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Interdependent Lattice Networks in High Dimensions STEVEN LOWINGER, GABRIEL CWILICH, SERGEY BULDYREV, Yeshiva University — We study the mutual percolation of two interdependent lattice networks following the procedure outlined by Buldyrev *et al* [1]. We studied lattices of dimensions 2, 3, 4, 5 and 6. We imposed that the length of interdependent links connecting the nodes from one lattice to the other be less than a certain value, r. We find that for each dimension, $D < 6$, there is a value of $r = r_I > 1$ such that for $r \geq r_I$, the cascading failures occur as a discontinuous first order transition, while for $r < r_I$, the system undergoes a continuous second order transition, as in the classical percolation theory. $r_I$decreases when the dimension of the lattice increases. For $D = 6$, $r_I = 1$, which is the same as in random regular (RR) graphs with the same degree (coordination number) of nodes. $D = 6$ is the upper critical dimension for classical percolation, the point at which the critical exponents of the lattice model become identical to those of RR graphs. We found that in all dimensions the maximal vulnerability of the networks, as a function of r, is achieved at a distance of $r = r_{max} > r_I$, but for $r > r_{max}$ the vulnerability starts to decrease as $r \to \infty$. However, the decrease becomes less significant as the dimension increases and becomes negligible for $D = 6$. Results on how the parameters of the transition scale with the size of the system will be presented. [**1**] Catastrophic cascade of failures in interdependent networks**,** Buldyrev, Parshani, Paul, Stanley& Havlin, ***Nature*** 464**, 1025-1028 (15 April 2010)**

Steven Lowinger
Yeshiva University

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