

**[P12] Epidemic Spreading on Scale-Free Networks**

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We study a susceptible-infected-susceptible (SIS) model on scale free networks. Recent careful mean field studies reveal that an epidemic threshold for the SIS model is given by  $\lambda_c = 1/\Lambda_1$  where  $\Lambda_1$  is the largest eigenvalue of the adjacency matrix corresponding to an underlying network. Being combined with the graph theory, the mean field theory predicts that  $\lambda_c = 0$  in all networks whose largest degree diverges in the infinite size limit. We challenge the mean field picture by taking account of statistical fluctuations. Our phenomenological theory predicts that the SIS model may have a non-vanishing threshold  $\lambda_c \neq 0$ . For  $\lambda < \lambda_c$ , the active state predicted by the mean field theory is unstable against fluctuations, which lead to the Griffiths phase characterized by an extremely slow dynamics. The non-vanishing threshold and the Griffiths phase are confirmed by extensive Monte Carlo simulations on a deterministic scale-free network model.