Detrended Fluctuation Analysis on Correlations of Complex Networks Under Attack and Repair Strategy

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Abstract: We analyze the correlation properties of the Erdös-Rényi random graph (RG) and the Barabási-Albert scale-free network (SF) under the attack and repair strategy with detrended fluctuation analysis (DFA). The maximum degree k_{max}, representing the local property of the system, shows similar scaling behaviors for random graphs and scale-free networks. The fluctuations are quite random at short time scales but display strong anticorrelation at longer time scales under the same system size N and different repair probability p_{re}. The average degree $\langle k \rangle$, revealing the statistical property of the system, exhibits completely different scaling behaviors for random graphs and scale-free networks. Random graphs display long-range power-law correlations. Scale-free networks are uncorrelated at short time scales; while anticorrelated at longer time scales and the anticorrelation becoming stronger with the increase of p_{re}.

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