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Rheological behavior of partially-wet granular matter RAMIN GHELICHI, Postdoctoral Associate, KEN KAMRIN, Assistant Professor, KAMRIN GROUP TEAM — The topic of wet granular material modeling is an open area of study. In this talk we present a comprehensive continuum model for wet granular matter, which is informed by a novel Discrete Element Method (DEM), which tracks the fluid content coating each grain as well as a variable fluid-bridge volume. We have devloped a DEM simulation method with a history-dependent potential based on the Hertz-Mindlin contact in compression and evolving capillary forces in tension. The capillary bridge in the simulations forms based on the volume of the fluid on each particle. First, we determine the cohesive force between grains, which is a function of grain separation, bridge volume, grain geometry, and fluid properties. The volume of the bridges also evolves in time, which affects the cut-off distance in bridges and the force-separation function. The other important factor which has been considered in the model is the particle roughness, which has a significant effect on the capillary force function. The effect of fluid viscosity is also considered. The second step in this work is to utilize the DEM results to identify a constitutive model that can explain the plastic behavior (flow rule) of a dense granular assembly under varying degrees of wetness.

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