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Probabilistic SI Disease Dynamics on a Finite Fixed Network

In this talk a novel probabilistic model is presented for infectious disease transmission on a finite network specified as a fixed weighted digraph. Individuals (network nodes) are classified as either susceptible or infectious, with transmission rates along weighted network arcs. The model is appropriate for diseases with no recovery, or for the initial outbreak of diseases with recovery. Our method to analyze the model yields the exact probability distribution of the time at which a given individual in the network becomes infected. This distribution can be used to compute the probability that any given individual is infected, as well as the expected number of infectious individuals at any time. Nodes can also be identified more generally, such as farms or cities, and the method can be applied to biological networks with estimated transmission rates on the network arcs.