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Inferring global network properties from egocentric data with applications to epidemics

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Abstract

Social networks are rarely observed in full detail. In many situations properties are known for only a sample of the individuals in the network and it is desirable to induce global properties of the full social network from this "egocentric" network data. In the current paper we study a few different types of egocentric data, and show what global network properties are consistent with those egocentric data. Two global network properties are considered: the size of the largest connected component in the network (the giant), and secondly, the possible size of an epidemic outbreak taking place on the network, in which transmission occurs only between network neighbours, and with probability p . The main conclusion is that in most cases, egocentric data allow for a large range of possible sizes of the giant and the outbreak. However, there is an upper bound for the latter. For the case that the network is selected uniformly among networks with prescribed egocentric data (satisfying some conditions), the asymptotic size of the giant and the outbreak is characterised.