

Real-time Forecasting and Prevention of Tip Screen-out Events using Deep Learning

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Dr. Hamed Soroush, CEO of Petrolern, will speak on Thursday, September 2, 2021 at 9:00 a.m. Central time.

The topic is “Real-time Forecasting and Prevention of Tip Screen-out Events using Deep Learning.”

Abstract

Screen-out is one of the major operational challenges during hydraulic fracturing. The most common type of screening out is tip screen-out (TSO), where induced fractures get packed off by proppant with no further propagation causing the pressure to build up and eventually spike. Essentially, almost all screen-outs occurs from a failure to cut sand on time. There are various indicators within real-time fracturing data, such as bottom hole pressure, slurry rate, proppant concentration and size, that can potentially signal when a TSO event is about to occur. An accurate forecasting model is required to predict TSO events and provide the assurance and guidance to operators to take preventative measures before screen-out occurs. To this end, we propose to use deep learning models to process fracturing data in real time and forecast the risks of screen-out events ahead of time. We propose a solution architecture that includes (i) a time series predictor module using sequential deep learning models that digests the bottom hole pressure data and forecasts the values of pressure in future, and (ii) a classifier module using ensemble learning models that receives the future values of pressure in conjunction with other static parameters and determines whether a screen-out event is plausible. The long short-term memory (LSTM) model is used in the predictor module to forecast bottom hole pressure data, and several classification models (e.g., decision tree, random forest, and neural network) are tested to classify the event based on forecasted pressure data. The proposed architecture is thoroughly

explored and successfully implemented to forecast and predict the likelihood of a TSO event 30 to 60 seconds ahead of time with an accuracy of over 90%. This solution readily shows the possibility to forecast such costly events for operators and save a tremendous amount of capital, meanwhile enhancing safety.

Biography

Dr Hamed Soroush is an internationally recognized geomechanics expert with more than 25 years of industry experience in different applications of rock mechanics in oil and gas, geothermal and carbon storage use cases. He has conducted or managed more than 250 consulting and research projects worldwide. Hamed is the CEO of Petrolern LLC providing strategic planning, leadership, and technical support for subsurface research and consulting projects. Prior to that, he held several positions with companies such as Dong Energy, Shell, Weatherford, Senenergy, GMI, and CSIRO. His current technical focus is on sustainable development of geothermal energy and carbon storage projects with advanced geomechanical analysis.

Hamed holds a BSc in Mining Engineering, an MSc in Rock Mechanics, and a PhD in Petroleum Engineering from Curtin University in Australia. He has published numerous journal and conference papers and has been selected as SPE Distinguished Lecturer three time in 2012, 2017 and 2020.