Artificial Intelligence, Machine Learning and Data Analytics for Energy Exploration and Production (AIM-DEEP) Seminar Series Presents

Applied Transfer Learning for Production Forecasting in Shale Reservoirs

Dr. Uchenna Odi,
Aramco Americas

Monday, September 20, 2021, noon-1pm CST
UH Petroleum Engineering, Technology Bridge, Room 124

ABSTRACT:
There are documented cases of machine learning being applied to different segments of the oil and gas industry with different levels of success. These successes have not been readily transferred to production forecasting for unconventional oil and gas reservoirs because of sparsity of production data at the early stage of production. Sparsity of unconventional production data is a challenge but transfer learning can mitigate this challenge. Application of machine learning for production forecasting is challenging in areas with insufficient data. Transfer learning makes it possible to carry over the information gathered from well-established areas with rich data to areas with relatively limited data. I outline the theory along with the application of transfer learning in to aid in production forecasting. Similarity metrics are utilized in finding candidates for transfer learning by using key drivers for reservoir performance. Key drivers include similar reservoir mechanisms and subsurface structures. After training the model on a related field with rich data, most of the primary parameters learned and stored in a representative machine or deep learning model can be re-used in a transfer learning manner. By employing the already learned basic features, models with sparse data are enriched using transfer learning.

With the help of the insights transferred from related sites with rich data, the uncertainty in production forecasting has decreased, and the accuracy of the predictions increased. As a result, the details of selecting a related site to be used for transfer learning along with the challenges and steps in achieving the forecasts have been outlined in detail. There are limited studies in oil and gas literature on transfer learning for oil and gas reservoirs. If applied with care, it is a powerful method for increasing the success of models with sparse data. This study uses transfer learning to encapsulate the basics of the substructure of a well-known area and uses this information to empower the model. This study investigates the application to unconventional shale reservoirs, which have limited studies on transfer learning.

BIO:
Dr. Uchenna Odi is a Petroleum Engineering Specialist and Data Scientist at Aramco Americas. He received his Ph.D. and M.S. in Petroleum Engineering from Texas A&M University, in addition to his B.S. in chemical engineering and Executive MBA from the University of Oklahoma. His prior work at Texas A&M, MIT, and ENI focused on modeling EOR processes including combined CO_2 enhanced gas recovery with CCS, chemical flooding optimization, and nanoemulsion EOR. His recent work at Devon Energy and Aramco Americas has focused on developing advanced analytical and AI workflows for the subsurface. Examples include facies classification/prediction, production anomaly detection, production forecasting, and geospatial machine learning, Data Science, EOR/EGR, CO_2 Sequestration, Reservoir Fluids, and Optimization.

Please contact **Ahmet Ersahin** aersahin@CougarNet.UH.EDU to receive a ZOOM link or attend in person. AIM-DEEP is supported by its sponsors. AIM-DEEP Seminar Series contains information about future seminars. For other information about AIM-DEEP please contact its Director, **Prof. Fred Aminzadeh**, faminzad@AIM-DEEP.Central.uh.edu.