

Lithofacies Guided Core Description Using Unsupervised Machine Learning

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Abstract

Cores are the ground truth for reservoir characterization, and core description is the most common way to utilize core data by sedimentologists. It is very challenging to describe cores with high accuracy and efficiency due to the core quality and the limitation of human naked eyes. At the same time, conventional wireline log curves are the direct measurements of those cored formations which were deposited millions of years ago in different depositional environment. How to combine these two kinds of data together to improve the core description becomes very important, especially knowing that cores are usually cut in few wells due to the high cost associated with core cutting, storage and maintenance. This paper describes a simple way to group the wells drilled in an area based on the most common petrophysical log curves, such as Gamma Ray, Bulk Density and Neutron Porosity. Following, several unsupervised machine learning models will be built and the output of models will be used to guide the core description in the core lab to save time and improve accuracy. It is really useful for the revise and update of the traditional core description in a developed oil and gas field.

This methodology has been applied in some oil and gas fields by sedimentologists in Saudi Aramco and very positive results have been received.