



Dynamic Social Networks with Beneficial and Detrimental Interactions

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Abstract

The complex social relationships in society can be understood as a network. In recent years, complex networks have given researchers a more accurate picture of social interactions than aggregation models such as compartmental models had hitherto provided. Compartmental models which collect individuals into population classes based on infection state, for instance, had left out local interactions that could be important for understanding social relationships and attendant phenomena such as epidemics, rumors, etc., in the society. Topics of modeling for complex networks have included the dynamics of social relationships and how they affect disease and opinion spread. Different types of relationships, such as friendly or unfriendly, have been considered. In this dissertation we study social network models in which interactions can be beneficial or detrimental to the parties involved. Motivated by HIV, in which a person's infection status is not readily known to others, we implement a model where individual decisions may affect the disease transmission. Individuals in such a situation may use information about each other's behavior such as the number of connections (degree) to form a risk-benefit assessment for whether to engage in a relationship. We study this model for a single benefit case, and then a multiple benefit case. We also investigate the case where offspring may inherit the benefit of their parents to determine how this affects disease transmission. We find that human behavior and individual differences can affect infection transmission and that adaptation in behavior can mitigate the disease prevalence.