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The Effect of Loops in Connectivity Percolation VARDA F. HAGH, Arizona State University, M. F. THORPE, Arizona State University- Rudolf Peierls Centre for Theoretical Physics, University of Oxford — We introduce a new method that employs the concepts of redundancy and stress from rigidity theory to study the effect of loops in connectivity percolation. In the rigidity percolation redundant bonds are not necessary to maintain the rigidity of a network. These redundant bonds cause internal stress in some regions and as a result those regions carry finite forces that characterize them as over-constrained. In connectivity percolation the bonds that cause a loop correspond to redundant bonds in rigidity and all the bonds that are part of a loop are equivalent to over-constrained bonds in rigidity. To illustrate this we start with a network in 2D where all the bonds are present and remove the bonds randomly. Then using renormalization groups and numerical simulations we study the behavior of loops near percolation transition in hierarchical networks and lattices.

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