Workshops 12 Sep 2019 - **full day sessions:** 9 – 12 / 13 – 16 (1 hour lunch break)

Overview	
Code	**Workshop**
F-1	**Estimating Exponential Random Graph Models using R** Michael Heaney (University of Glasgow and University of Michigan)
F-2	**Mixed Methods Research in Social Networks** Elisa Bellotti (The University of Manchester) Betina Hollstein (University of Bremen)
F-3	**Introduction to Dynamic Social Network Analysis with Stochastic Actor-oriented Models** András Vörös, Per Block, Zsófia Boda (ETH Zurich) Isabel Raabe (University of Zurich)
F-4	**Social Network Analysis Workshop: How do I answer my research question?** Filip Agneessens (University of Surrey)
F-5	**Discourse Network Analysis with DNA and rDNA** Philip Leifeld (University of Essex, Department of Government)
F-6	**Introduction to Python's graph-tool** Haiko Lietz, Marcos Oliveira (GESIS - Leibniz Institute for the Social Sciences)
F-7	**Using R and igraph for Social Network Analysis** Michał Bojanowski (Kozminski University)
F-8	**Introduction to Qualitative Structural Analysis (QSA)** Luisa Peters, Andreas Herz, Inga Truschkat (University of Hildesheim)

F-1	**Estimating Exponential Random Graph Models using R** Michael Heaney, University of Glasgow and University of Michigan
	This workshop introduces the theory, methods, and R programming behind the estimation of Exponential Random Graph Models (ERGMs). Topics include endogenous model terms, specification, Markov Chain Monte Carlo (MCMC) estimation, convergence, goodness of fit, one-mode ERGMs, two- mode ERGMS, and TERGMs.

F-2	**Mixed Methods Research in Social Networks** Elisa Bellotti (The University of Manchester) Betina Hollstein (University of Bremen)
	The workshop focuses on the use of mixed methods research designs when studying whole and ego-centered social networks. The workshop will be conducted in two parts. The first part introduces social network qualitative research and the principles of mixed methods research designs and its contributions to the study of social networks, pointing out advantages and challenges of this approach. Illustrations of the theoretical and methodological aspects are given by bringing examples from a variety of fields of research. The second part is devoted to the presentation of concrete procedures to apply mixed methods in network research both at the level of data collection and analysis. This part includes an introduction of different approaches to the collection of whole and ego-centered network data, i.e. interviews, ethnographic methods, archival data, together with visual instruments. It then moves to the analysis of the quantitative and qualitative dimensions of network relationships and structures in a mixed method perspective.

F-3

Introduction to dynamic social network analysis with Stochastic Actor-oriented Models

András Vörös, Per Block, Zsófia Boda (ETH Zurich, Social Networks Lab)
Isabel Raabe (University of Zurich)

This workshop offers a basic introduction to the theory and application of Stochastic Actor-oriented Models (SAOMs). SAOMs are a statistical model family developed for the analysis of longitudinal social network data. The method has been gaining popularity among network researchers recently, and about 50 articles applying it are published every year in journals from various fields. In light of these developments, we find it important to aid scholars who are new to dynamic network modeling and SAOMs in developing a clear basic intuition and understanding about the model. Our workshop primarily targets researchers who already have some experience in social network analysis (and perhaps have collected their own data) but have little or no expertise in dynamic network modeling.

The workshop will help participants to

- understand the motivation and basic principles behind using statistical models to analyse longitudinal social networks,
- understand the theoretical foundations of SAOMs,
- use the RSiena software package to fit simple SAOMs to empirical network data,
- apply their knowledge to study empirical social network data in their own research field.

The workshop consists of theoretical lectures and computer exercises. The RSiena package in R will be used in the exercises; example scripts and datasets will be provided by the instructors. Participants are welcome to bring questions about dynamic network models from prior courses or research. These can be discussed in a brief Q&A session at the end of the workshop.

Prerequisites: Basic understanding of social network analysis concepts and methods and basic knowledge of the R programming language is necessary to successfully follow the workshop. Basic knowledge of multivariate statistical models (e.g. linear regression) is recommended.

Preparation: Participants should bring a laptop to the workshop with the latest versions of R, RStudio (or their preferred GUI if any) and the RSiena R package installed. Studying the literature listed below can facilitate learning at the workshop.

Literature:

- Snijders, T.B.A., Van de Bunt, G.G., & Steglich, C.E.G. (2010). Introduction to stochastic actor-based models for network dynamics. Social networks, 32(1), 44-60.
- Ripley, R.M., Snijders, T.B.A., Boda, Zs., Vörös, A., & Preciado, P. (2011). Manual for RSIENA. University of Oxford, Department of Statistics, Nuffield College, 1.
- Steglich, C., Snijders, T.B.A., & Pearson, M. (2010). 8. Dynamic Networks and Behavior: Separating Selection from Influence. Sociological methodology, 40(1), 329-393.
- Block, P., Koskinen, J.H., Hollway, J., Steglich, C.E.G., & Stadtfeld, C.W. (2017). Change we can believe in: Comparing longitudinal network models on consistency, interpretability and predictive power. Social Networks, 52, 180-191.
- and further materials from https://www.stats.ox.ac.uk/~snijders/siena/

F-4	**Social Network Analysis Workshop: How do I answer my research question?** Filip Agneessens (University of Surrey)

This introductory/intermediary workshop aims to offer participants a roadmap in order to appropriately answer their research with social network analysis (SNA). The goal of the 6-hour workshop is to provide an overview and typology of the research questions that can be answered with SNA and to offer a decision tree in order to help identify the type of network data that are needed, and to help decide on the most appropriate statistical technique.

Questions that will guide students include:

- Do you need an egocentric or a complete social network approach?
- Do I need data from a single network or group, or do I need data from multiple networks or groups? And what is the boundary of the network/group?
- Am I looking at the consequences of networks, at the antecedents of networks, or at both?
- Do I require a dyadic, individual, group or intergroup approach?

Outline: The workshop will provide examples of existing research questions, as well as potentially interesting future directions for research at each of the four levels: the dyadic, individual, group and intergroup level. We first start with a discussion of concepts at these different levels, which will help answer descriptive research questions: the dyadic level (geodesic distance, structural equivalence, …), the individual level (degree, closeness, betweenness centrality, …), the group level (density, centralization, subgroup formation, …) and intergroup level (the centrality of a group among a network of multiple groups).

We then turn to research questions that require statistical methods. At the group level we focus on how the network structure of a group (its density, centralization and subgroup formation) might impact group outcomes (e.g. group performance), as well as questions about how such structures come about as a result of specific antecedents (e.g. the group's composition). At the individual level we discuss research questions, such as why some individuals become more central in a network, and how such network positions might impact outcomes, such as their well-being. At a dyadic level the focus will be on why a tie between two individuals might emerge. To model the emergence of a tie between two members, the focus will be on statistical techniques such as Exponential Random Graph Models (ERGM) and longitudinal Stochastic Actor Oriented Models (RSiena models and relational event models).

Finally, we will also discuss different ways of dealing with ties across multiple groups and multilevel approaches. The aim of the course is to offer students an overview and guidance on how to answer their research question. Specific techniques on how to use specific software are covered in other courses. The workshop is partly based on a recent chapter for the Oxford Handbook of Social Network Analysis.

F-5	**Discourse Network Analysis with DNA and rDNA** Philip Leifeld (University of Essex, Department of Government)

The standalone software Discourse Network Analyzer (DNA) and its companion R package rDNA are a software solution for qualitative content analysis with a focus on actors and concepts and their networks. For example, DNA can be employed to annotate policy debates/political discourses and subsequently analyze them as temporal networks to identify coalitions of actors with similar views. DNA can also be used to measure policy networks by annotating senders and receivers of attack or support statements in text data and analyze the resulting network dynamics. DNA is based on a supervised, manual coding approach with a specific focus on network analysis of the resulting annotations. While DNA can be used without R, the rDNA package can serve as a full-fledged qualitative content analysis solution in R with network coding and analysis capabilities and a seamless data exchange between the graphical user interface and the R package.

DNA has been employed for the analysis of policy debates around topics such as the U.S. climate debate in the U.S. Congress (based on testimony), the design of the German pension system (based on newspaper articles), large infrastructure projects (based on news media reports), and many other cases. In these case studies, the main interest was the systematic description of actor coalitions and their changing composition over time as a network. Additional usage scenarios are inferential network analysis of annotated text data and applications to any other kinds of text data with relations between entities.

The workshop will first introduce a few examples from the literature on discourse networks, define the key concepts, and discuss theoretical frameworks that are compatible with the methodological approach of discourse network analysis. We will then consider different text sources, types of debates, and obstacles in the coding process. I will introduce the DNA software in a hands-on computer lab session, and after demonstrating the coding process, we will proceed to analyse the resulting network data in external network analysis software packages, such as visone. We will consider the different expoart options and algorithms available to the user when exporting network data from DNA. In the last third of the workshop, I will introduce rDNA and demonstrate data management and discourse network analysis in R. Finally, we will briefly introduce the statistical or inferential analysis of temporal discourse network data using relational event models for bipartite signed graphs, as implemented in the R package rem.

Participants should bring their own laptop for the computer lab sessions, ideally with full user privileges for installing software. Before attending in the workshop, participants should make sure Java 8 is installed on their laptop; they should download the jar file, the sample file, and the manual from https://www.github.com/leifeld/dna/releases; they should install the rDNA R package from the same page; and they should download the visone jar file from http://www.visone.info. Chapter 3 of the manual on GitHub contains full installation instructions for different operating systems. If there are any installation problems, questions can be posted to the issue tracker on GitHub at https://www.github.com/leifeld/dna/issues.

F-6	**Introduction to Python's graph-tool** Haiko Lietz, Marcos Oliveira (GESIS - Leibniz Institute for the Social Sciences)
	There are three major packages for graph analysis in Python: networkx, igraph, and graph-tool, and each has its benefits. In this workshop, we offer a basic introduction to graph-tool (gt) because it's fast and has unique functionalities like stochastic blockmodeling. First we will introduce gt data structures, how network data like attributed and weighted edgelists can be loaded, how attributes and weights can be stored in property maps, how bipartite graphs can be folded into unipartite graphs, and how graphs can be filtered. We will then show for a medium-sized real social network how to obtain node-level measures like centrality and how to visualize these. On the meso level, participants will learn the basic idea behind stochastic blockmodels and how they can be employed. Finally, on the macro level, we will check if the network has the small-world property. Participants should be willing to study algorithmic approaches on abstract and applied levels. For the most part and to progress at appropriate speed, the tutors will do live coding using Jupyter Notebooks. An affinity to computational approaches to research as well as a basic understanding of statistics are highly recommended. Previous knowledge on network analysis is helpful but not necessary. Previous knowledge on programming in Python or another programming language (like R, Java) is advantageous but not necessary to follow the workshop. To ensure a common starting level between participants, we expect attendants to familiarize themselves with the most basic concepts of Python such as variables and tables via provided learning materials beforehand. A mini refreshment of basic Python commands will be offered at the beginning of the course. Please note that participants have to bring their own laptop. All utilized software is available without cost as open source under Windows, MacOS, and Linux systems. Detailed installation instructions for the suggested development environments will be provided before the start of the course. Participants should try hard to install gt which is hard on many systems. Those how don't succeed will be offered a virtual machine (notebooks.gesis.org).

F-7

Using R and igraph for Social Network Analysis
Michał Bojanowski (Kozminski University)

The workshop introduces R and package igraph for social network data manipulation, visualization, and analysis.

The material will cover:

- Brief introduction to R.
- Creating and manipulating network data objects.
- Working with node and tie attributes.
- Creating network visualizations.
- A tour through computing selected SNA methods including: degree distribution, centrality measures, shortest paths, connected components, quantifying homophily / segregation, network community detection.
- Connections to other R packages for SNA, e.g.: statnet, RSiena, egonetR.

Target audience and requirements: The workshop is designed to be accessible for people who have limited experience with R. The participants are expected to be familiar with basic R objects (e.g. matrices and data frames) and functions (e.g. reading data, computing basic statistics, basic visualization). Some brief introduction to R will be provided.

To be absolutely on the safe side we recommend taking an Internet course on the level of R programming course on Coursera (https://www.coursera.org/course/rprog), which you can take every month, or skimming through a book on the level of initial eight sections of Roger D. Peng book "R programming" (https://leanpub.com/rprogramming). Participants are encouraged to bring own laptops. We have prepared examples and exercises to be completed during the workshop. Detailed instructions how to prepare will be distributed in due time.

Attendance limit: 30 people

F-8	**Introduction to Qualitative Structural Analysis (QSA)** Luisa Peters, Andreas Herz, Inga Truschkat (University of Hildesheim)

Qualitative Structural Analysis (QSA) is an approach for analyzing qualitative network data (e.g. network maps and narrative data from interviews). QSA is based on procedures from qualitative research (sequential analysis, sensitizing concepts, memo writing) and integrates these procedures with concepts from formal network analysis. QSA is thus a combination of the analytical perspective of structural analysis and analytical standards taken from qualitative social research.

In the workshop participants will get an insight in the theoretical and methodical basis as well as basic principles of QSA. Here we introduce both basic premises of qualitative social research and of social network analysis and how they can be accomplished and integrated via QSA. We explore the process of analysis via QSA and introduce hands-on methods for the qualitative analysis of network data. Amongst others, we discuss how QSA allows to sequence and interpret qualitative data material via structure-, relation- and actor-focused questions and how concepts from SNA can be used as sensitizing concepts to guide the analysis. Strategies to integrate material from different sources in the analysis (e.g. qualitative interview and network map) are also discussed.

The format of the workshop encompasses presentations to introduce the basics, small group sessions to practice hands-on analysis strategies and open question slots.
Note: Participants get the opportunity to bring own qualitative network data from own empirical projects to be analysed in small group analysis sessions (network map, transcript of interview part, etc) and – depending on the number of workshop participants – the possibility to discuss questions in own qualitative network projects. Please contact Andreas Herz (herzand@uni-hildesheim.de) before the workshop to organize who brings qualitative material to the sessions.

Recommended Reading prior to the workshop:
Herz, A., Peters, L. & Truschkat, I. (2015). How to do Qualitative Structural Analysis: The Qualitative Interpretation of Network Maps and Narrative Interviews. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research [52 paragraphs], 16(1). Online available: http://nbn-resolving.de/urn:nbn:de:0114-fqs150190

Workshops 12 Sep 2019 – **half day morning sessions:** 9 – 12

Overview	
Code	Workshop
M-1	**Analyzing the Dynamics of Networks and Continuous Behaviour with Rsiena** Nynke Niezink (Carnegie Mellon University)
M-2	**Introduction to Network Regression Models using the ghypernet-package in R** Giona Casiraghi, Laurence Brandenberger (ETH Zurich)
M-3	**Studying the Micro-Macro Link with Stochastic Actor-based Models and Rsiena** Christian Steglich (University of Groningen & Linköping University)
M-4	**Goldfish: Estimating Network Event Models** Christoph Stadtfeld, Marion Hoffman, Alvaro Uzaheta (ETH Zurich) Mirko Reul, James Hollway (Graduate Institute Geneva)
M-5	**Introduction to Modeling Temporal (dynamic) ERGMs using statnet** Martina Morris (University of Washington) Michał Bojanowski (Kozminski University) Pavel Krivitsky (University of Wollongong)

M-1	**Analyzing the dynamics of networks and continuous behaviour with RSiena** Nynke Niezink (Carnegie Mellon University)
	Stochastic actor-oriented models (SAOMs), implemented in the R package RSiena, are used to study peer influence, also known as contagion or diffusion, in dynamic social networks. In the original SAOM for the analysis of the co-evolution of networks and individual actor behavior, behavior variables were assumed to be measured on an ordinal categorical scale. Continuous variables such as many performance and health-related measures had to be discretized to fit into the modeling framework. This workshop introduces the recently developed SAOM for the dynamics of networks and continuous actor behavior. Continuous behavior variables in this model are modeled by stochastic differential equations. In the workshop, we give an introduction to stochastic differential equations, and discuss parameter interpretation, explained variance and goodnessof-fit. The workshop combines a lecture with hands-on exercises using the RSiena package. Some experience with R and familiarity with SAOMs are recommended.

M-2	**Introduction to Network Regression Models for multi-edge/weighted networks using the ghypernet-package in R** Giona Casiraghi, Laurence Brandenberger (ETH Zurich)

This workshop provides an introductory tutorial on Network Regression Models (NRMs) for weighted social networks. It includes a brief explanation of the model, empirical examples a software demonstration followed by a hands-on lab session where participants get the chance to run the models themselves (either using their own data or example data provided by us). After this workshop, participants will be able to prepare their network data in R, run a weighted network model using the ghypernet-package and interpret the results.

To facilitate structural analysis of static networks, most networks are simplified to binary networks, where ties between two nodes are either present (0) or absent (1), to facilitate analysis. However, in reality such networks are rare and the ties (or edges) between nodes can be described more accurately if they are given a count frequency or a weight. Indeed, the added information on tie strength holds valuable information on the intensity of the social interaction between two nodes that can be harnessed to improve statistical modeling of social interactions.

In this workshop we demonstrate a new network inference model---called NRM---for multi-edge (and weighted) networks. Multi-edge networks are a form of networks where ties (or edges) between two nodes can be drawn repeatedly. Examples of multi-edge networks include a) collaboration networks, where nodes repeatedly work together on different projects; b) information exchange networks, where nodes repeatedly communicate with each other and trade information; c) co-sponsorship networks, where members of parliament (MPs) support different bills proposed by the same MP; d) or email networks, where nodes send each other multiple emails. (contact networks). The NRM uses the information on repeated interactions and can be used to test which endogenous and exogenous factors affect its data-generating process. The model is comparable to conventional network inference models such as Exponential Random Graph Models or Stochastic Actor-Oriented Models in that it allows for parameter estimation of conventional network terms such as reciprocity, triadic closure or homophily effects. However, the model does not rely on numerical simulations (as the ERGM does for instance), which makes it easy to apply, fast and well-suited for large-scale networks (i.e., networks with >1000 nodes).

The NRM is based on hypergeometric ensembles, which we will briefly introduce in the workshop. After the brief statistical explanation of the model, we'll demonstrate empirical examples. The largest part of the tutorial is devoted to a software demonstration followed by a lab session where participants will get the chance to test the model hands-on.

Prerequisites: All analyses are performed in R using the R-package 'ghypernet'. Participants should be familiar with base-R commands as well as basic descriptive network concepts. Familiarity with statistical methods for network analysis is recommended but not required.

M-3	**Studying the micro-macro link with stochastic actor-based models and RSiena** Christian Steglich (University of Groningen & Linköping University)
	How much can observed network distances between ethnic groups be explained by in-group clustering, or by out-group avoidance? To what degree does performance homogeneity in advice seeking networks result from selecting advisors, or from being influenced by them? How much does it matter for innovation adoption when a network is rewired while a diffusion process unfolds on it? All these questions seek to explain an emergent macro-level outcome while invoking competing micro-level explanatory mechanisms. In the presence of information-rich social network data, this becomes a task of statistical quantification. But what are suitable tools for such a quantification exercise? One such tool are stochastic actor-based models for network dynamics (Snijders, van de Bunt & Steglich, 2010). They were developed to facilitate the testing of behavioral (micro-level) theories of social action in an interdependent social network setting. These models are computationally complex. Their calibration to longitudinal network data is achieved by means of simulation-based statistical inference. The simulation framework developed for calibration purposes can also be used for other goals, such as the study of emergent macro-phenomena (Snijders & Steglich, 2015). The latter is what we will focus on in this workshop. The RSiena package in R instantiates stochastic actor-based models for network dynamics. In the workshop, we first address its use for finding empirically calibrated model specifications, and then move on to the evaluation of empirically informed simulation scenarios. **Literature:** • Snijders, T.A.B., G.G. van de Bunt and Ch. Steglich (2010). Introduction to actor-based models for network dynamics. Social Networks, 32, 44-60. • Snijders, T.A.B., and Ch. Steglich (2015). Representing micro-macro linkages by actor-based dynamic network models. Sociological Methods & Research, 44, 222-271.

M-4	**Goldfish: Estimating Network Event Models** Christoph Stadtfeld, Marion Hoffman, Alvaro Uzaheta (ETH Zurich, Social Networks Lab) Mirko Reul, James Hollway (Graduate Institute Geneva)
	The advent of electronic communication, social media, and human sensor technologies and the digitization of many archives has generated a wealth of temporally specific relational data for social scientists to explore. Ties come with details about when they begin and, sometimes, end, giving us information about the order and duration of ties. This workshop introduces and compares different approaches for the analysis of time-stamped network data with special attention to the dynamic network actor class of longitudinal statistical network models (DyNAMs). The goal is to provide an overview of research problems that relate to time-stamped network data, to enable participants to conduct basic analyses with the Goldfish package in R, and to introduce conceptual and practical differences between models that have been proposed, in particular, focusing on differences between actor-oriented and tie-oriented approaches. The practical elements of the workshop (about 50%) introduce Goldfish, a new R package for the analysis of time-stamped network data. In particular, three types of models are introduced, compared, and practically applied. 1) Actor-oriented models for undirected coordination ties. Typical examples are research problems found in the political sciences (e.g., the creation and dissolution of international treaties) and economics (e.g., coordination between financial institutions) and are concerned with the creation of undirected, bilateral agreements that are the result of a coordination process. 2) Actor-oriented models for directed events. Typical examples are sequences of interaction events (e.g., phone calls) or directed transactions (e.g., financial transactions). 3) Both actor-oriented models are compared to the tie-oriented relational event model which can also be estimated with the Goldfish package. The practical elements make use of R scripts that are distributed to participants in advance. Participants can further bring their own research problems and their own data. Based on the number of participants, a limited amount of time will be reserved to discuss these.

M-5	**Introduction to Modeling Temporal (dynamic) ERGMs using statnet** Martina Morris (University of Washington) Michał Bojanowski (Kozminski University) Pavel Krivitsky (University of Wollongong)
	This workshop will provide a hands-on tutorial on the estimation and simulation of models for dynamic networks using Temporal Exponential-Family Random Graph Models (TERGMs) in statnet. TERGMs can be used for estimation from several different forms of dynamic network data, and provide a wide range of fitting diagnostics. Fitted models can be used to simulate dynamic networks that reproduce the network statistics included in the model. The topics covered include exploratory data analysis with temporal network data (using the statnet packages tsna and ndtv to create network movies), model estimation (from network panel data, a single cross-sectional network with link duration information, and cross-sectional, egocentrically sampled network data), model diagnostics, and simulating dynamic networks from fitted models. The methods can be used with both fixed and changing node sets. statnet is an open source collection of integrated packages for the R statistical computing environment that support the representation, manipulation, visualization, modeling, simulation, and analysis of network data. **Prerequisites:** Familiarity with R. Previous experience with the statnet packages (ergm, network, sna).

Workshops 12 Sep 2019 – **half day afternoon sessions**: 13 – 16

Overview	
Code	Workshop
A-1	**Tidy Networks: the tidyverse and tidygraph for Social Network Analysis in R** Matthew Smith (University of Greenwich) Yasaman Sarabi (Edinburgh Business School, Heriot-Watt University)
A-2	**Introduction to Egocentric Network Data Analysis with ERGMs and TERGMs using statnet** Martina Morris (University of Washington) Michał Bojanowski (Kozminski University) Pavel Krivitsky (University of Wollongong)
A-3	**Relational Event Modeling with eventnet** Jürgen Lerner (University of Konstanz) Alessandro Lomi (University of Lugano
A-4	**Goldfish: Advanced Practical Session for Researchers with own Data** Christoh Stadtfeld, Marion Hoffman, Alvaro Uzaheta (ETH Zurich) Mirko Reul, James Hollway (Graduate Institute Geneva)
A-5	**Analysing Multilevel Network Dynamics using Rsiena** Tom Snijders (University of Groningen)

A-1	**Tidy Networks: the tidyverse and tidygraph for social network analysis in R** Matthew Smith (University of Greenwich) Yasaman Sarabi (Edinburgh Business School, Heriot-Watt University)
	This workshop provides an introduction to the R programming language for those without any previous or limited experience. It will introduce the tidyverse – a set of functions and packages for data processing, cleaning, and visualisation in R. In particular, we will focus on dplyr for data processing, ggplot2 for visualisation, and Rmarkdown for creating reports. We will go on to demonstrate how the tidyverse can be applied to social network analysis - more specifically through the use of the tidygraph package. The tidygraph permits you to utilise the underlying grammar structure of the tidyverse when dealing with graph objects in R. By using the tidygraph package you can manage edgelists and network attributes in a single object, along with implementing analysis on these objects. The tidyverse allows you to create tidy data frames, whilst the tidygraph allows you to create tidy graph objects – or tidy networks! **Learning Outcomes**: By the end of the session participants should be able to: • Use R and RStudio. • Make use of the tidyverse for data processing – more specifically preparing datasets for SNA. • Visualising networks in R using ggplot2 (part of the tidyverse) and tidygraph. • Create tidygraph objects and undertake some initial network analysis using the tidygraph package. **Target group:** Individuals new to R, or those with limited R experience. These users will benefit from gaining an insight into how to use R for data processing and social network analysis following the tidy philosophy. Requirements: No prior knowledge of R is required as an introduction will be provided. Maximum number of participants: 25

A-2	**Introduction to Egocentric Network Data Analysis with ERGMs and TERGMs using statnet** Martina Morris (University of Washington) Michał Bojanowski (Kozminski University) Pavel Krivitsky (University of Wollongong)
	This workshop will provide a tutorial on analyzing egocentrically sampled network data with exponential-family random graph models (ERGMs). It will be a hands-on workshop demonstrating how to fit, diagnose and simulate both static and dynamic ERG models from such data, using the new "ergm.ego" package, part of the integrated statnet software in R. Topics covered within this session include: a review of approaches to analyzing egocentrically sampled data, an overview of the statistical theory that supports the use of ERGMs for egocentric samples; defining and fitting ERGMs to egocentric data; interpretation of model coefficients; goodness-of-fit and model adequacy checking; and simulation of complete networks from the specified ERG models. The workshop will also cover estimating, fitting, diagnosing and simulating dynamic networks from cross-sectional egocentrically sampled data with relationship duration information. statnet is an open source collection of integrated packages for the R statistical computing environment that support the representation, manipulation, visualization, modeling, simulation, and analysis of network data.

A-3	**Relational event modeling with eventnet** Jürgen Lerner (University of Konstanz) Alessandro Lomi (University of Lugano)
	Networks of social relations frequently generate information on repeated interaction between sender and receiver units over time. This information typically takes the form of relational event sequences - streams of directed, time-ordered events connecting social actors. Examples of relational events are common. Conversations, financial transactions, technology-mediated communication, interorganizational coordination, on-line communities, team-based tasks, and participation in peer-production projects, are all examples of interactive settings that generate observable streams of relational events. Despite the increased availability of relational event data, statistical models suitable for their analysis have been developed only in relatively recent times. This workshop provides a practical introduction to relational event modeling with the open-source software eventnet (https://github.com/juergenlerner/eventnet) illustrated on publicly available data from two application domains: (1) interaction events in international relation networks and (2) online collaboration networks in Wikipedia. These networks vary in a wide range of characteristics such as the presence of event signs, weights, or types; nodal and dyadic covariates; one-mode vs two-mode networks; time resolution; and, last but not least, network size. During the workshop we will discuss and illustrate strategies to account for these empirical differences across networks, and specify flexible models for relational event sequences. The workshop is targeted at participants interested in statistical modeling of networks of relational events. It does not assume any deep previous knowledge or experience.

A-4	**Goldfish: Advanced practical session for researchers with own data** Christoh Stadtfeld, Marion Hoffman, Alvaro Uzaheta (ETH Zurich, Social Networks Lab) Mirko Reul, James Hollway (Graduate Institute Geneva)
	This workshop builds upon the introductory Goldfish workshop and covers some advanced topics beyond the scope of the introductory session. We will discuss finer aspects of network event model specification, diagnosis and interpretation. It is also a hands-on practical workshop for researchers with their own time-stamped network data. Please bring a cleaned data-set, conforming to the format introduced in the first Goldfish session, with you.

A-5	**Analysing multilevel network dynamics using RSiena** Tom Snijders, University of Groningen

Multilevel network analysis comes in two flavors: multilevel analysis of networks ('MAN') where the data consists of a set of multiple networks which are conceptually similar but have disjoint node sets and no connections between them, and regarded as independent replications with respect to the social processes investigated; and analysis of multilevel networks ('AMN') defined as multiple interdependent networks with several node sets, some of which are shared; e.g., a one-mode friendship network between individuals together with a two-mode network of the activities of the same set of individuals. Longitudinal analysis of both of these kinds of multilevel network structures will be treated in this workshop, using stochastic actor-oriented models and the RSiena package.

The focus will be on the first kind (MAN), in particular the random coefficient multilevel longitudinal network analysis implemented in the function sienaBayes in RSiena. The basic idea of this random coefficient model will be presented, with the approach taken by the analysis using sienaBayes. The use of this function will be explained, and guidance will be given for parameter interpretation.

For the second kind of analysis (AMN), the regular estimation function siena07 can be used, with multivariate specification of the data set. Some possibilities offered by the RSiena package for analysis of multilevel networks will be discussed.

Prerequisites:
The workshop is intended for participants who have at least a basic experience in working with RSiena.

Literature:
Ruth M. Ripley, Tom A.B. Snijders, Zsofia Boda, András Vörös, and Paulina Preciado (2019). Manual for RSiena. URL: https://www.stats.ox.ac.uk/~snijders/siena/RSiena_Manual.pdf
Tom A.B. Snijders (2016). The Multiple Flavours of Multilevel Issues for Networks. Chapter 2 in Emmanuel Lazega and Tom A.B. Snijders (eds.), Multilevel Network Analysis for the Social Sciences, Cham: Springer, 2016.
SIENA website: http://www.stats.ox.ac.uk/~snijders/siena instructions for different operating systems. If there are any installation problems, questions can be posted to the issue tracker on GitHub at https://www.github.com/leifeld/dna/issues.