Cantwell, George T.; Kirkley, Alec; Newman, M. E. J.
The friendship paradox in real and model networks. (English) Zbl 07395656
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Summary: The friendship paradox is the observation that the degrees of the neighbours of a node in any network will, on average, be greater than the degree of the node itself. In common parlance, your friends have more friends than you do. In this article, we develop the mathematical theory of the friendship paradox, both in general as well as for specific model networks, focusing not only on average behaviour but also on variation about the average and using generating function methods to calculate full distributions of quantities of interest. We compare the predictions of our theory with measurements on a large number of real-world network datasets and find remarkably good agreement. We also develop equivalent theory for the generalized friendship paradox, which compares characteristics of nodes other than degree to those of their neighbours.

MSC:
90B10 Deterministic network models in operations research

Keywords:
friendship paradox; generalized friendship paradox; random graphs; real-world networks; generating functions; assortative mixing

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