a field with scarce well control the validity of the method becomes increasingly uncertain. Fortunately, the main application of neural networks in property estimation is minimizing error, while providing a more empirical observation of the error rather than purely mathematical. Observation of error measures how well the method predicts reservoir properties. Final validation however, should not depend on error statistics and coefficient correlations alone, but include geological reasoning. Probabilistic Neural Network is used in this work to predict reservoir properties from 3-D synthetic seismic data.

Reconstruction of the 3-D synthetic data for this purpose minimizes uncertainty from the well-seismic ties. Once bias of well-ties is minimized, the main source of error comes from the input well parameters. Varying this input and adding a set of pseudo wells from the synthetic data enhances understanding as to the source of error. Observation of error as a function of the well location suggests uncertainty of the estimation if the well distance and stratigraphy vary with the input wells, and raises the issue of unreliability of high correlation coefficients as a result of using many wells with varying stratigraphy. Applying the result of this heuristic validation can improve property estimation in a field with limited wells, avoid misinterpretation of high correlation coefficients, provide multi-realizations of property models using pseudo wells, and rejuvenate new well development in mature fields.