Statistical mechanics framework for granular packings

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Abstract: We have constructed a statistical mechanics framework for granular packings. The starting point is an analogue to the Boltzmann ensemble derived from a conservation law for the stress tensor. This enables us to define a granular temperature related to maximum configurational entropy. We have verified this ensemble on simulated static packings of frictionless disks, although the formalism is more general (Phys. Rev. Lett. 99, 038002 (2007)).
A field theory for the jamming transition based on the ensemble shows that it has the features of a zero-temperature transition in granular temperature.