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Distribution of Betweenness in Networks Failing by Overload MARK TUCHMAN, GILAD BARACH, SERGEY BULDYREV, GABRIEL CWILICH, Department of Physics, Yeshiva University — We study the Motter and Lai [1] model of cascading failures based on the betweenness centrality of the nodes, for a random regular network. After removing a fraction of the nodes, we study the size of the giant component at the end of the cascade of failures, as a function of the fraction of the nodes that survived the initial attack. We find that the type of transition through which the network disintegrates changes from first order to second order as the maximum capacity of the nodes increases. We examine the distribution of the betweenness of the nodes in the vicinity of the critical fraction of initial surviving nodes, and we look at the distribution at different stages of the cascade. We explore the disintegration of the network when the size of the initial attack approaches the percolation threshold of the network. We compare our results with an analytical ansatz of the role of subcomponents of the network nearly isolated from the giant component.

[1] A. Motter, Y. Lai, "Cascade-based attacks on complex networks," *Phys. Rev. E* **66**, 065102(R) (2002)

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