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The link between the geometric and mechanical phase transitions at jamming PETER MORSE, ERIC CORWIN, Department of Physics and Material Science Institute, University of Oregon — We have observed a phase transition in the geometrically defined network of nearest neighbors of sphere packings as a function of packing density. By creating packings in a range of spatial dimension, from $d = 2$ to $d = 9$, we have amassed evidence suggestive of an upper critical dimension for this transition of $d \leq 3$. However, as of yet we do not have a field theory to confirm this fact. It is suggestive that the geometric transition point coincides with the mechanical jamming point in all dimensions, raising the question of how the geometry of nearest-neighbors relates to the formation of contacts necessary for mechanical stability. We present an answer to this question based on the evolution of geometric constraints as mechanical jamming is approached. In addition, we find that many of the requirements for renormalization are met by the order parameters associated with the geometric phase transition. Taking cues from traditional condensed matter systems and networking theory we explore various renormalization group approaches to this phase transition.

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