Hydraulic Fracture Characterization Using Continuous Wavelet Transform for Treating Pressure, Calibrated with Fiber Optics Data

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Mohamed Adel Gabry is a Postdoctoral Fellow at the University of Houston. The topic is "*Hydraulic Fracture Characterization Using Continuous Wavelet Transform for Treating Pressure, Calibrated with Fiber Optics Data*". His seminar will be at 9:00 a.m. Central time on Thursday, August 7, 2025.

Abstract

This presentation explores how the Continuous Wavelet Transform (CWT) can serve as a powerful and cost-effective tool to better understand hydraulic fracture propagation and fracture-formation interactions—using nothing more than treating pressure data. By treating CWT as a mathematical "microscope," we are able to extract high-resolution insights from pressure signals and visualize dynamic fracture behavior in real time. Dr. Gabry will walk through how normalized CWT scalograms identify key patterns in fracture growth-such as fracture length extension, height growth, and interactions with high leak-off zones—all by interpreting specific color bands within the scalogram. These results have been benchmarked against conventional diagnostics like the Nolte-Smith plot and Moving Reference Point (MRP) method and further validated using fiber-optic strain data and time-dependent microseismic events. The technique was applied to public datasets from the Marcellus Shale (MSEEL project), revealing strong agreement between CWT scalogram patterns and known physical responses. For instance, red bands (coefficients

0.8–0.95) reliably indicated height growth or leak-off interactions, while blue regions (0.0–0.25) suggested insufficient fracture width. Ultimately, this talk will demonstrate how normalized CWT provides a low-cost, real-time, high-resolution diagnostic for fracture analysis in unconventional reservoirs-offering operators a new way to upscale machine learning models, optimize stimulation designs to improve recovery.

Biography

Mohamed Adel Gabry is a Postdoctoral Fellow at the University of Houston with over a decade of hands-on experience as a Subsurface Petroleum Engineer. His background spans both conventional and unconventional reservoir development, with specialized expertise in hydraulic fracturing, acid stimulation, well completions, and production optimization. His recent work centers on advancing signal processing in upstream operations, enabling the integration of machine learning and data-driven technologies. His research emphasizes cutting-edge fracture diagnostics, intelligent well optimization, and adaptive reservoir management.