Abstract Submitted
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Critical correlations and dynamics of force networks in a model of jammed granular solids[1] KONSTANTIN TURITSYN, Los Alamos National Laboratory, ILYA GRUZBERG, University of Chicago, JULIE STERN, SUNY Stony Brook, BERNARD NIENHUIS, University of Amsterdam — Distribution and correlations of contact forces in two-dimensional static granular packings is studied within a framework of (Edwards) Force Network Ensemble. A two-dimensional "snooker" model without friction is shown to be critical. An explicit expression for the force correlation function is derived using Bethe Ansatz. The force correlation function decays algebraically with universal exponent -2. This result implies that the system satisfies (extended) Harris criterion, and that the scale invariant force networks (studied by Ostojic et. al. Nature, 439, 2006) belong to the universality class of the usual percolation transition. These analytical results are confirmed by direct numerical sampling from the ensemble. It is also shown that the microscopic dynamics of forces experiences critical slowdown: the force network relaxation time grows like the sixth power of the system size. This result explains the slow convergence of standard Monte Carlo algorithms, and suggests novel approaches for studying the model.

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