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The onset of jamming as the sudden emergence of an infinite k -core cluster¹

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A theory is constructed to describe the zero-temperature jamming transition as the density of repulsive soft spheres is increased. Local mechanical stability imposes a constraint on the minimum number of bonds per particle; we argue that this constraint suggests an analogy to k -core percolation. The latter model can be solved exactly on the Bethe lattice, and the resulting transition has a mixed first-order/continuous character. The exponents characterizing the continuous part appear to be the same as for the jamming transition. Finally, numerical simulations suggest that in finite dimensions the k -core transition can be discontinuous.

¹Work done in collaboration with Andrea Liu and Lincoln Chayes