Abstract Submitted
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Local pressure distributions in the force network ensemble for granular media BRIAN TIGHE, Universiteit Leiden — We present an analytic calculation of the probability distribution of pressure on individual grains in a static granular packing. We maximize entropy within an ensemble of all possible force networks on a fixed contact network, which incorporates force balance on each grain. Similar to energy in the microcanonical ensemble, the average pressure in each configuration is fixed. Subject to this global constraint alone, entropy maximization would yield a pressure distribution with an exponential tail. We demonstrate that, as a direct consequence of local force balance, there exists an additional global conserved quantity. Maximizing entropy while also respecting this new conserved quantity, we find a pressure distribution that, in frictionless packings, grows as a power law for small pressures and decays with a Gaussian tail. The form of the distribution is confirmed by numerics. As we increase the coefficient of friction, the tail approaches an exponential.

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