Reconstruction of a Ketton Limestone using Generative Adversarial Networks

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This seminar will be structured in two parts:

2. Recent results on stochastic image reconstruction using generative adversarial networks.

Abstract

Stochastic image reconstruction is a key part of modern digital rock physics and materials analysis that aims to create numerous representative samples of material micro-structures for upscaling, numerical computation of effective properties and uncertainty quantification. We present a method of three-dimensional stochastic image reconstruction based on generative adversarial neural networks (GANs) [1]. GANs represent a framework of unsupervised learning methods that require no a priori inference of the probability distribution associated with the training data. Using a fully convolutional neural network allows fast sampling of large volumetric images [2]. We apply a GAN based workflow of network training and image generation to an oolitic Ketton limestone micro-CT dataset. Minkowski functionals, effective permeability as well as velocity distributions of simulated flow within the acquired images are compared with the synthetic reconstructions generated by the deep neural network. While our results show that GANs allow a fast and accurate reconstruction of the evaluated image dataset, we address a number of open questions and challenges involved in the evaluation of generative network based methods.

Speaker Bio

Lukas is a PhD student under supervision of Olivier Dubrule and Martin Blunt at Imperial College London. He holds a Bachelor’s degree in Petroleum Engineering from the University of Leoben and a Master’s degree in Petroleum Engineering. Before his studies at Imperial College, Lukas has performed a number of internships in the oil and gas industry in operations, research and services. Recently, he and his teammate have won the SEG contest in machine learning for supervised classification of well log facies. At the EAGE hackathon for machine learning, his team received best execution and peoples choice award for best project; Seismic forward modeling and inversion based on generative networks (www.model2seismic.com).

References
