Centre for Business Network Analysis Summer School

**ECON1136 Longitudinal Models for Social Network Analysis:**
Panel Data with Stochastic Actor-Oriented (SIENA) Models and Relational Events Models
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1. Welcome

Dear Students,


This course is aimed at those researchers and post-graduate students who are in the field of Social Network Analysis (SNA), and would like to better understand how to analyse the evolution of social networks to enhance their research programmes. Students from all social sciences and other backgrounds are welcome. Participants are not assumed to have any previous knowledge in the longitudinal modelling of social networks, but a familiarity with the main descriptive statistical tools in SNA and standard regression framework.

Guido Conaldi

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2. Introduction to the Course

2.1 Aims

This course is aimed at researchers and post-graduate students willing to explore the dynamics of social networks. Social networks are dynamic by nature. For example, network dynamics are important for domains ranging from friendship networks (e.g., van Duijn et al., 2003; Burk et al., 2007) to inter-organisational networks (Borgatti and Foster, 2003; Berardo and Scholz, 2010). Ties can be established and can be terminated; also there may be changes in the actors taking part in the network. Changes in ties may be considered the result of the structural positions of the actors within the network - e.g., when friends of friends become friends -, characteristics of the actors ('actor covariates'), characteristics of pairs of actors ('dyadic covariates'), and residual random influences representing unexplained influences. The study of network dynamics sheds light on the underlying theoretical micro-mechanisms that induce the evolution of social network structures on the macro-level.

Social scientists having the possibility to access and exploit the wealth of longitudinal datasets on social networks that are becoming available require analytical tools able to cope with the scale and complexity of such data. To this purpose the course will introduce participants to the techniques and tools required to visualise and analyse (1) panel network data using the Stochastic Actor-Oriented Models - a.k.a. SIENA Models - (Snijders et al., 2010) and (2) event network data using the Relational Events Models (Butts, 2008). The course will also introduce and discuss the main methodological and empirical studies that in various fields of social sciences have contributed to and successfully applied such methods.

2.2 Learning Outcomes

By the end of the course participants will be able to:

• Understand challenges in analysing longitudinal network data and critically assess a variety of approaches to this problem.

• Make use of Stochastic actor-oriented (SIENA) models and relational event models in relation to network data.

• Use the R platform for the visualisation and statistical analysis of social networks (the Statnet, igraph, RSiena and relevent packages in particular).

• Specify, estimate and interpret Stochastic actor-oriented (SIENA) models and relational event models at the forefront of social network analysis originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline

• Critically evaluate current research and advanced scholarship in social network analysis of longitudinal data

• Evaluate social network methodologies, develop critiques of them and, where appropriate, to propose new hypotheses.
2.3 Course Prerequisites

Participants should have taken an introductory course in social network analysis, and be familiar with concepts such as network density and centrality. Participants should also have taken a basic course in (logistic) regression analysis and have a minimal familiarity with the statistical package R. Useful background references are provided in the reference list.
### 3. Contact Details

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<th>Room</th>
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<tbody>
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4. Course Content and Design

The course will run 4 hours per day over 5 days in the first week (Mon 2.6.14 - Fri 6.6.14) for the unaccredited version plus a further 3 days (Mon 8.6.14 – Weds 10.6.14) for the accredited version. For further and up-to-date information about the programme please visit the website of the Summer School.

The course adopts a hands-on approach. Topics for each day will be firstly introduced and discussed in class. Extensive lab sessions will follow in which software packages and specific techniques required to apply the methods discussed in class are presented. Participants will be guided to learn software packages such as R, Pajek, Visone, and Gephi for the purposes of visualising and analysing a variety of datasets including, among others, email exchanges, academic citations, article co-authorships, patents and collaboration in software production. Techniques and tools for the collection and storage of online data will be introduced in the tutorials. Participants will also have the opportunity to practice with their own datasets and discuss the potential applications of the techniques presented in class to their own research.

4.1 Topics Covered

- Longitudinal analysis of networks: Panel data and relational event data; Visualisation and descriptive measures for longitudinal social networks.

- Stochastic actor-oriented (SIENA) models for network dynamics (Snijders, van de Bunt, and Steglich, 2010) are a type of models that have the purpose to represent network dynamics on the basis of longitudinal panel data, and evaluate these according to the paradigm of statistical inference
  o Stochastic actor-oriented (SIENA) models I: Introduction and statistical foundations; Modelling structural selection mechanisms in social networks
  o Stochastic actor-oriented (SIENA) models II: Introducing actor covariates and time-heterogeneous parameters; Goodness-of-fit diagnostic.
  o Stochastic actor-oriented (SIENA) models IV: Modelling the co-evolution of selection and influence mechanisms; Modelling the evolutions of two-mode networks.

- The evolution of social networks is rapidly expanding to include the analysis of time-dependent sequences of relational events embedded in social ecologies and sustained by technologically-mediated communication through relational event models (e.g., estimating the effect of local interaction patterns in the development of sequences of email exchanges or individual actions in collaborative software production
  o Relational event models I: Introduction and statistical foundations; Specification and estimation of models for sequences of relational events.
  o Relational event models II: Applications and definition of local event patterns.
  o Relational event models III: Extensions to event history models for exact-time relational events.
4.2 **Suggested Reading**

Every session will bring together contents from a combination of different sources. Specific information about the reading lists associated with each session will be provided in class.

However, the following can be used as general background readings for the course:

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5. Further Information

Dr. Guido Conaldi is currently Senior Lecturer in Economic Sociology at the Centre for Business Network Analysis, University of Greenwich, UK. Previously he was Post-Doc at the Centre for Organisational Research, University of Lugano, CH. He holds an MSc in Sociology from the London School of Economics and a PhD in Social Sciences from the Sant'Anna School of Advanced Studies in Pisa, Italy. He has teaching experience in the areas of economic sociology, research methods in social sciences, and Social Network Analysis at the Essex Summer School in Social Science Data Analysis.

His research interests lie in the area of interpersonal and organizational social networks. His current research investigates the social mechanisms contributing to the endogenous formation of structure and hierarchy in self-managing teams. He especially looks at the impact of knowledge and collaboration networks re-configurations on team management.