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**Statistics of force networks<sup>1</sup>**

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We study the statistics of contact forces in the force network ensemble, a minimal model of jammed granular media that emphasizes the role of vector force balance. We show that the force probability distribution can be calculated analytically by way of an analogy to equilibrium ensemble methods. In two dimensions the large force tail decays asymptotically as a Gaussian, distinct from earlier predictions, due to the existence of a conserved quantity related to the presence of local vector force balance. We confirm our predictions with highly accurate statistical sampling – we sample the force distribution over more than 40 decades – permitting unambiguous confrontation of theory with numerics. We show how the conserved quantity arises naturally within the context of any constant stress ensemble.

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