

# EIGHT HOUR WRITTEN CANDIDACY EXAMINATION

## SOCIAL NETWORKS

### PART I

March 18, 2015

Examination Committee:

David Hachen (chair)

Omar Lizardo

David Gibson

Please answer the question in Section A and then one (1) question from Section B. Answer all parts of each question as thoroughly as possible given the time allotted. Your answers should include reasoned arguments and be informed by empirical research. You have four hours to answer these two questions. Make sure to allocate your time wisely so that you answer each question adequately. Some students find it helpful to make an outline before answering each question. Please make sure to include references to the literature -- authors' last names and when necessary to distinguish multiple works by the same author, relevant years of publication. You can include titles of articles or books if you want.

#### Section A: You must answer this question.

A1. Suppose that a beginning graduate student asked you about each of the terms listed below. For four (4) of the following items, briefly state: (a) what it refers to as you might explain it to the student; (b) where it may apply in sociological analysis; and (c) key references where the student might look to learn more about it.

- a triadic closure
- b strength of weak ties
- c agent based modeling
- d choice versus induced homophily
- e social contagion
- f small world
- g two mode network
- h role equivalence
- i betweenness centrality
- j stochastic actor-based models
- k community detection
- l preferential attachment

## Section B: Answer one of the following three questions.

B1. In the last decade we have seen the development of numerous statistical methods for analyzing social networks including ERGMs, SABM (Stochastic Actor-Based Models), QAP, agent-based models and simulations, network rewiring algorithms (graph generators), to name a few. First, what are the problems in using OLS and logistic regression statistical methods to model social networks and their impacts. Second, what do you think are the two most promising statistical methods for analyzing social networks? Discuss each method being sure to discuss what it is, when it can be used, what its assumptions are, and why you think it is a promising statistical approach.

B2. The concept of degree (degree centrality, network size, network range) figures prominently in social network theories and research.

1. Compare and contrast two ways in which researchers have measured the degree of persons in social networks. Be sure to discuss both the various types of data that can be used to measure degree, the specific operational definitions of degree, and problems you think the measure has or problems with other measures that you think the measure overcomes.
2. Why is it important to have accurate and reliable measures of degree? What are some of the most important research questions that you think need to be addressed that require reliable and valid data on the degree distribution within a population?

B3. The study of the diffusion and contagion is one of the most important areas of theoretical and applied network research. Discuss the ways in which social scientists have attempted to formalize the notion of diffusion and contagion. In particular be sure to deal with formal methods attempting to characterize the susceptibility of agents to the behavior of others, as well as attempts to characterize the evolution of adoptions over time. Finally, discuss recent attempts to use statistical (e.g. regression based) methods to study the “spread” of behaviors, disease, moods and other “contagious” entities via network ties in human populations. What are the advantages and limitations of these techniques? What sort of substantive issues (e.g. self-selection) provide roadblocks to making causal claims about contagion? What are some of the most promising methodological tools for dealing with these issues?

# EIGHT HOUR WRITTEN CANDIDACY EXAMINATION

## SOCIAL NETWORKS

### PART II

March 19, 2015

For: Brandon Sepulvado

Examination Committee:

David Hachen (chair)

David Gibson

Omar Lizardo

Please answer the question in Section A and then one question from Section B. Answer all parts of each question as thoroughly as possible given the time allotted. Your answers should include reasoned arguments and be informed by empirical research. You have four hours to answer these two questions. Make sure to allocate your time wisely so that you answer each question adequately. Some students find it helpful to make an outline before answering each question. Please make sure to include references to the literature - authors' last names and when necessary to distinguish multiple works by the same author, relevant years of publication. You can include titles of articles or books if you want.

### Section A: You must answer this question.

A1. In the last decade there has been a good deal of research and theorizing on how networks, including social networks, evolve over time. Much of this work has focused on tie formation, though there also has been research on tie persistence/decay.

1. Compare and contrast what you consider to be the two most important theories/explanations of tie formation. Be sure to discuss empirical evidence for each theory. What do you think are the most important unanswered questions about tie formation?
2. Why is it also important to examine tie persistence/decay? What empirical evidence is there that points to the importance of understanding tie decay? Can theories there were developed to account for tie formation be adapted and used to understand tie decay? If so, discuss how two theories of tie formation can be used to understand tie decay. If not, compare and contrast what you consider to be two promising avenues for understanding variation in the longevity of social ties.

## Section B: Answer one of the following three questions.

B1. While there has been a good deal of interest in how social networks emerge and evolve, there has also been interest in how people's ego networks are historically changing in terms of their composition. Two issues have dominated the literature: changes in the size of people's networks and changes in the composition of people's ego networks.

1. Do you think the average size of people's networks has been changing over the last 50 years in the United States (and other industrialized countries)? Are ego networks becoming bigger or smaller? What is the evidence for any changes, and how have people understood the causes of such changes?
2. Do you think the composition of ego networks has changed? Be sure to first identify various dimensions for mapping compositional changes such as kin vs non-kin, physical distance / propinquity (e.g., the prevalence of neighbors in people's networks), social status, and closeness. What do you think are the important factors that are causing changes in the composition of ego networks?

B2. One of the most promising avenues for research on social networks concerns the relationship between social networks and culture. There are many different ways in which theorists are bringing either culture into our understanding of networks, or networks into our understanding of culture. Some have focused on how cultural objects diffuse through networks, others on how cultural traits impact tie formation and evolution, and still others on how social ties between people can be understood not just as indicators of social interaction but as markers of cultural similarity. Outline at least two ways in which scholars have attempted to theorize the culture/networks linkage. In discussing each framework, lay out what you think are the important claims, the empirical evidence that different scholars draw on to establish their substantive claims, and the research questions about culture and networks that emerge from each framework.

B3. In the last two decades physicists and computer scientists (under the banner of Network Science) have made major contributions to our understanding of networks in general and social networks in particular.

1. What do you think are two of the most important concepts or techniques advanced by network scientists, and why and how do you think these two concepts or techniques have advanced research on social networks?
2. Social network analysis researchers have been known to complain that network science scholars are ignorant of important research and theories developed by social network theorists. Discuss at least two concepts developed by social network scholars that have not but should inform research by network scientists.
3. Network scientists put on an emphasizes on relatively simple generic mechanisms that can be used to model the growth of macro-features of social networks from (relatively) simple micro-level rules of tie formation. So far this approach has had relatively little impact on social network analysis. Discuss the promises and limitations of "generative" approaches to network analysis in network science for future research and theory on social networks.