Big Data Analytics: What Can It Do for Petroleum Engineers and Geoscientists?

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ABSTRACT

Big data analytics has become quite the buzzword in recent years, and its growing application in E&P operations promises to be an exciting new development. It involves: (1) acquiring and managing data in large volumes, of different varieties, and at high velocities, and (2) using statistical techniques to “mine” the data and discover hidden patterns of association and relationships in large, complex, multivariate datasets. The ultimate goal is to develop data-driven insights for understanding and optimizing the performance of petroleum reservoirs. However, the subject remains a mystery to most petroleum engineers and geoscientists because of the statistics-heavy jargon and the use of complex algorithms.

This talk will provide a "gentle" introduction to big data analytics by focusing on: (a) easy-to-understand descriptions of the commonly-used concepts and techniques, (b) broad categories of E&P problems that can be solved with big data analytics, and (c) case studies demonstrating practical applications. The first example to be discussed involves building robust predictive models for oil production in an unconventional reservoir using well architecture and completion data as predictors. The second example involves the ability to predict the presence or absence of vugular zones in carbonate reservoirs based only on a standard suite of electric logs. The third example involves building a data-driven model from historical injection-production data in waterflooding operations for optimization of injection rates and locations. The focus of the talk will be on showcasing an expanded repertoire of statistical and machine learning techniques that can help develop data-driven insights for understanding and optimizing the performance of petroleum reservoirs.

Dr. Srikanta Mishra is Institute Fellow and Chief Scientist (Energy) at Battelle Memorial Institute. He is responsible for developing and managing a geoscience-oriented technology portfolio related to computational modeling and data analytics for geological carbon storage, shale gas development and improved oil recovery projects. He is the author of a forthcoming book on statistical modeling and data analytics for the petroleum geosciences to be published by Elsevier. He holds a PhD degree from Stanford University, an MS degree from University of Texas and a BTech degree from Indian School of Mines – all in Petroleum Engineering.