

The role of weak links in the society: Empirical study of a huge network

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We study data obtained from a major mobile phone provider which contains records of all phone calls aggregated in periods of two weeks. We construct a network from these data where the nodes are the consumers and the links between them are created if they call each other. The duration of the calls is a natural measure of the intensity of the social relationship between two persons. The weighted network obtained this way consists of more than 7 million nodes which is probably the largest social network, which have been analyzed in detail. Using percolation theory as well as concepts of motif intensity and coherence we identify communities in the network. Such communities are connected by links of high weights while they are bridged by weak links, in perfect agreement with Granovetter's hypothesis. If in a percolation process is carried out by removing the links in the order of their weights starting with the strongest one, there is no percolation transition in the system, while there is a sharp transition if the procedure is started with the weakest link.

Size matters: Some stylized facts of the market revisited

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We reanalyze high resolution data from the New York Stock Exchange and find a monotonous (but not power law) variation of the mean value per trade, the mean number of trades per minute and the mean trading activity with company capitalization. We show that the second moment of the traded value distribution is finite. Consequently, the Hurst exponents for the corresponding time series can be calculated. These are, however, non-universal: The persistence increases with larger capitalization and this results in a logarithmically increasing Hurst exponent. A similar trend is displayed by intertrade time intervals. Finally, we demonstrate that the distribution of the intertrade times is better described by a multiscaling ansatz than by simple gap scaling.