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# An epidemic model on computer networks

We study failure spread scenarios in computer/communication networks. A general epidemic model of type *Susceptible-Infected-Disabled* is analyzed and takes into account two levels of failure caused by the attack of a virus or a worm for instance. The first level takes place when the failure can be repaired without disconnecting the node, preserving the connections passing through this node. The second failure level involves that the node must be replaced and, consequently, the connections are dropped.

The dynamic process is given by a Markov chain in continuous time according to the transmission and recovery processes. Several results on both types of steady states, disease-free and endemic, are given and an epidemic threshold is stated. Here the network features are summarized by the largest eigenvalue of the weighted adjacency matrix of the network.

On the other hand, a second model is presented according to the heterogeneous mean-field approach. In this case, the network features are given by both the node degree distribution and the conditional probabilities (i.e. the connections of the neighbours of each node).

We have carried out several stochastic simulations using different network topologies (e.g. *scale-free* generated via Barabási-Albert, *random* generated via Erdős-Rényi, *homogeneous*, ...). Finally, a complete-parameter comparison is performed in order to evaluate the theoretical approaches presented.

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