GENETIC INVERSION: AN INNOVATIVE COMBINATION OF NEURAL NETS AND GENETIC ALGORITHM FOR SEISMIC INVERSION

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A new approach to derive an Acoustic Impedance Inversion volume is proposed in Petrel. Multi layer neural networks as well as genetic algorithm are combined together in order to provide a robust and straightforward seismic inversion.

Estimation of rock properties using seismic data and derived attributes has always been a very important but challenging task. There are several "schools" using different methods in order to achieve this goal. All of them are based on strong and constraining a-priori information. The required knowledge of an initial model (cf. for the stochastic inversions), or source wavelet (cf. Colored-, Sparse Spike Inversion), is in several cases hard to acquire, if not even impossible. Moreover, the result of this kind of inversion is often biased by the input initial model itself.

In the case of Genetic Inversion, the required inputs are limited to the seismic amplitude, and the Acoustic Impedance well logs used as training data. Indeed no single unique wavelet, neither initial property modeling are needed as inputs prior to run the inversion. A genetic algorithm changes the weights of the neural network such that the prediction error is minimized, using principles from evolution.

The advantage of this new method to generate property estimation is that the genetic algorithm constrains the convergence of the inversion in a way that the chance to achieve a global minimum error is much greater than in other previous neural network based inversions. Thus, success is quasi absolute. In addition, another huge advantage of this process is that it is not only restricted to conventional Acoustic/Elastic impedance inversion, but that it could be extended to any kind of petro-physical attribute/parameter, which is linked in a meaningful, and straightforward way to the seismic amplitude or derived attribute data. To be more explicit all the parameters contained in the wave-equation are possible candidates such as velocity, density, porosity and bulk modulus.