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Contact Numbers in 2D Granular Systems[1] MATTHIAS SPERL, TRUSHANT MAJMUDAR, ROBERT BEHRINGER, Duke University — There exists a critical density below which a granular system is no longer mechanically stable. Above this threshold, the particles form stable contacts with each other, while below there are no permanent contacts. We introduce a method to determine the number of contacts per particle with high accuracy: Using stress induced birefringence to identify contact points, the critical density can be identified with an uncertainty of 0.5%. For a binary mixture of frictional disks we find a discontinuous transition in the number of contacts per particle from zero to a value around 2.5; the transition point is located at an area fraction of 0.845. For higher densities, the increase in the contact number is compatible with a square-root law; however, different exponents close to 0.5 cannot be ruled out yet. At the same transition point, the average force in the system increases linearly with density.

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