Seminar

Soft Disk Packings: Unjamming and Stress Localization

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We develop a scaling theory of the unjamming transition of soft frictionless disks in two dimensions. We show that distributions of a local order parameter, defined as the area associated with the contacts between disks, exhibits divergences as the transition is approached. Using a mean-field analysis that includes three-body correlations we demonstrate that these divergences predict several observed power-law behaviours of global quantities near the transition. The global elastic properties of such jammed packings are governed by the constraints of vector force balance at the microscopic scale. We develop a framework for the stress response of such disordered media that respects this constraint. We introduce local gauge degrees of freedom which allow us to uniquely determine the contact forces that develop in response to externally imposed stresses. By mapping this response to diffusion in the underlying contact network, we show that this naturally leads to spatial localization of forces as has been observed in experiments using photoelastic soft disks.

Wednesday, Jul 18th 2018

4:00 PM (Tea/Coffee at 3:30 PM)

Seminar Hall, TIFR-H