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> The random graph of Erdos and Renyi is one of the oldest and best studied models of a network, and possesses the considerable advantage of being exactly solvable for many of its average properties. However, as a model of real-world networks such as the Internet, social networks or biological networks it leaves a lot to be desired. In particular, it differs from real networks in two crucial ways: it lacks network clustering or transitivity, and it has an unrealistic Poissonian degree distribution. In this paper we review some recent work on generalizations of the random graph aimed at correcting these shortcomings. We describe generalized random graph models of both directed and undirected networks that incorporate arbitrary non-Poisson degree distributions, and extensions of these models that incorporate clustering too. We also describe two recent applications of random graph models to the problems of network robustness and of epidemics spreading on contact networks.

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