Shale Analytics

Instructor: Shahab D. Mohaghegh (Intelligent Solutions, Inc. & West Virginia University)

Description

Data-driven analytics is becoming an important competitive differentiation in the upstream oil and gas industry. When it comes to production from unconventionals, specifically, shale, companies are realizing that they are in possession of large amount of facts and information in the form of the data they have been collecting in the past several years. It has been proven beyond any reasonable doubts that when it comes to analysis and modeling of production from shale, our traditional techniques (Numerical Simulation, RTA, and Decline Curve Analysis) leave much to be desired. Relevant and domain-based implementation of Artificial Intelligence and Machine Learning in analysis and modeling of the collected data via field measurements can provide much needed insight that would overcome the biases, preconceived notions, and overwhelming assumptions that have dominated our traditional techniques.

Data-driven analytics is the set of tools and techniques that provides the means for extraction of patterns and trends in data and construction of predictive models that can assist in decision-making and optimization. Shale Analytics is the domain (reservoir completion and production engineering) based application of the state of the art Artificial Intelligence and Machine Learning for production and recovery optimization from shale wells. Shale Analytics integrates all relevant data (well, reservoir, completion, frac job, placement and stacking, and operation) with production history in order to model the complex physics of hydrocarbon production from shale. As the number of wells in an asset increases, so does the accuracy and reliability of the analytics.

Attendees will become familiar with the fundamentals of data-driven analytics, Artificial Intelligence and Machine learning including the most popular techniques used to apply them such as artificial neural networks, evolutionary computing, and fuzzy set theory.

This course will demonstrate through actual case studies (and real field data from thousands of shale wells) how to impact well placement, completion, and operational decision-making based on field measurements rather than human biases and preconceived notions.

Topics

- Basics of artificial intelligence (AI) and machine learning
  - Artificial Neural Networks (Deep Learning)
  - Fuzzy Set Theory

- Descriptive analytics
  - Impact of reservoir, completion, and operational characteristics on production
  - Organize and prepare the data for predictive modeling

- Predictive analytics
  - Honor known physics of fluid flow in shale
  - Train, calibrate, and validate data-driven predictive model
  - Avoid over-training (memorization) while promoting generalization

- Prescriptive analytics
  - Optimize completion practices
  - Optimize well spacing and stacking
  - Identify best service companies

- Introduction to AI-based dynamic modeling
  - Capturing well and reservoir dynamics
  - Address well interference (issues such as frac hits)

Why Attend?

The large amount of data that is routinely collected during production operation of shale wells can be utilized to gain a competitive advantage in optimizing production and increasing recovery.

Application of data-driven analytics and predictive modeling in the oil and gas industry is fairly new. A handful of domain experts have dedicated extensive amount of time and effort to develop and present the next generation of tools that incorporates these technologies in the petroleum industry. Unfortunately, hypes, buzz words, and marketing schemes around data analytics have overwhelmed the petroleum industry in the past couple

of years. Many with little to no understanding and knowledge of the physics and the geology of unconventional hydrocarbon resource have been marketing these hypes.

This course will demonstrate the power of Artificial Intelligence and Machine learning and the difference they can make for informed decision making when it comes to objectives such as completion optimization and well spacing and stacking once domain expertise becomes the foundation of their use and application in the unconventional resources.

Who Should Attend

This course is intended for completion engineers, production engineers and managers, reservoir engineers, geoscientists, asset managers, and unconventional team leaders.

Instructor

Shahab D. Mohaghegh, a pioneer in the application of AI, machine learning and data mining in the exploration and production industry, is professor of petroleum and natural gas engineering at West Virginia University, and the president and CEO of Intelligent Solutions, Inc. (ISI). He holds BS, MS, and PhD degrees in petroleum and natural gas engineering.

He has authored three books, more than 170 technical papers and carried out more than 60 projects for independents, national and international oil companies. He is an SPE Distinguished Lecturer and has been featured four times as a Distinguished Author in SPE's *Journal of Petroleum Technology (JPT)*. He is the founder of the SPE Petroleum Data-Driven Analytics Technical Section dedicated to AI, machine learning and data mining. He was honored by the U.S. Secretary of Energy for his technical contribution in the aftermath of the Deepwater Horizon (Macondo) incident in the Gulf of Mexico and was a member of the U.S. Secretary of Energy's Unconventional Resources Technical Advisory Committee in two administrations (2008-2014). He recently represented the United States on the International Standard Organization (ISO) carbon capture and storage technical committee (2014-2016).

Book

https://www.amazon.com/Shale-Analytics-Data-Driven-Unconventional-Resources/dp/3319487515/ref=sr_1_1?ie=UTF8&qid=1526214750&sr=8-1&keywords=shale+analytics