Assignment #9 (Exponential Random Graph Models)

What factors contribute to the structure of an advice and collaboration network?

The data for this exercise consist of doctors relationships. The data were collected in 1966 be a team led by James Coleman (Coleman, Katz & Menzel). The group collected data on the doctors' adoption of a new drug, tetracycline.

They were asked: 1.) “When you need information or advice about questions of therapy where do you usually turn?" 2.) "And who are the three or four physicians with whom you most often find yourself discussing cases or therapy in the course of an ordinary week - last week for instance?" 3.) "Would you tell me the first names of your three friends whom you see most often socially?"

They collected these data in several towns, but we will look at the Peoria doctor’s network with these relationships summed.

One nodal attribute is “time” which is the amount of time that doctors have spent in Peoria.

> How long have you been practicing in this community?
>
> 1 a year or less
> 2 more than a year, up to two years
> 3 more than two years, up to five years
> 4 more than five years, up to ten years
> 5 more than ten years, up to twenty years
> 6 more than twenty years
> 9 no answer

You can find the network stored in peoria.RDA in the data folder.

1. Basic Description

A. Plot the graph in statnet and summarize the major features of the network.

2. ERGM

A. Build a baseline model that describes how density relates to the Peoria Doctors Graph

B. Add the effect of homophily on time in the community

C. Add the effect of local clustering (e.g. triangle) and control for any model degeneracy (gwesp(0, fixed = TRUE)).

D. Does reciprocity (or mutuality) play a role in structuring this network?

3. ERGM Goodness-of-fit and Diagnostics

Make sure that the model works by checking the goodness-of-fit and diagnostics.