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The Future of Core Analysis: Estimating of Effective Porosity via µCT & Transfer Learning

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Currently, µCT has emerged as a valuable tool for analyzing rock samples on a standard core plug scale. Typically utilized in Special Core Analysis (SCAL) as an assessment instrument before the filtration experiment, µCT serves to examine core samples and identify any potential defects, cracks, or heterogeneities that could influence flow behavior during the procedure. Despite the relatively low resolution of such µCT images, they contain valuable information on lithological features and reservoir properties. This study focuses on the development and validation of an integrated methodology that combines µCT scanning of core plugs with machine learning algorithms to predict effective porosity values. For this work, we created a dataset of micro-tomographic images for standard samples of various types of reservoir rocks and annotated all images based on experimentally determined values for the samples. Utilizing a transfer learning approach, we trained a ResNet50 model to predict effective porosity values for standard core plugs. The results demonstrated high validation scores for the obtained values. This approach can be used to optimize Standard Core Analysis (SCA) procedures, reducing the time and financial costs associated with hydrocarbon extraction procedures from core plugs.

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