

CHAPTER 1 INTRODUCTION

There are many aspects of social networks that make them a useful tool in the field of epidemiology. And while there are a number of important developments to have come out of social network research relating to disease diffusion, there are also a number of pitfalls when employing them on real-world social networks. In this work we address the problems of generating social networks that approximate close-proximity interaction from fine-grained spatiotemporal data, accurately modeling important aspects of these networks, and using these networks to improve decisions about vaccination policies and disease surveillance.

Social networks represent the relationships between individuals of a population. Online social networks (e.g., Facebook, Okrut, Baidu, etc.) replicate the structure of real-life relationships, which can be as strong as family members or as weak as acquaintances. This social structure can also be due to well-defined interactions such as communication over email [58], collaboration on a scientific publication [9], or the observed friendship between individuals [111].

Interest in social networks has a long history starting with famous experiments by Milgram [72] that suggested any two individuals were separated by “six degrees of separation” through acquaintances. In 1977 Zachary [111] observed that the split of a karate club was dictated by the structure of the friendship network. Barabasi et al. [9] use social networks to study the evolution of scientific collaboration. More recently Mas and Moretti [66] used social networks representing line-of-sight visibility