

Modelling the dynamical interaction between epidemics on overlay networks

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Abstract

Epidemics seldom occur as isolated phenomena. Typically, two or more viral agents spread within the same host population and may interact dynamically with each other. We present a general model where two viral agents interact via an immunity mechanism while propagating simultaneously on two networks connecting the same set of nodes. Exploiting a correspondence between the propagation dynamics and a dynamical process performing progressive network generation, we develop an analytic approach that accurately captures the dynamical interaction between epidemics on overlay networks. The formalism allows for overlay networks with arbitrary joint degree distribution and overlap. To illustrate the versatility of our approach, we consider a hypothetical delayed intervention scenario in which an immunizing agent is disseminated in a host population to hinder the propagation of an undesirable agent (e.g. the spread of preventive information in the context of an emerging infectious disease).