Degree-Based approach for Epidemiological Model on a Homogeneous Complex Network

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Abstract

This seminar explores how complex networks can serve as a powerful framework for modeling transmission phenomena within a population, with a particular focus on epidemiology.

We begin by introducing the classical deterministic SIR epidemiological model ([1]), which provides a foundational understanding of disease transmission dynamics under the assumption of homogeneous mixing. However, real-world populations exhibit significant heterogeneity in contact patterns, requiring more sophisticated modeling approaches.

To address these complexities, we will review various mean-field approximations that, incorporating stochasticity in population structure, offer a more realistic representation of disease spread ([2]).

The core of the seminar will focus on a *Degree-Based Mean-Field* approach for homogeneous complex networks. We will explore its analytical formulation and discuss the implications of network structure on epidemic thresholds ([3]).

References

1. Keeling, Matt J., and Pejman Rohani. Modeling infectious diseases in humans and animals. Princeton university press, 2008.

2. Pastor-Satorras, Romualdo, et al. "Epidemic processes in complex networks." Reviews of modern physics 87.3 (2015): 925-979.

3. Moreno, Yamir, Romualdo Pastor-Satorras, and Alessandro Vespignani. "Epidemic outbreaks in complex heterogeneous networks." The European Physical Journal B-Condensed Matter and Complex Systems 26 (2002): 521-529.