

2023 ARMA Future Leader Webinar Series

Every Two Weeks on Fridays 9-10 AM MT



6th lecture: May 05, 2023

Please reach out to shahrzad.roshankhah@utah.edu to get the Zoom meeting information.

Speaker: Yu (Olivia) Meng

Title & Abstract:

Photoporomechanics: a new technique to explore grain-scale mechanisms for fluid-driven fractures in granular media

Multiphase flow through granular and porous materials exhibits complex behavior, the understanding of which is critical in many natural and industrial processes. While fluid-fluid displacement in rigid porous media has been studied in depth, the understanding of the interplay between multiphase flow and granular mechanics remains an ongoing challenge.

Photoelasticity has been used as an experimental technique to quantify the internal stresses within solid bodies for decades. In this talk, we extend this technique to producing millimeter-size, residual-stress-free, spherical photoelastic particles that form granular assemblies with connected pore space, thus permitting for the first time the visualization and quantification of effective stress in coupled granular-fluid systems. We hereby refer to this novel experimental method as photoporomechanics. We employ photoporomechanics to study fluid-induced deformation and fracture of granular media, with a focus on its underpinning grain-scale mechanics. We develop macroscopic mathematical models that explain the transition from a fluid-like to a solid-like state underpinning the fracturing process, a phenomenon that plays a key role in real-world processes, from drying of superhydrophobic surfaces, to methane venting from lake and marine sediments, and the formation of desiccation cracks in soils.

Biography:

Yue (Olivia) Meng is currently a postdoc under the supervision of Dr. Ching-Yao Lai in the Department of Geoscience at Princeton University. She received her master's and PhD (2022) degrees in Civil and Environmental Engineering from MIT, supervised by Professor Ruben Juanes. Her research interests lie in multiphase flow in porous media, granular mechanics, energy and environmental sciences. She combines continuum theory, discrete element modeling and novel experimental technique to study the fundamental mechanics involving solid-fluid coupling. She is currently studying the granular physics of sea ice, its impact on icebergs calving and response to global warming.

