Model-based prediction of petrophysical properties

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Petrophysical modelling of a variety of reservoirs systems requires the creation of simple yet effective and powerful methodological approaches. By applying such uniform and straightforward approaches we can standardize the procedure for creating petrophysical and interpretation models from scratch, while increasing the accuracy of the model.

The model-based concept of pore space connectivity (PSC) allows to build a set of consistent relationships for porosity, permeability, residual and current water saturation, and capillary pressure for most terrigenous and carbonate reservoirs. The PSC concept is based on three equations and six coefficients unique to a particular reservoir and a deposit. The additional parameter S, characterizing the structural and textural features of a porous media, significantly increases the reliability of models of reservoir rocks properties.

To automatically calculate five PSC coefficients, we applied the genetic algorithm using the multi-objective optimization method. We tested the algorithm on the data for 20 reservoirs in Western Siberia. The results of testing the algorithm, show that it performs more accurately and much faster compared to the manual setting by an expert. The coefficients have a clear regional localization, which allows the application of machine learning methods to predict petrophysical properties on new fields, and increase the reliability of analysis of large amount of data.

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