Society of Petrophysicists and Well Log Analysts

Petrophysical Data-Driven Analytics

SPWLA's 1st Petrophysical Data-Driven Analytics Contest

Call for Team Registration

SPWLA PDDA SIG is excited to announce its first machine-learning contest!

The contest is open to all SPWLA members (including student members) who are interested in machine-learning applications in petrophysics. Top winning teams will be awarded prizes and invited to present their work at the PDDA SIG annual meeting. If you or your teams are interested in this contest, please preregister with Yanxiang Yu (pdda_sig@swpla.org) by submitting your team information, including names, affiliations and contacts, before January 31, 2020. A data repository will be ready in February 2020 on: https://github.com/pddasig/

Sponsoring Opportunities: SPWLA PDDA SIG is accepting sponsorship for this event to award the top winning teams. Please contact Yanxiang Yu (pdda_sig@swpla.org) for details.

SPWLA PDDA SIG Contest Committee: Yanxiang Yu, Yan Xu, Oghenekaro Osogba, Siddharth Misra, Brendon Hall, Chicheng Xu, and Weichang Li

Task: Sonic Log Synthesis

Background: Well logs are interpreted/processed to estimate the in-situ petrophysical and geomechanical properties, which is essential for subsurface characterization. Various types of logs exist, and each provides distinct information about subsurface properties. Certain well logs, like gamma ray (GR), resistivity, density, and neutron logs, are considered as "easy-to-acquire" conventional well logs that are run in most wells. Other well logs, like nuclear magnetic resonance, dielectric dispersion, elemental spectroscopy, and sometimes sonic logs, are only run in a limited number of wells.

Sonic traveltime logs contain critical geomechanical information for subsurface characterization around the wellbore. Often, sonic logs are required to complete the well-seismic tie workflow or geomechanical properties prediction. When sonic logs are absent in a well or an interval, a common practice is to synthesize them based on neighboring wells that have sonic logs. This is referred to as sonic-log synthesis or pseudosonic log generation.

Problem Statement: Compressional-wave traveltime (DTC) and shear-wave traveltime (DTS) logs are not acquired in all the wells drilled in a field due to financial or operational constraints. Under such circumstances, machine-learning techniques can be used to predict DTC and DTS logs to improve subsurface characterization. The goal of the "SPWLA's 1st Petrophysical Data-Driven Analytics Contest" is to develop data-driven models by processing "easy-to-acquire" conventional logs from Well 1, and using the data-driven models to generate synthetic compressional and shear traveltime logs (DTC and DTS, respectively) in Well 2. A robust data-driven model for the desired sonic-log synthesis will result in low prediction errors, which can be quantified in terms of Mean Absolute Error by comparing the synthesized and the original DTC and DTS logs.

You will be provided with two datasets: Well 1 dataset and Well 2 dataset. You need to build a generalizable data-driven models using the Well 1 dataset. Following that, you will deploy the newly developed data-driven models on the Well 2 dataset to synthesize DTS and DTC logs. The data-driven model should use feature sets derived from the following eight logs: caliper, neutron, gamma ray, deep resistivity, medium resistivity, shallow resistivity, photoelectric factor and density. The data-driven model should synthesize two target logs: DTC and DTS.

Evaluation Metrics

1. Contestant can be an individual or a group.
2. A contestant will submit the synthetized DTS and DTC logs for Well 2 as two separate .csv files. One file should contain depth vs. DTS and the second file should contain depth vs. DTC.
3. A contestant will submit the source code used for the sonic log synthesis and a brief report documenting the accuracy achieved in a few plots.
4. The judges will review the source code.
5. The judges will compare the synthetic logs with original logs for Well 2. Error in log synthesis will be quantified in terms of mean absolute error.
6. The contestant with best quality source code and best performance in log synthesis for Well 2 will be declared the winner for this competition.