UNIVERSITY OF GREENWICH

NUSC | NEWORKS & URBAN SYSTEMS CENTRE

Conference Programme

6th European Conference on Social Networks

12-16 September 2022

University of Greenwich, London

Version 2.0 (08.09.22)

University of Greenwich Stockwell Street Building

University of Greenwich Royal Naval College Complex

Welcome to EUSN 2022

The 6th European Conference on Social Networks (EUSN 2022) is hosted by the Networks and Urban Systems Centre at the University of Greenwich and will be held in London, 12-16 September 2022.

Continuing the traditions of previous conferences in Barcelona (2014), Paris (2016), Mainz (2017), Zurich (2019), and Naples (2021), as well as the legacies of predecessors Applications of Social Network Analysis (ASNA) and UK Social Network Analysis (UKSNA), the conference brings together researchers and practitioners from the social sciences in the broad sense as well as statistics, computer science, data science, physics, economics, humanities, and other areas dealing with social networks.

EUSN 2022 is endorsed by INSNA, the International Network for Social Network Analysis.

Workshops and Organised Sessions

The conference with be held at the Greenwich Campus, University of Greenwich, London.

Greenwich Campus sits on the World Heritage Site of the Old Royal Naval College and is located in the heart of Greenwich, south-east London. The campus is surrounded by historical landmarks and Greenwich Park.

The Stockwell Street Building will host the organised and plenary sessions from Tuesday to Thursday of the conference week. All rooms numbered 11_XXXX are located in the Stockwell Street Building. The Devenport House Building will host the workshops on the Monday and Friday of the conference week.

University of Greenwich Devenport House Building

Organising Committee

Guido Conaldi, Stefano Ghinoi, Francesca Pallotti (University of Greenwich)

Programme Committee

Viviana Amati, ETH Zürich
Spyros Angelopoulos, Durham University
Elisa Bellotti, University of Manchester
Per Block, Oxford
Zsófia Boda, University of Essex
Ulrik Brandes, ETH Zürich
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Miranda Lubbers, Autonomous University of Barcelona
Matteo Magnani, Uppsala University
Sophie Mützel, UniLu
Anna Piazza, University College London
Juergen Pfeffer, Technical University of Munich
Giancarlo Ragozini, University of Naples Federico II
Yasaman Sarabi, Edinburgh Business School Heriot-Watt University
Termeh Shafie, University of Manchester
Matthew Smith, Edinburgh Napier University
Tom Snijders, University of Groningen and University of Oxford
Christoph Stadtfeld, ETH Zürich
Paola Tubaro, CNRS
Maria Prosperina Vitale, University of Salerno
Srinidhi Vasudevan, University of Greenwich
Susanna Zaccarin, University of Trieste
Paola Zappa, Maynooth University

Keynotes

Tuesday, September 13th 2022 at 17:30, Room 11_0003

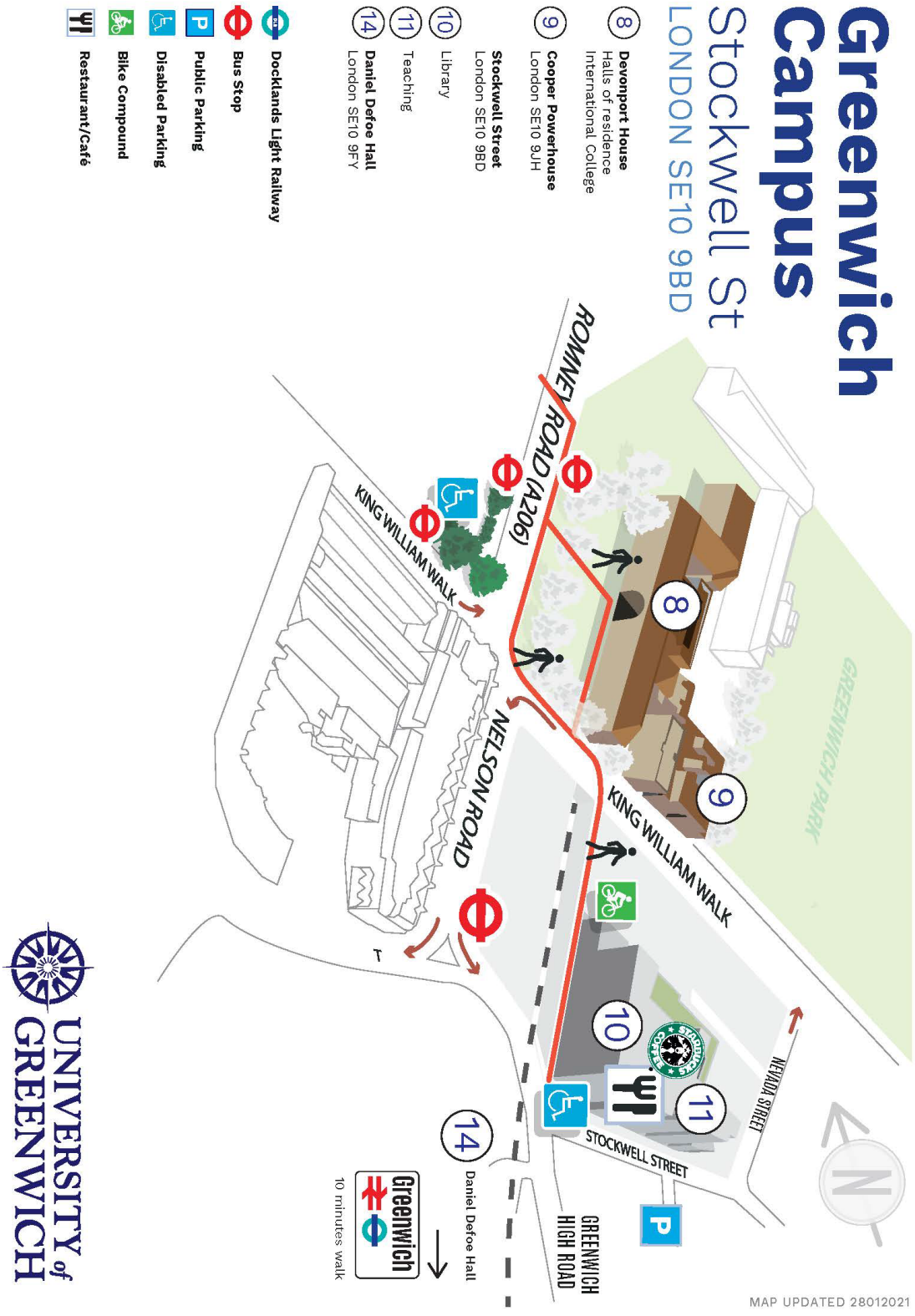
Kerstin Sailer is Professor in the Sociology of Architecture at UCL's Bartlett School of Architecture. She is a sociologist at heart, yet has trained as in architect in Germany, where she completed her Diploma in Architecture (Leibniz University of Hannover), as well as her PhD thesis "The Space-Organisation Relationship" (Technical University of Dresden). A Knowledge Transfer Partnership (KTP) between UCL and Spacelab Architects brought her to London in 2006. In this project she developed a new and intensively data-driven workplace consultancy service for Spacelab. Apart from a short stint as visiting PhD student in 2005, she joined UCL in 2006 as KTP Associate, became a Teaching Fellow in January 2009, was appointed Lecturer in October 2009, and was promoted to Reader in 2016 and to full Professor in 2021.
In her research Professor Sailer investigates the impact of spatial design on people and social behaviours inside a range of buildings such as offices, laboratories, hospitals and schools. Her research interests combine complex buildings, workplace environments and space usage with social networks, organisational theory and organisational behaviour. She is an expert in Social Network Analysis, specifically in relation to spatial network analysis and geographical applications. She has also contributed to the debate on data-driven or evidence-based design practices.

Wednesday, September 14th 2022 at 17:30, Room 11_0003

Alessandro Lomi is a Professor in the Faculty of Economics of the University of Italian Switzerland, Lugano. He is a Life Member of Clare Hall College, University of Cambridge, and an Honorary Senior Fellow in the School of Psychological Sciences at the University of Melbourne. Since 2022, he has been an Associate Editor of the Journal of the Royal Statistical Society (Series A). Until 2021, he was Distinguished Research Professor at the University of Exeter. In 2017-18 he was a visiting professor at the Annenberg School of Communication and Journalism, University of Southern California, Los Angeles. In 2016-17, he was Visiting Scientist at the ETH Zurich. Between 2008-16, he was Conseiller à la Recherche in the Human and Social Sciences Division of the Conseil national de la recherche Suisse (Swiss NSF), where he also served as vice-Chairperson of the Interdisciplinary Research Commission. In 2011 he was Banco Santander Cátedra de Excelencia Professor at the Universidad Carlos III, Madrid. In 2008, he was Jemolo Fellow at Nuffield College, University of Oxford. In 2002-03 he was NATO Senior Research Fellow at the Santa Fe Institute (New Mexico) where he previously worked as Research associate (2001-02). In the less recent past, he was a Professor of Management in the faculty of economics at the University of Bologna, and an Assistant Professor at the London Business School (UK). He was a Visiting Professor at the Haas School of Business (University of California, Berkeley); NATO Advanced Science Fellow at Syracuse University (New York), and NATO Junior Research Fellow at New York University (New York). He holds a BA in Economics from the University of Bologna, and a MS and PhD degree from Cornell University (Ithaca, New York).

Map

A [complete map of the Greenwich Campus](#) can be downloaded from the conference website and it is reproduced here.



UNIVERSITY of GREENWICH

Other Meetings and Social Events

EUSN 2022 is proud to host the **Early and Middle Career Researchers Social Meeting** on Tuesday, September 13th at 12:30 in room 11_2008, organised by Francisca Ortiz Ruiz (Millennium Institute for Care Research MICARE, Santiago, Chile) and Zoran Kovacevic (Social Networks Lab, ETH Zürich), as well as the **Women in Network Science Social Event** on Tuesday, September 13th at 19:00 at the Old Brewery pub, organised by Francisca Ortiz Ruiz (Millennium Institute for Care Research MICARE, Santiago, Chile).

The *Early and Middle Career Researchers* is an association that aims to create a community to connect and share what it means to be in this stage of academic career. EMCRs has three main objectives: 1) to organise sessions during the main network conferences for early career researchers to get to know each other; 2) to work on the realization of helpful workshops. And 3) to making visible the different expertises of each participant.
The EMCRs event at EUSN2022 aims to create the space to get to know other early and middle career researchers working with networks, and discuss about current and future research collaborations and projects. Everyone is more than welcome to join.

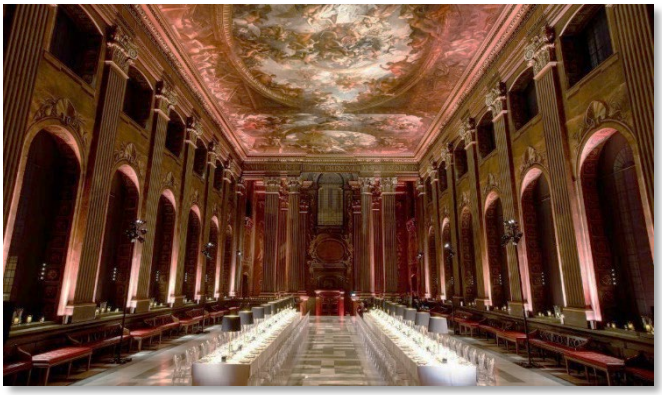
The *Women in Network Science* (WiNS) connects women, trans and non-binary genders network scientists from different races, socioeconomic backgrounds and nations. The society aims to recognise the work, perspectives and expertise of its members to create bridges between academia, government, and private industry related to network science. By leveraging its members' professional and social networking and creating safe spaces for conversation, WiNS intends to increase representation and recognition, create mentorship programs and collaborations between junior and senior researchers, and develop a network for well-being resources (e.g. mental health and funding). Its goals are: 1) To increase the presence and visibility of women, trans and non-binary genders as participants, speakers, and organisers of scholarly gatherings within network science, social networks, and complex systems. 2) To promote collaborative learning and networking with role models from underrepresented backgrounds towards advancing careers of junior researchers in network science. 3) To encourage the discussion and research about underrepresented communities in our societies under the network science and complex system approach.
The WiNS event at EUSN2022 aims to create the space to get to know each other in a safe and comfortable space. Everyone is more than welcome to join.

A **EUSN Business Meeting** open to all delegates will be held on Wednesday, September 14th at 12:30 in room 11_2008.

The EUSN2022 **Gala Dinner** will be held at the iconic Painted Hall of the Old Royal Naval College on Wednesday, 14th September at 19:00. Painted in the early 18th century by Sir James Thornhill, the Painted Hall is a masterpiece of English baroque and one of the highlights of the architectural complex designed by Sir Christopher Wren with a vast decorated interior covering 4,000 square meters. Drinks will be served before the dinner under the colonnade of the King William building. Live music will be played during the event.

Every evening between Tuesday and Thursday **a social event** open to all delegates will be held starting at 19:00 in the Stockwell Street Building, Queen Ann Courtyard, and Devenport House Courtyard (weather permitting).

Check the timetable for details on all social events.

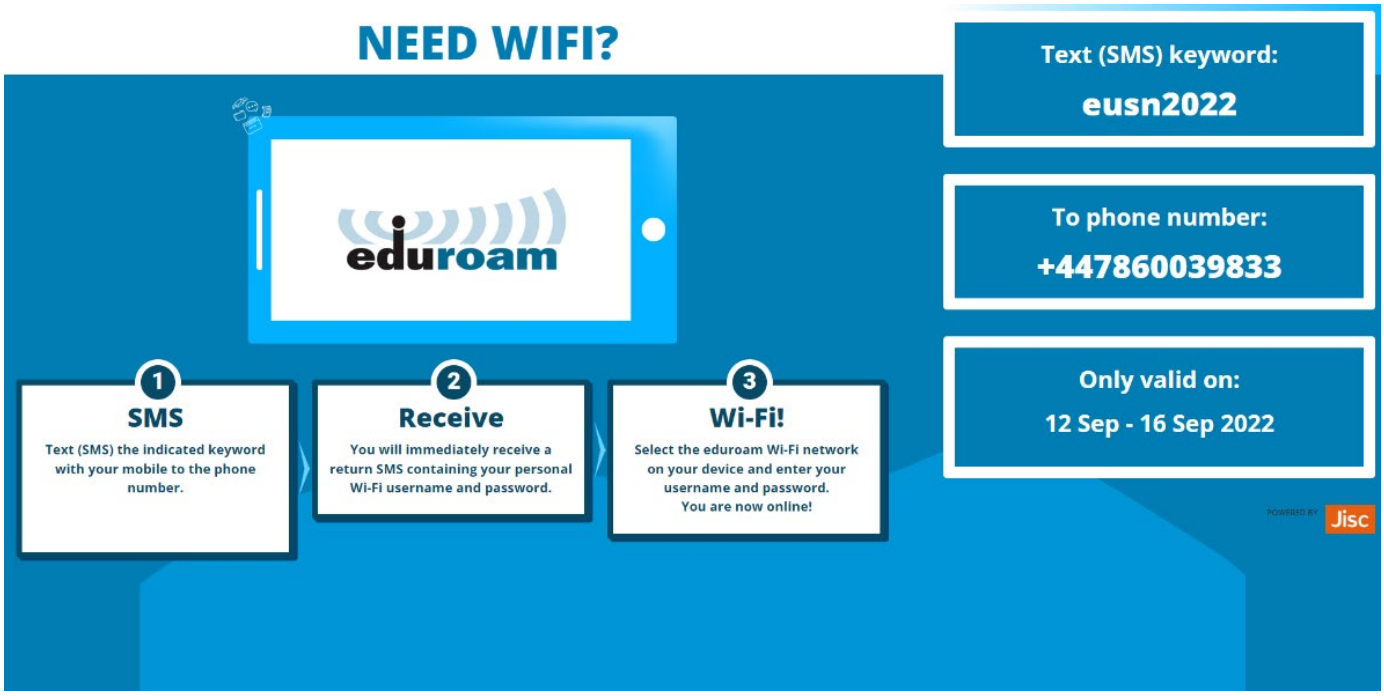


The Painted Hall at the Old Royal Naval College

The King William Building Colonnade

WiFi

WiFi is available throughout the Greenwich Campus via eduroam. In all rooms there will be instructions to generate temporary login credentials for the WiFi via mobile phone if you do not already have them. The instructions are reproduced here. The Events team will be available to help in case of difficulties receveing the return SMS.



Workshops
Monday, 12th September 2022 (British Summer Time)

	Full Day	Half Day				
Time \ Room	Devonport 007	Devonport 003	Devonport 004	Devonport 005	Devonport 008	Devonport 108
09:30-12:30 (including coffee break)	**Handling Missing Network Data – Theory and Practice** *Robert W Krause*	**In-person and Remote Social Network Interviewing with Network Canvas** *Bernie Hogan*	**Discourse Network Analyzer 3.0** *Philip Leifeld*	**The goldfish Package in R** *Alvaro Uzaheta, James Hollway, Marion Hoffman*	**Introduction to Network Analysis Tools in R** *Lorien Jasny*	**The Analysis of Longitudinal Social Network Data Using RSIENA** *Per Block*
12:30-13:30	**Lunch Break**					
13:30-16:30 (including coffee break)	**Handling Missing Network Data – Theory and Practice** *Robert W Krause*	**migraph: Multimodal Network Analysis** *James Hollway, Jael Tan*	**Introduction to UCINet** *Srinidhi Vasudevan, Anna Piazza*	**Generalized Blockmodeling in R Using Blockmodeling Package Blockmodeling** *Aleš Žiberna, Marjan Cugmas*	**Moving Beyond Descriptives: Basic Hypothesis Testing with R/Statnet** *Lorien Jasny*	**REM Beyond Dyads: Relational hyperevent Modeling with eventnet** *Juergen Lerner, Alessandro Lomi*

Workshops
Friday, 16th September 2022 (British Summer Time)

	Full Day		Half Day			
Time \ Room	Devonport 008	Devonport 108	Devonport 004	Devonport 005	Devonport 006	Devonport 109
09:30-12:30 (including coffee break)	**Egocentric Network Analysis with R** *Raffaele Vacca*	**Advanced Rsiena Workshop** *Tom A.B. Snijders*	**Tidy Networks: the tidyverse and tidygraph for Social Network Analysis in R** *Matthew Smith, Yasaman Sarabi*	–	**Introduction to Visone** *Julian Müller*	**Analysis of Multiplex Social Networks (Hands on with R)** *Matteo Magnani*
12:30-13:30	**Lunch Break**					
13:30-16:30 (including coffee break)	**Egocentric Network Analysis with R** *Raffaele Vacca*	**Advanced Rsiena Workshop** *Tom A.B. Snijders*	–	–	–	–

Sessions Overview
Tuesday, September 13th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

Time \ Room	11_2007	11_2014	11_2016	11_2017
07:00-08:00	*Yoga session (Room: Cooper Building 9.017)*			
09:00-09:30	*Coffee Break*			
09:30-10:30	**Conference Opening** (Room: 11_0003)			
10:30-11:00	*Coffee Break*			
11:00-12:30	**S22_1: Sustainability and Social Network Analysis** *Organisers: Stefano Ghinoi, Riccardo De Vita*	**S02_1: Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano*	**S14_1: Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk*	**S11_1: Networks and Crime** *Organisers: Tomáš Diviák, Paolo Campana*
12:30-13:30	*Lunch Break* *Early and Middle Career Researchers social meeting (Room: 11_2008)*			
13:30-15:00	**S08_1: Network Analysis and Bibliometrics** *Organisers: Stefano Ghinoi, Guido Conaldi*	**S02_2: Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano*	**S14_2: Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk*	**S17_1: Social Influence** *Organisers: András Vörös, Zsófia Boda*
15:00-15:30	*Coffee Break*			
15:30-17:00	—	**S02_3: Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano*	**S14_3: Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk*	**S17_2: Social Influence** *Organisers: András Vörös, Zsófia Boda*
17:30-18:30	**Opening Keynote: Prof Kerstin Sailer (Room: 11_0003)**			
19:00-20:30	*Women in Network Science Social Event (Old Brewery Pub)*			
19:00-23:00	**Social Event (Room: 11_0002)**			

Sessions Overview
Wednesday, September 14th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

Time \ Room	11_2007	11_2014	11_2016	11_2017
07:00-08:00	*Yoga session (Room: Cooper Building 9.017)*			
08:30-09:00	*Coffee Break*			
09:00-10:30	**S07_1: Multiplex Networks and Individual Outcomes in School** *Organisers: Andras Voros, Zsófia Boda, Elisa Bellotti*	**S12_1: Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa*	**S20_1: Social Networks and Personal Communities in Migration and Migrant Incorporation** *Organisers: Raffaele Vacca, Başak Bilecen*	**S05_1: Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*
10:30-11:00	*Coffee Break*			
11:00-12:30	**S10_1: Networking Historical Past** *Organisers: Paolo Cimadomo, Anna Collar, Maria Carmela Schisani*	**S12_2: Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa*	**S20_2: Social Networks and Personal Communities in Migration and Migrant Incorporation** *Organisers: Raffaele Vacca, Başak Bilecen*	**S05_2: Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*
12:30-13:30	*Lunch Break* *EUSN Business Meeting [Open to all delegates] (Room: 11_2008)*			
13:30-15:00	**S10_2: Networking Historical Past** *Organisers: Paolo Cimadomo, Anna Collar, Maria Carmela Schisani*	**S12_3: Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa*	**S21_1: Social support and Health** *Organiser: Guy Harling*	**S05_3: Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*
15:00-15:30	*Coffee Break*			
15:30-17:00	**S15_1: Public Policy and Discourse Networks** *Organiser: Philip Leifeld*	**S04_1 Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*	**S21_2: Social support and Health** *Organiser: Guy Harling*	**S05_4: Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*
17:30-18:30	**Closing Keynote: Prof Alessandro Lomi (Room: 11_0003)**			
19:00-23:00	**Gala Dinner (Ticketed Event at the Old Royal Naval College Painted Hall)**			
19:00-23:00	**Social Event (Queen Ann Courtyard)**			

Sessions Overview

Thursday, September 15th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

Time \ Room	11_2007	11_2014	11_2016	11_2017	11_1001
08:30-09:00	*Coffee Break*				
09:00-10:30	**S23_1: Teaching Social Network Analysis** *Organisers: Riccardo De Vita, Yasaman Sarabi, Matthew Smith, Guido Conaldi*	**S04_2 Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*	**S19_1: Social Network Analysis and System Science for Social Change** *Organisers: Emily Long, Claudia Zucca, Mark McCann*	**S06_1: Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*	—
10:30-11:00	*Coffee Break*				
11:00-12:30	**S23_2: Teaching Social Network Analysis Panel Discussion** *Organisers: Riccardo De Vita, Yasaman Sarabi, Matthew Smith, Guido Conaldi*	**S04_3 Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*	**S13_1: Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik*	**S06_2: Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*	—
12:30-13:30	*Lunch Break*				
13:30-15:00	**S18_1: Social Network Analysis and International Business** *Organisers: Kim Bui, Pi-Chi Chen, Bruce Cronin, Lena Langosch*	**S04_4 Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*	**S13_2: Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik*	**S06_3: Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*	**Poster Session**
15:00-15:30	*Coffee Break*				
15:30-17:00	**S18_2: Social Network Analysis and International Business** *Organisers: Kim Bui, Pi-Chi Chen, Bruce Cronin, Lena Langosch*	**S04_5 Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*	**S13_3: Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik*	**S06_4: Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*	**Poster Session**
17:00-17:30	**Posters Award Ceremony and Conference Closing (Room: 11_0003)**				
18:00-19:00	*Yoga Session (Room: Cooper Building 9.017)*				
19:00-23:00	**Social Event (Devenport House Building Courtyard)**				

Detailed Sessions Programme
Tuesday, September 13th 2022 (British Summer Time)
All rooms numbered 11_XXXX are located in the Stockwell Street Building.

9:30-10:30	**Conference Opening (Room: 11_0003)**	
S22_1 11:00-12:30	**Sustainability and Social Network Analysis** *Organisers: Stefano Ghinoi, Riccardo De Vita, Guido Conaldi* Room: 11_2007	
11:00-11:20	Knowledge networks and the rate of technological improvement: Speeding up emission reduction	David Dekker; Dimitris Christopoulos
11:23-11:43	Testing structure in portfolios of assets based on price and ESG via two-sample graph Kernel inference procedures	Ragnar Gudmundarson
11:46-12:06	The role of interlocking directorates on firm climate change performance: A network perspective	Thomas Riise Johansen; Slobodan Kacanski
12:09-12:29		
S02_1 11:00-12:30	**Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano* Room: 11_2014	
11:00-11:20	Motives and strategies of actors in the production of knowledge in university context	Marina Hennig
11:23-11:43	Fostering network collaboration– a topic modelling approach	Matthew Smith
11:46-12:06	Is collaboration a luxury? Interorganisational collaboration approach within the Higher Education	Srinidhi Vasudevan; Anna Piazza; Madeline Carr
12:09-12:29		
S14_1 11:00-12:30	**Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk* Room: 11_2016	
11:00-11:20	Generation of temporal multilayer networks from population-scale register data	Matteo Magnani; Miia Bask; Mikael Bask; Ilkka Henrik Mäkinen
11:23-11:43	The anatomy of a population-scale social network	Eszter Bokanyi; Eelke Heemskerk; Yuliia Kazmina; Frank Takes
11:46-12:06	Anonymity of multi-hop neighborhoods in social networks	Rachel de Jong; Frank Takes; Mark van der Loo
12:09-12:29	Analysing a population-scale co-offending network	Peter J Carrington; Alexander Graham
S11_1 11:00-12:30	**Networks and Crime** *Organisers: Tomáš Diviák, Paolo Campana* Room: 11_2017	
11:00-11:20	When organized misconduct lives or dies: A comparative analysis of misconduct networks	Sarah Gordon
11:23-11:43	Divergent definitions? How Social Network Analysis detects "Gangs" and what It means for policing	Alexandra Ciomek
11:46-12:06	The anatomy of organised crime cooperation in a UK police area	Paolo Campana; Andrea Giovannetti
12:09-12:29	Structural resilience and recovery of a criminal network after disruption: A simulation study	Tomáš Diviák

Detailed Sessions Programme
Tuesday, September 13th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S08_1 13:30-15:00	**Network Analysis and Bibliometrics** *Organisers: Stefano Ghinoi, Guido Conaldi* Room: 11_2007	
13:30-13:50	Social Network Analysis and graphical models. When connections matter	Giuseppe Giordano; Giancarlo G. Ragozini; Maria Prosperina Vitale
13:53-14:13	Portrait of citizenship regimes – Dynamics of scientific polarisation or consensus in the field	Lukáš Lehotský; Eva Fernández G.G; Manlio Cinalli
14:16-14:36	Talking about consumer food waste in scientific and grey literature: A bibliometric analysis	Elisa Iori; Matteo Masotti; Matteo Vittuari
14:39-14:59	Business models towards circular economy: A bibliometric analysis	Cecilia Correggi; Stefano Ghinoi; Paolo Di Toma
S02_2 13:30-15:00	**Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano* Room: 11_2014	
13:30-13:50	Exploring inter-organisational collaboration networks in tourism disaster management: A case study of rural and nature-based destinations in New Zealand	Lucia Danzi; Caroline Orchiston; James Higham; Rodolfo Baggio
13:53-14:13	Shared governance network dynamics and unexpected shocks: an empirical study of hospitals after l'Aquila earthquake	Federica Angeli; Fausto Di Vincenzo; Valentina Iacopino; Daniele Mascia; Anna Piazza
14:16-14:36	Unpacking centrality of key creatives in screen sector collaboration networks	Pete Jones; Kaska Musial-Gabrys; Aresh Dadlani; Deb Verhoeven
14:39-14:59	Learning in collaborations: assessing interdisciplinary collaborative networks of vocational interns in four health care organizations in The Netherlands	Thomas Teekens; Francesca Giardini; Rafael Wittek
S14_2 13:30-15:00	**Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk* Room: 11_2016	
13:30-13:50	Mobile-tracked visits to millions of places reveal socioeconomic inequality of daily consumption in the United States	Yuanmo He; Milena Tsvetkova
13:53-14:13	Urban mobility networks during the COVID-19 pandemic	Thomas Marlow; Kinga Makovi
14:16-14:36	Capturing the social fabric: Population-scale socio-economic segregation patterns	Yuliia Kazmina; Eszter Bokanyi; Eelke Heemskerk; Frank Takes
14:39-14:59	Measuring social capital in a population-scale social network	Bart de Zoete; Frank Takes; Eelke Heemskerk; Eszter Bokanyi; Yuliia Kazmina
S17_1 13:30-15:00	**Social Influence** *Organisers: András Vörös, Zsófia Boda* Room: 11_2017	
13:30-13:50	Perceived discrimination among ethnic minority students: The role of ingroup socialization	Chloe Bracegirdle; Nils Reimer; Ralf Wölfer; Nikhil Sengupta
13:53-14:13	The consequences of social influence for the secondary transfer effect of intergroup contact	Tibor Zingora; Olivia Spiegler; Tobias Stark; Chloe Bracegirdle; Miles Hewstone
14:16-14:36	Multi-issue and multiplex network lens on social influence in a university context	Ivana Smokovic; Christoph Stadtfeld; Timon Elmer
14:39-14:59	Too late? Complex contagion and delayed responses	Thomas U. Grund

Detailed Sessions Programme
Tuesday, September 13th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S02_3 15:30-17:00	**Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano* Room: 11_2014	
15:30-15:50	Inventors' collaboration networks and the future use of brokers' output	Ecem B Delicik
15:53-16:13	Knowledge spillover in the French biotechnology industry: From a polarized to a unified coordination scheme	Alvaro Pina Stranger; German Varas; Valentin Gerard
16:16-16:36		
16:39-16:59		
S14_3 15:30-17:00	**Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk* Room: 11_2016	
15:30-15:50	Understanding the multi-scale structure of macro-level internal migration networks	Gergely Mónus
15:53-16:13	The Small-World structure of a population-scale social network	Frank Takes; Eszter Bokanyi; Eelke Heemskerk
16:16-16:36		
16:39-16:59		
S17_2 15:30-17:00	**Social Influence** *Organisers: András Vörös, Zsófia Boda* Room: 11_2017	
15:30-15:50	Social preferences and position in signed friendship networks in school classrooms	Eszter Bokanyi; Luca Flora Drucker; Daniel Horn; Hubert Janos Kiss; Flora Samu
15:53-16:13	Tie formation strategies do not foster polarization of communication networks in consensus decision making	Nico Gradwohl; Ariana Strandburg-Peshkin; Helge Giese
16:16-16:36	Toward malaria eradication. The importance of social influence in the adoption of mosquito bites preventive measures in Meghalaya, India	Elisa Bellotti; Andras Voros
16:39-16:59	Identification with informal groups	Alejandro Espinosa-Rada; András Vörös; Christoph Stadtfeld
17:30-18:30	**Opening Keynote: Prof Kerstin Sailer (Room: 11_0003)**	
19:00-23:00	**Social Event (Room: 11_0002)**	

Detailed Sessions Programme
Wednesday, September 14th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S07_1 09:00-10:30	**Multiplex Networks and Individual Outcomes in School** *Organisers: Andras Voros, Zsófia Boda, Elisa Bellotti* Room: 11_2007	
09:00-09:20	Social role attribution networks in school	Andras Voros
09:23-09:43	Should I go to college? How social networks based on friendship, extra-curricular activities, and academic help exchange predict rural and urban students' college aspirations above and beyond scholastic abilities	I-Chien Chen; Lysann Zander
09:46-10:06	An investigation of the impact of COVID on student academic engagement and mental health: A longitudinal study	Matt Kammer-Kerwick; Kevin Swartout; Kara Takasaki; Jeffery Sternberg; Amy Schaeffer; Noel Busch-Armendariz
10:09-10:29	Data collection for temporal networks in higher education: A study on the evolution of study profiles	Nidia G Lopez Flores; Anna Sigríður Islind; María Óskarsdóttir
S12_1 09:00-10:30	**Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa* Room: 11_2014	
09:00-09:20	It's about "Who Agrees with Whom When": Opening the black-box of group consensus and network interactions in strategic decision-making	Guido Conaldi; Carmine Basile
09:23-09:43	Cooperation and productivity. The influence of network cooperation on the output of projects in teaching education	Dumitru Malai
09:46-10:06	Effects of COVID-19 on the Swiss board interlock network: An exploratory analysis	Malte Doehne; Katja Rost
10:09-10:29		
S20_1 09:00-10:30	**Social Networks and Personal Communities in Migration and Migrant Incorporation** *Organisers: Raffaele Vacca, Başak Bilecen* Room: 11_2016	
09:00-09:20	Building ties in a new home country: a closer look into the social network characteristics of foreign-born populations	Minna R. Tuominen; Elina Kilpi-Jakonen; Regina García Velázquez; Anu Castaneda; Hannamaria Kuusio
09:23-09:43	Composition of Immigrant's Social Networks and National Attachment to the Host Country	Ashraf Rachid
09:46-10:06	A systematic comparison of personal networks between migrant generations in the US	Raffaele Vacca; Başak Bilecen
10:09-10:29		
S05_1 09:00-10:30	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi* Room: 11_2017	
09:00-09:20	A fast approximation method for Bayesian regularization	Diana Karimova; Joris Mulder; Roger Leenders; Sara van Erp
09:23-09:43	PyERGM: A gateway to ERGM modeling in Python	Mowafak Allaham; Noshir Contractor
09:46-10:06	Community detection and reciprocity in networks by jointly modeling pairs of edges	Martina Contisciani; Hadiseh Safdari; Caterina De Bacco
10:09-10:29	Towards stochastic generalized blockmodeling	Aleš Žiberna

Detailed Sessions Programme
Wednesday, September 14th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S10_1 11:00-12:30	**Networking Historical Past** *Organisers: Paolo Cimadomo, Anna Collar, Maria Carmela Schisani* Room: 11_2007	
11:00-11:20	Networks and resilience: Understanding the resilience of Mesopotamian settlement networks via Exponential Random Graph models and Agent-Based Modelling	Deborah Priß
11:23-11:43	Towards a network analysis of Hans Sloane's collection: A preliminary study	Daniele Metilli; Andreas Vlachidis; Marco Humbel; Victoria Pickering; Mark Carine; Kim Sloan; Julianne Nyhan
11:46-12:06	On the effects of rooted family ties in business networks: The South of Italy in the 19th century	Roberto Rondinelli; Giancarlo Ragozini; Maria Carmela Schisani
12:09-12:29	The declining power of Swiss Patrician families during the 20th Century	Pierre Benz; Michael A Strebel; Emilie Widmer; André Mach; Steven Piguet; Legentilhomme Geoffroy; Pedro Araujo
S12_2 11:00-12:30	**Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa* Room: 11_2014	
11:00-11:20	The coevolution of leader identity, social network buy-in, and leader effectiveness	Andrew Parker; Christian Waldstrøm
11:23-11:43	Do busy female directors affect corporate governance quality? Evidence from the UK publicly listed companies	Claudine Salgado; Yasaman Sarabi; Dimitris Cristopoulos
11:46-12:06	Holey Diamond! Brokerage in signed networks	Paul Schuler; Srebrenka Letina; Károly Takács
12:09-12:29	The multifaceted effects of multiplexity on job satisfaction: An empirical investigation in a large organizational setting	Ali Al Busaidi
S20_2 11:00-12:30	**Social Networks and Personal Communities in Migration and Migrant Incorporation** *Organisers: Raffaele Vacca, Başak Bilecen* Room: 11_2016	
11:00-11:20	Better schools, better parties, better lives? Investigating the drivers of student mobilities in Europe	Micol M Morellini; Monika Verbalyte
11:23-11:43	Changing networks: Network trajectories of high-skilled returning migrants	Dorottya Hoor
11:46-12:06		
12:09-12:29		
S05_2 11:00-12:30	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi* Room: 11_2017	
11:00-11:20	Advancements for Bayesian ERGM – Handling missing nodal attributes, model constraints, and off-set values	Robert W Krause
11:23-11:43	Specification of attribute effects in statistical models for social groups	Marion Hoffman
11:46-12:06	Interactive network graphs online to analyze surveys and other databases	Modesto E Escobar; Cristina Calvo López
12:09-12:29		

Detailed Sessions Programme
Wednesday, September 14th 2022 (British Summer Time)
All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S10_2 13:30-15:00	**Networking Historical Past** *Organisers: Paolo Cimadomo, Anna Collar, Maria Carmela Schisani* Room: 11_2007	
13:30-13:50	Population dynamics in Dudelange from 1800 to 1950	Laura Silva; Franco Bonomi Bezzo; Sonia Schifano; Antoine Paccoud
13:53-14:13	Lost at home. A historical Social Network Analysis of the Italian community in post-independence Lybia, 1943-1970	Maddalena Zaglio
14:16-14:36	Interactive representations of celebrity networks across time and space	Cristina Calvo López; Modesto E Escobar
14:39-14:59		
S12_3 13:30-15:00	**Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa* Room: 11_2014	
13:30-13:50	Who decide what computers see? Studying AI datasets production through relational chains	Maxime Cornet; Clément Le Ludec
13:53-14:13	Understanding search strategies at networking events: An exploratory study using sociometric badges	Balint Dioszegi; Anne ter Wal; Valentina Tartari; Daniella Laureiro-Martinez; Stefano Brusoni
14:16-14:36	The impact of audience characteristics on third order inferences in sponsorship decisions	Andrew J Kloeden; Cécile Emery; Andrew Parker
14:39-14:59		
S21_1 13:30-15:00	**Social support and Health** *Organiser: Guy Harling* Room: 11_2016	
13:30-13:50	Visualisation of personal network: the experience of patients with severe mental illness	Hélène Garin; Vincent Lorant
13:53-14:13	Getting by with a little help from our friends – Predicting students' mental health outcomes post-transition to university with combined ego and cohort network parameters	Maria Kempnich; Ralf Wölfer; Miles Hewstone; Robin Dunbar
14:16-14:36	Social network-based HIV Post Exposure prophylaxis uptake among female sex workers in Iran	Yahya Salimi; Zahra Jorjoran Shushtari
14:39-14:59		
S05_3 13:30-15:00	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi* Room: 11_2017	
13:30-13:50	The dual ordering of individuals and words in organizations: A positional dominance approach	Julian Müller; Alessandro Lomi; Ulrik Brandes
13:53-14:13	Patterns in the recall of friendship relations	Zoran Kovacevic; Christoph Stadtfeld
14:16-14:36		
14:39-14:59		

Detailed Sessions Programme
Wednesday, September 14th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S15_1 15:30-17:00	**Public Policy and Discourse Networks** *Organiser: Philip Leifeld* Room: 11_2007	
15:30-15:50	Semantic hypergraph approach to semantic network induction and comparison	Telmo Menezes; Ksenia Puzyreva; Camille Roth; Nikita Basov
15:53-16:13	Does the climate matter? Discourse network analysis of climate delay in the Czech Republic	Lukáš Lehotský; Petr Ocelik; David Blazek; Kristina Zakova
16:16-16:36	Exploring the latent social space arising from the network of COVID-19 Twitter superstars	Giacomo De Nicola; Victor Tuekam; Göran Kauermann
16:39-16:59		
S04_1 15:30-17:00	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer* Room: 11_2014	
15:30-15:50	Uncovering the kinship matrix: A new study of solidarity and transmission in European families	Thomas Leopold; Charlotte Becker; Beyda Cineli; Zafer Buyukkececi
15:53-16:13	Have personal networks changed over the last decades? Comparing cross sectional surveys in France (2001-2017) and in California (1978-2015)	Guillaume Favre; Eric Giannella
16:16-16:36		
16:39-16:59		
S21_2 15:30-17:00	**Social support and Health** *Organiser: Guy Harling* Room: 11_2016	
15:30-15:50	Organizational network analysis of cross-sector providers serving medically complex people experiencing homelessness: Does relational coordination matter?	Amanda Anderson
15:53-16:13	Comparing group detection methods in the context of school networks and health	Srebrenka Letina; Mark McCann
16:16-16:36	On a typology of negative ties as a further perspective in social support research	Philip Adebahr; Sylvia Keim-Klärner; Andreas Klärner; André Knabe
16:39-16:59		
S05_4 15:30-17:00	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi* Room: 11_2017	
15:30-15:50	The comprehensive framework of virtual power	Mohammad Mohsen Mehdizadeh Naeini
15:53-16:13	Community detection in tripartite 3-uniform hyper-graph	Giancarlo G. Ragozini; Giuseppe Giordano; Maria Prosperina Vitale; Vincenzo Giuseppe Genova
16:16-16:36	How to explore the potential of a tennis player using tools of sna?	Antonina Milekhina; Marialuisa Restaino; Kristijan Breznik
16:39-16:59	Inducing optimal diffusion	Marco Pelliccia
17:30-18:30	**Closing Keynote: Prof Alessandro Lomi (Room: 11_0003)**	
19:00-23:00	**Gala Dinner (Room: Old Royal Naval College Painted Hall)**	
19:00-23:00	**Social Event (Queen Ann Courtyard)**	

Detailed Sessions Programme
Thursday, September 15th 2022 (British Summer Time)
All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S23_1 09:00-10:30	**Teaching Social Network Analysis** *Organisers: Riccardo De Vita, Yasaman Sarabi, Matthew Smith, Guido Conaldi* Room: 11_2007	
09:00-09:20	Open Education Resources (OERs) – Developing a resource hub for Social Network Analysis (SNA)	Yasaman Sarabi; Matthew Smith
09:23-09:43	Social Network Analysis: a challenge to conventional sociological approaches taught in university courses	Andrea Salvini
09:46-10:06	Teaching Network Science to undergraduate interdisciplinary students	Ebrahim Patel
10:09-10:29	Combining social network analysis and complex networks for new generations of researchers	Paola Tubaro; Floriana Gargiulo
S04_2 09:00-10:30	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer* Room: 11_2014	
09:00-09:20	Being Your Own Boss: Network Determinants of Young People's Orientations towards Self-Employment	Vacchiano Mattia; Eric Widmer; Vera de Bel
09:23-09:43	Revising tie strength in Latin American labor market: From information to the "Padrino" for income mobility in Colombia	Thibaud Deguilhem; Jean-Philippe Berrou
09:46-10:06	Indirect effect of contact frequency with social network members on the link between residential mobility and psychological well-being	Cansu Yilmaz
10:09-10:29		
S19_1 09:00-10:30	**Social Network Analysis and System Science for Social Change** *Organisers: Emily Long, Claudia Zucca, Mark McCann* Room: 11_2016	
09:00-09:20	A collaboration network of a community-based action programme stimulating healthy growth and development during the first 1000 days of a child's life	Carline Wesdorp; Vera de Bel; Coosje Dijkstra; Wilma Waterlander; Jaap Seidell
09:23-09:43	A longitudinal Social Network Analysis of alcohol-related sexual violence	Kevin Swartout; Matt Kammer-Kerwick; Ashlyn Swartout; Amy Schaeffer; Jeffrey Sternberg; Kara Takasaki; Noel Busch-Armindariz
09:46-10:06	Outdoor nature-based play in Early Care and Education centers: Identifying the determinants of implementation using causal loop diagrams and social network analysis	Claudia Zucca; Paul McCrorie; Avril Johnstone; Stephanie Chambers; Nai Rui Chng; Oliver Traynor; Anne Martin
10:09-10:29		
S06_1 09:00-10:30	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause* Room: 11_2017	
09:00-09:20	Modeling overlapping subgroups: Stochastic Actor Oriented approach	Stepan Zaretckii; Christian E.G. Steglich; Tom A.B. Snijders; Marijtje van Duijn
09:23-09:43	Evaluating blockmodeling approaches for undirected dynamic networks with newcomers and departure nodes	Marjan Cugmas; Aleš Žiberna
09:46-10:06	Reciprocity, community detection, and link prediction in dynamic networks	Hadiseh Safdari; Martina Contisciani; Caterina De Bacco
10:09-10:29		

Detailed Sessions Programme
Thursday, September 15th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S23_2 11:00-12:30	**Teaching Social Network Analysis** *Organisers: Riccardo De Vita, Yasaman Sarabi, Matthew Smith, Guido Conaldi* Room: 11_2007	
11:00-12:29	Panel: Rights and Wrongs of Teaching SNA	Panellists: Elisa Bellotti, Bruce Cronin, Martin Everett, Paola Tubaro, Anne Ter Wal
S04_3 11:00-12:30	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer* Room: 11_2014	
11:00-11:20	The ties that bother: Difficult relationships in older adults' personal networks	Lea Ellwardt; Theo van Tilburg
11:23-11:43	Ambivalent triads in the personal networks of young adults	Vera de Bel; Eric Widmer
11:46-12:06	Capturing the re-actualisation of ties: A biographical and formal analysis of personal networks	Cécile Plessard
12:09-12:29		
S13_1 11:00-12:30	**Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik* Room: 11_2016	
11:00-11:20	Social-ecological fit and outcomes: a (rare) empirical assessment of a prominent hypothesis	Manuel Fischer; Martin Huber; Mario Angst
11:23-11:43	Comparing egocentric networks to assess the impact of digital expertise and political conflict on the politicization of AI in the fields of health, finance and welfare	Nicole Lemke
11:46-12:06		
12:09-12:29		
S06_2 11:00-12:30	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause* Room: 11_2017	
11:00-11:20	What influences interaction in group work in elementary classrooms? An exploratory study using dynamic network actor models	Tomas Lintner
11:23-11:43	Stochastic Actor-oriented Models for Different Group Sizes	Tom A.B. Snijders
11:46-12:06	Change detection in dynamic networks using flexible multivariate control charts	Jonathan Flossdorf; Carsten Jentsch
12:09-12:29	Too many networks, outcomes, and time-points: Network modelling of support and fighting, mood, self-harm, drinking, productivity etc. in shared houses during lockdown	Per ER Block

Detailed Sessions Programme
Thursday, September 15th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S18_1 13:30-15:00	**Social Network Analysis and International Business** *Organisers: Kim Bui, Pi-Chi Chen, Bruce Cronin, Lena Langosch* Room: 11_2007	
13:30-13:50	Guanxi networks within the Chinese exhibition industry: the impact of internationalisation	Yehui Hu
13:53-14:13	The application of ego-centric networks in the impact of 'guanxi' on Chinese OFDI in the UK	Feng Zhang
14:16-14:36	Huawei's battle with influence networks in the UK	Bruce Cronin; Francisca Da Gama; Kim Bui
14:39-14:59		
S04_4 13:30-15:00	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer* Room: 11_2014	
13:30-13:50	Social support networks of trough life histories: transitions and dynamics of the networks until retirement	Francisca Ortiz
13:53-14:13	Distant social contacts, distant social identities? A social network approach to national identity and well-being of binational youth in Switzerland	Anahita Mehrpour; Paul Schuler
14:16-14:36	The role of past and current personal networks in social support to individual	Vida Česnuitytė
14:39-14:59		
S13_2 13:30-15:00	**Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik* Room: 11_2016	
13:30-13:50		
13:53-14:13		
14:16-14:36	For all the right reasons: using network entailment models to examine UK support for military intervention	Lorien Jasny
14:39-14:59	Networks and participation in cultural associations	Mario Diani
S06_3 13:30-15:00	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause* Room: 11_2017	
13:30-13:50	Modeling social network evolution over time using Graph Neural Networks to detect polarisation	Victor Chomel; Maziyar Panahi; David Chavalarias
13:53-14:13	Exponential Random Graph Models for dynamic signed networks: An application to international politics	Cornelius Fritz; Marius Mehrl; Paul Thurner; Göran Kauermann
14:16-14:36	Modeling the dynamics of network perceptions	Nynke Niezink
14:39-14:59		
Posters 13:30-17:00	**Posters Session** Room: 11_1001	

Detailed Sessions Programme
Thursday, September 15th 2022 (British Summer Time)

All rooms numbered 11_XXXX are located in the Stockwell Street Building.

S18_2 15:30-17:00	**Social Network Analysis and International Business** *Organisers: Kim Bui, Pi-Chi Chen, Bruce Cronin, Lena Langosch* Room: 11_2007	
15:30-15:50	Community relations and political ties for operational licenses in international business: A social network analysis	Shuna Shu Ham Ho
15:53-16:13	International business within and cross-continent: A case study of Social Network Analysis in the European Union and America	Jurema Luzia Luzia Ribeiro Pereira
16:16-16:36	Measuring the Spaghetti Bowl of Regional Integration	Justine MT Miller
16:39-16:59		
S04_5 15:30-17:00	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer* Room: 11_2014	
15:30-15:50	The impact of friendship structures on marital quality of heterosexual couples	Julia Sauter; Olga Ganjour; Rita Gouveia; Eric Widmer
15:53-16:13	Changes in formal social participation and their effects on friend ties in old age: Evidence from the Survey of Health, Ageing and Retirement in Europe (SHARE)	Jing-Yi Wang
16:16-16:36	Women's and men's partnership trajectories are differently associated with wellbeing in older age – Findings from Finland	Elisa Tambellini; Anna Rotkirch; Miika Maki; Mirkka Danielsbacka
16:39-16:59	The evolution of networks and homophily	Stephen M Nei; Matthew Jackson; Erik Snowberg; Leeat Yariv
S13_3 15:30-17:00	**Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik* Room: 11_2016	
15:30-15:50	The National Network of U.S. State Legislators on Twitter	Ishita Gopal; Taegyoon Kim; Nitheesha Nakka; Bruce A Desmarais
15:53-16:13	"They will not replace us": conspiratorial othering in nativist networks	Hugo Leal
16:16-16:36	Structural balance in international relations: Evidence from a new statistical model	Marius Mehrl; Cornelius Fritz
16:39-16:59		
S06_4 15:30-17:00	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause* Room: 11_2017	
15:30-15:50	A matter of time: Simulating network interventions in relational event networks	Rumana Lakdawala; Joris Mulder; Roger Leenders
15:53-16:13	Role switching and generalized exchange in a financial market	Alessandro Lomi; Federica Bianchi
16:16-16:36	An extended family of measures for directed networks	Martin Everett; David Schoch
16:39-16:59		
Posters 13:30-17:00	**Posters Session** Room: 11_1001	
17:00-17:30	**Posters Award Ceremony and Conference Closing (Room: 11_0003)**	
19:00-23:00	**Social Event (Devenport House Building Courtyard)**	

Poster Session
Thursday, September 15th 2022 (British Summer Time)
Room: 11_1001, 13:00 -17:00

Title	Authors
A Diffusion Network Event History Estimator	Jeffrey Harden (Notre Dame); Bruce A Desmarais (Pennsylvania State University)*; Mark Brockway (Syracuse University); Frederick Boehmke (University of Iowa); Scott LaCombe (Smith College); Fridolin Linder (Siemens Corp.); Hanna Wallach (Microsoft Research)
The effect of marriage on Core Discussion Networks: estimation and simulation of ego-centric ERGMs with non-trivial dyadic covariates	Michal Bojanowski (Kozminski University)*
A Longitudinal Investigation of Adolescents' Friendship Networks in Singapore Schools	Imelda S. Caleon (National Institute of Education)*; Rui Xiang Tan (National Institute of Education); Wei Xun Koh (National Institute of Education); Qamarina Ilham (National Institute of Education)
Making blockmodeling easier: R Shiny as a GUI for generalised blockmodeling	Fabio Ashtar Telarico (University of Ljubljana)*; Aleš Žiberna (University of Ljubljana)
Radicalization and social ties. The contribution of mixed methods: the example of French boxers	Gianni Marasà (University of Artois)*; Williams Nuytens (University of Artois)
Modifying Vector Autoregressive model (VAR) using Latent Position Models (LPM) for count data	Hardeep Kaur (University College Dublin)*
The influence of sociodemographic and drug use homophily in the development of friendship dyads: A sociocentric network study of Latinx women living in rural South Florida, USA	Edda Rodriguez (University of Miami)*; Ariana Johnson (University of Miami); Daniel Castaneda (University of Miami); Cho Hee Shrader (Columbia University); Juan Arroyo-Flores (Fors Marsh Group); Alfonso Yepes (University of Miami); Rebe Silvey (University of Miami); Lacey Craker (University of Miami); Gabrielle Webb (University of Miami); John Skvoretz (University of South Florida); Mariano Kanamori (University of Miami)
How are social prescribing link workers creating and maintaining professional networks in areas with high levels of socioeconomic disadvantage?	Amadea M Turk (University of Oxford)*; Stephanie Tierney (University of Oxford); Kamal Mahtani (University of Oxford); Catherine Pope (University of Oxford); Bernie Hogan (University of Oxford)
Social interactions and school coexistence in public elementary schools' neurodiverse classrooms.	Patricia Soto-Icaza (Universidad del Desarrollo)*; Melanie Oyarzún (Universidad de Desarrollo); Tamara Yaikin (Universidad del Desarrollo); Mirla Arcos (Universidad Autónoma de Madrid); Cristian Candia (Universidad del Desarrollo); Carlos Rodríguez-Sickert (Universidad del Desarrollo); Pablo Billeke (Universidad del Desarrollo)
Efficiency & Effectiveness of Uganda's Minigrid Governance Network: A Structural Network Analysis	Lillian Donna Namujju (Paderborn University)*
The Network Dynamics of Transdisciplinary Knowledge Creation - A longitudinal study of social networks in research collaboration	Marcel Mallow (University of Groningen)*; Christina Prell (Faculty of Spatial Sciences, University of Groningen)
Peer-to-peer electricity sharing: Network formation and stability analysis	Henrietta Acquah-Swanzy (Paderborn University)*
Exploring the impact of a teacher preparation program on teacher support networks	Meltem Alemdar (Georgia Institute of Technology)*; Christopher Cappelli (CDC); Jessica Gale (Georgia Institute of Technology)
Lockdown policy debate in the UK: Exploration of policy coalitions formation using discourse network analysis	Kristijan Garic (University of Essex)*
Scientific Collaboration Network under the Shadow of a War: The Nuclear Fusion Community Reaction to Russia's Invasion of Ukraine	Dominika Czerniawska (Leiden University)*
ScriptNet: An Integrated Criminological-Network Analysis Tool	Diana Bociga (University of Manchester)*

Abstracts
Tuesday, September 13th 2022

S22_1 11:00-12:30	**Sustainability and Social Network Analysis** *Organisers: Stefano Ghinoi, Riccardo De Vita, Guido Conaldi*

Title	**Knowledge networks and the rate of technological improvement: Speeding up emission reduction**
Authors	**David Dekker (Heriot Watt University)*; Dimitris Christopoulos (Heriot-Watt University)**
Abstract	Emission reduction is a key policy goal for many countries. Resistance to even minor loss in prosperity and economic welfare, makes that much of this reduction can only be achieved with new innovations. Business networks are important drivers of innovation. Not only do they facilitate the creation of new ideas, but perhaps more importantly they connect knowledge areas, which in turn define technological domains. One key dimension of knowledge networks are patent networks. Patent centrality in a technological domain has been shown to affect the rate of technological improvement (Magee, 2012). This rate is a very important predictor of technological dominance. As emission reduction hinges on innovative technologies it is crucial to know how long it will take before a developing technology can have a substantial impact beyond existing technologies. Why the observed effect between patent centrality and technological improvement rate occurs remains largely an open question. However, the most remarkable aspect of the rate of technological improvement is that it appears constant (see for example, Moore et al., 1965). In fact, many processes may align to create this relation, which is what makes patent centrality a good proxy for the rate of technological improvement. To enable policy makers to make informed decisions it seems eminent to create further insights in the processes driving the relations between patent centrality and the rate of technological improvement. First, we can establish that patents are 'legal products' which intrinsically have no agency. The owners of the patent have created a right to seek legal protection against disadvantageous commercialization of their investment creating new knowledge. Patents are therefore a social construct. Second, technology can also be seen as a social construct sublimated in the construct of a technological domain. In fact, it is this aspect of technology that has been measured to assess the rate of technological improvement. Singh, Triulzi, and Magee (2021) developed a method that produces extensive technological domain descriptions to then derive the patent network centrality for each of these domains. Our interest is focused on how social networks affect both social constructs. Gaining insight in how social networks create patent networks and how this simultaneously affects the creation of knowledge domains will help improve policy decision making. For example, patent owners' references to other patents produce a referral patent network. A patent here is the outcome of a knowledge creation process that (re-)combines existing knowledge. There is also ample evidence that social network structures have a major impact on new knowledge creation. A highly central patent will be pivotal to many other patents and hence holds evidence on the reuse of knowledge. The underlying social network structure can be hypothesized to be a predictor of patent centrality.

Title	**Testing structure in portfolios of assets based on price and ESG via two-sample graph Kernel inference procedures**
Authors	**Ragnar Gudmundarson (Heriot-Watt)***
Abstract	The global financial system is highly complex and its interconnectedness has been a major reasearch focus in recent years. Furthermore, a rising sustainability awareness among regulators, consumers and investors has created another mode of interconnections and potential risks. In this highly interconnected environment, local financial shocks and events can heavily alter the network representation or structure of the financial market. In this study we extract sequences of undirected graphs using the correlations of the SnP500 index returns and ESG risk factors (Environmental, Social and Governance) both for the SnP500 sector and industries. We then suggest using a graph kernel two-sample hypothesis test to test for structural changes within sectors and industries. Graph kernels are already well established and provide a very flexible way of comparing samples of graphs as they exist for a wide range of different graph structures. Moreover, we examine if structural changes occur if ESG information is taken into account. We also use this methodology to test for structural changes before and after events, such as COVID.

Title	**The role of interlocking directorates on firm climate change performance: A network perspective**
Authors	**Thomas Riise Johansen (Copenhagen Business School); Slobodan Kacanski (Roskilde University, Denmark)***
Abstract	The aim of this study is to investigate the role of interlocking directorates on emergence of sustainability-driven mimetic isomorphism between connected firms. We argue that since sustainability strategy is nowadays an important concern that is discussed on boards at annual general meetings, companies connected through interlocks tend to integrate similar sustainability strategies. This implies that interlocking board members tend to share information about business strategies (including sustainability) between firms they represent. Therefore, firms which share the same board member might integrate similar sustainability strategies. As a result of that, we hypothesize that interlocking directorates lead to emergence of similar climate change scores. However, literature suggests that not all interlocks would necessarily cause the occurrence of mimetic isomorphism in the climate change context. We are interested in identifying which board member attributes have the most prominent role on triggering the emergence of isomorphism between the connected firms. Earlier research shows that both firm, and socio-demographic and psychological aspects may generate inter-firm homophily. However, we are focusing only on socio-demographic and psychological attributes such as: gender, age,

	knowledge, experience, skills, expertise, tenure, education, nationality, professionalism, committee memberships etc. to investigate whether and how those personal characteristics impact climate change scores of by interlock bridged firms. We investigate this effect for public firms in Denmark, UK, Germany, and France for the period from 2010 – 2021. We collect corporate board member data from BoardEx and Orbis data bases, and CDP database for climate change scores. To quantitatively measure propensity for emergence of mimetic isomorphism, we use exponential random graph models (ERGMS) for multilevel networks to model network statistics for each country and each year by using MPNet software. Our findings are on the way…

S02_1 11:00-12:30	**Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano*

Title	**Motives and strategies of actors in the production of knowledge in university context**
Authors	**Marina Hennig (Johannes Gutenberg University of Mainz)***
Abstract	Knowledge, especially new knowledge, results from a novel combination of existing knowledge. It is known from current research that above all the combination of implicit and explicit knowledge of different actors is important for knowledge production. Moreover, previous research shows that the characteristics of social relations and the resulting networks influence how knowledge is acquired, transferred, absorbed and applied. Although research suggests that the actors involved in knowledge production are active, strategic agents who differ significantly in their abilities to absorb and create knowledge, they are usually treated only as nodes or black boxes. However, relational research has shown that actors differ in their motivation and ability to share information and knowledge, and that such motives are often strategic. But when and how actors' strategic motives influence the information and knowledge flows between them in knowledge creation and adoption, and what role internal knowledge structures play in this, has been largely neglected in research so far. The aim of this presentation is therefore to explore the question of when and how strategic motives as well as internal knowledge structures influence the acquisition and transfer of knowledge in the university context. Therefore, 8 interviews of professors and their knowledge acquisition processes in different phases of their career will be analysed.

Title	**Fostering network collaboration – a topic modelling approach**
Authors	**Matthew Smith (Edinburgh Napier University)***
Abstract	This study maps the collaboration networks in a Business School, with the aim of investigating how the collaboration network can be optimised for producing novel ideas and collaborative research. It has been argued that the optimal network structure is the small world network, which has a balance of weak ties for explorative innovation and strong ties for exploitative innovation activity. Firstly, this study maps existing collaboration ties between members of the Business School, where individuals are linked if they have worked together on the same outputs. This will be followed by an analysis of the output text data. More specifically we examine the topics that are being researched by Business School members by applying topic modelling to the text data, making use of an established natural language programming technique (LDA). The topic modelling is used to construct a network of individuals that are linked if they are working in the same topic area. This is then compared to the observed collaboration network to identify 'missing collaborative ties', where there are individuals working in the same area yet not connected. This study then implements a network intervention to promote collaboration between these individuals that would optimise the network structure (to better align it with the small world structure).

Title	**Is collaboration a luxury? Interorganisational collaboration approach within the Higher Education**
Authors	**Srinidhi Vasudevan (University of Greenwich); Anna Piazza (University College London)*; Madeline Carr (University College London)**
Abstract	2020 has changed how we are all working, including how educational institutions are engaging with everyone within their network. The recent increase in cyber-attacks have had a crippling effect on Higher Education Institutions (HEIs) which calls for collaborative efforts through Cyber Threat Intelligence (CTI) that will result in timely, actionable insights for institutions. While HEIs operate independently and in "silos", attackers are increasingly working together as evidenced by the Advanced Persistent Threats. Even though researchers have already investigated the cybersecurity collaborative work practices, few research has emphasised the social interaction process that shape collaboration across this sector in the cybersecurity market space. This paper takes a relational approach to explore cyber threat information transfer among institutions and stakeholders. Specifically, we unfold the social mechanism that underlines the collaborative patterns through cyber threat information transfer across the sector. We use survey data on institutions and organisations to identify the distinctive collaboration patterns that characterise the higher education sector. Our preliminary findings show that stakeholders with high in-degree centrality are more likely to share timely threat intelligence that would aid HEIs remediate threats in a proactive and preventive manner. Furthermore, interorganisational collaborative networks are highly clustered. We extend the quantitative analysis with insights from qualitative interviews that allows us to elaborate a deep understanding of the social nature of this sector: human,

	governance and organisational factors and the perception about collaboration. Our preliminary findings have key practical implications for the community as it allows managers to make strategic decisions based on the ability to structure their networks in terms of with whom they are connected to – in order to improve interorganisational collaboration or communication among educational institutions. It allows policy makers to account for broad patterns of relationship and to foster collaborative practices in the sector to build cyber resilience and to improve the preparedness of the HEIs against the cyber threats they face. "

S14_1 11:00-12:30	**Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk*

Title	**Generation of temporal multilayer networks from population-scale register data**
Authors	**Matteo Magnani (Uppsala University)*; Miia Bask (Uppsala University); Mikael Bask (Uppsala University); Ilkka Henrik Mäkinen (Uppsala University)**
Abstract	In this presentation we identify challenges in the generation of temporal multilayer networks from register data, and argue that the current framework (model, methods, and software) for multilayer network analysis needs to be extended. As a case study, we use data about the whole adult Swedish population (1990-2019). In particular, we focus on three aspects. First, there are different ways to define layers from register data, e.g., based on family, workplace, education, gender, age, income, time, and combinations of these dimensions. In knowledge discovery processes, identifying the best combination of relevant dimensions is typically one of the outcomes of exploratory data analysis. This requires the ability to manipulate multilayer networks, e.g., dynamically generating and merging layers. Second, the size of the data makes it challenging to manipulate them in main memory on non-high-end systems. Both challenges lead to our proposal to develop Multilayer Network Database Management Systems, which includes the development of database query languages for multilayer networks. Third, most register data do not contain direct social ties, but only refer to contexts where these ties may have been established. For example, the parents of two same-age and same-gender kids living in the same neighborhood will have some probability of knowing each other, but we cannot be certain. Therefore, we argue that the multilayer network model should be able to represent uncertainty about the existence of edges.

Title	**The anatomy of a population-scale social network**
Authors	**Eszter Bokanyi (UvA)*; Eelke Heemskerk (UvA); Yuliia Kazmina (University of Amsterdam); Frank Takes (Leiden University)**
Abstract	The analysis of large-scale societal networks has recently seen tremendous growth, in part because of the relative abundance of digital data sources such as online social networking platforms or mobile communication datasets. However, most of these data sources lack demographic data on users or are uncertain with respect to the representativity of the user sample. Moreover, it is often not clear what exact types of social relations these online or communication ties represent, thus, it is difficult to interpret findings. This talk will overcome a number of these drawbacks by presenting a thorough overview of the structure of a 17M node multilayer population-scale social network of the Netherlands containing roughly 1.6B edges derived from highly curated official data sources of CBS Netherlands. In particular, we revisit three important concepts in the field, being degree, closure and distance. First, we show how the degree distribution of this network is a composition of the degree distributions of the different types of edges. In the overall degree distribution, we find a characteristic value that is in sharp contrast to the scale-free or other fat-tailed distributions found in online social networks or communication networks. Second, we discuss different types of clustering in this multilayer network, and show how closed or open network structures emerge for people of certain ages. In particular, we introduce a normalized multilayer clustering coefficient that we call excess closure, that captures the fraction of triangles in people's social circles that span across multiple types of relationships. Finally, we show that long-range ties that span large distances are very scarce in this network, which is in contrast to findings in online social networks. This suggests that fast and efficient diffusion processes are mostly facilitated through co-affiliations of nodes and their overlaps instead of individual edges. Thus, we can show that this type of network derived solely from register data has remarkably short path lengths. Our measurements are first steps in building both methods and universal insights on the rich network structure of highly curated population-level network datasets."

Title	**Anonymity of multi-hop neighborhoods in social networks**
Authors	**Rachel de Jong (Leiden University)*; Frank Takes (Leiden University); Mark van der Loo (Statistics Netherlands)**
Abstract	Introduction & Goal. Sharing large-scale social network datasets is advantageous, since studying and replicating findings on such datasets are key to understanding and modeling various social phenomena. Following the principles of widely implemented privacy laws such as GDPR, such network datasets need to be anonymous, which means that people should not be identifiable by someone with a realistic amount of background knowledge. This work focuses on assessing this risk of disclosure, by measuring the anonymity of individuals in networks based on their structural position within the network.

	While some previous work has focused on measuring anonymity using only the direct surroundings of a node, other work has shown that when a possible attacker (i.e., a person attempting to de-anonymize a given anonymized graph) has information about a larger neighborhood beyond these direct surroundings, this could drastically decrease the anonymity of the individual. Therefore, in this work, we present a novel approach that extends earlier works into a parametrized measure that can serve as a lower bound for the expected anonymity at different levels of knowledge of the attacker. Approach. We measure anonymity by partitioning the set of nodes of a given social network into equivalence classes. We define equivalence by using the measure of d-k-anonymity, where two nodes are d-equivalent if 1) their respective d-hop neighborhoods (i.e., neighborhoods up to distance d of the node) are isomorphic, and 2) there is an isomorphism mapping the two compared nodes onto each other. Next, we define a node as unique if it has no equivalent nodes in the network. This improves upon existing measures because we allow for larger-hop neighborhoods, and because we assume perfect information about connectivity of individuals up to a certain distance. Experiments. To understand anonymity of individuals in real-world networks, we measure structural anonymity in the Erdős–Rényi and Watts Strogatz model, and a range of open-source empirical network datasets. We investigate anonymity for increasingly larger hop neighborhoods, and therewith different attacker knowledge scenarios. For both graph models and empirical networks, we obtained similar results where the fraction of unique nodes increases significantly when accounting for neighborhoods with distance greater than one. Conclusions. On both modeled and real-world social network data, we demonstrate that if an attacker has perfect information about what we call multi-hop neighborhoods, the anonymity of individuals in the social network is severely compromised. Since it is realistic for an attacker to obtain some (but not always all) information about larger-hop neighborhoods, one cannot dismiss the de-anonymizing effects of network structure surrounding a node for d greater than 1. This has serious implications for any social science researcher sharing social network data with other parties."

Title	**Analysing a population-scale co-offending network**
Authors	**Peter J Carrington (University of Waterloo)*; Alexander Graham (University of Waterloo)**
Abstract	The structure of the national network of police-recorded co-offenders in Canada is described, and hypotheses accounting for the network are tested. Co-offences, or crimes committed by more than one person, create or indicate links among criminals, which induce a national network of criminal collaborations. The population comprises all recorded co-offences and co-offenders in the 32 principal cities (Census Metropolitan Areas) in Canada in 2006-2009. This very large network is made manageable and intelligible – and the anonymity of participants is assured – by defining the cities as the nodes of the network, and the numbers of people recorded as committing a co-offence in both cities as the valued edges between pairs of cities. The cities form one connected component, containing two clusters connected by a link between Toronto and Vancouver. One cluster, centred on the triad of Toronto, Montreal, and Ottawa, comprises the cities in Ontario and Quebec, with weak links to cities in the Atlantic provinces. The other cluster, centred on Vancouver, comprises the cities in the four western provinces. The structure is strongly correlated with the residential mobility of the general population, which in turn is strongly correlated with intercity distances. The correlation with mobility is less strong for instrumental than for noninstrumental crimes. The structure of this co-offending network can be explained by criminals' routine activities, namely ordinary residential mobility, but the alternative explanation of purposive interurban criminal collaboration is more plausible for instrumental crime.

S11_1 11:00-12:30	**Networks and Crime** *Organisers: Tomáš Diviák, Paolo Campana*

Title	**When organized misconduct lives or dies: A comparative analysis of misconduct networks**
Authors	**Sarah Gordon (University of Michigan - Ross School of Business)***
Abstract	Organizational misconduct yields heavy costs to firms and society. Most research explores this phenomenon by analyzing the attributes of individual wrongdoers and the situational factors that enable misconduct or prevent it. While this approach is valuable, I argue that organizational misconduct is, inherently, an organized phenomenon. However, a network-based approach to misconduct remains under-developed, and there have been several calls to further expand it. Scholars do not know why some groups' efforts to perpetuate misconduct succeed over time, while others' efforts fail more quickly. I address this gap by identifying structural attributes of network communities that influence the duration of misconduct. I examine the longevity of organized misconduct through an innovative theoretical framework that distinguishes between licit and illicit organizational settings, and examine misconduct that is semi-visible, reflecting the information asymmetry between what is known inside an organization versus outside of it. In both contexts, misconduct communities are obscured within closed organizational systems that are difficult for outsiders to observe. A network community level of analysis is relevant as it captures the interplay between local and global constraints. A community structure suggests dense, local pockets characterized by tight social cohesion and strong monitoring capabilities. As these actors are weakly connected to other communities, they are more constrained by their community and less influenced by the global network. I demonstrate that characteristics useful for sustaining misconduct within a legitimatized setting can lead to the opposite effect within an illicit context. In licit contexts, there is an inherent tension between a misconduct community's proclivity to engage in misconduct and the global network's incentives to eliminate

	misconduct. Therefore, I hypothesize that such misconduct communities that are more densely-connected locally, and more sparsely-connected globally, will survive for longer periods of time. However, in illicit contexts, I expect the opposite. Because the global network is structured around perpetuating misconduct, as communities become more isolated from it they will be more likely to disengage from the global network and disband. In this case, network communities characterized by stronger local density and sparser global connectivity will survive for shorter periods of time. My first study (licit) examines misconduct communities within the Chicago Police Department over 25 years (1991 – 2015). My sample includes 51,347 complaints filed against 17,063 police officers. My second study (illicit) examines misconduct communities within two extremist online chat forums. My dataset includes 11 million chat forum posts over 20 years (2001 – 2021) among 140,000 users. I thus offer a comparative analysis to establish a theory of misconduct duration, centered on misconduct communities, that transcends context.

Title	**Divergent definitions? How Social Network Analysis detects "Gangs" and what It means for policing**
Authors	**Alexandra Ciomek (University of Chicago)***
Abstract	How are gangs, as defined by law enforcement, different from other groups that commit crime together and in what ways? Given the impact of criminal justice system involvement on the life course, as well as the multitude of detrimental effects associated with official labels of gang membership, understanding how current policing practices represent offending is paramount. It is clear from previous literature that peers affect an individual's offending. However, gang membership influences delinquency beyond the effects of associating with delinquent peers. Therefore, the gang has a particular impact on individual criminal activity that is not simply due to having more peers in one's gang involved in crime. Though individual and macrosociological factors may explain gang-related crime and violence, policing strategies are nonetheless motivated to focus on gang activity in order to address violence and increase public safety. In this study, I aim to use the idea of the interplay between peer effects and gangs to better assess and inform policing strategies. Law enforcement requires information on gangs and their members to design policies and strategies aimed at reducing violence perpetrated by gangs. However, there are many negative implications of official identification, including greater chances of criminal convictions and legal sentencing enhancements as well as increased surveillance. While previous work has shown the importance of links between and within gangs to the effectiveness of strategies aimed at youth and gang violence reduction, it has not developed a rich account of criminal network dynamics, one mechanism through which these strategies likely operated. Co-offending networks, or networks that connect individuals that offend together, capture these connections between individuals most at risk of offending and victimization. Therefore, I analyze a co-offending network of individuals with law enforcement contact in Boston from 2007-2014, either through arrests or informal field interviews. I use a community detection technique to determine empirical co-offending groups and assess their differences from law enforcement gang delineations and associated implications. My findings show that gang members and network-based co-offending groups are similarly involved in arrests, including violent arrests, though the group types tend to differ in their forms. Current gang classifications may not capture all criminal groups, and vice versa, at least in the context of co-offending, suggesting that other key individuals are at risk of engaging in crime as well as becoming victims. Based on this work, balancing the benefits of tracking and the consequences of the "gang member" label may make social network analysis more beneficial to law enforcement than current classification techniques.

Title	**The anatomy of organised crime cooperation in a UK police area**
Authors	**Paolo Campana (University of Cambridge)*; Andrea Giovannetti (University of Cambridge)**
Abstract	Organised Crime Groups (OCGs) constitute the backbone of many illegal markets and a threat to the well-being of people and communities. While wide-ranging non-network literature has explored OCGs and their activities in different settings, network approaches have lagged behind, particularly in assessing interactions among OCGs. In this work, we focus on collaboration among OCGs. We use police records to explore a unifying motivating question: what are the drivers of cooperation at the OCG-level? We explore the determinants of cooperation among OCGs based on the following dimensions: OCG size, type of activities and OCG relative control over their territory (turf). We approach the study of cooperation among OCGs from a number of complementary angles. First, we explore the impact of our determinants on the OCG's level of centrality and brokerage within the cooperation network. Next, we shift the focus to dyadic tie formation and explore the determinants of cooperative ties using a battery of Exponential Random Graph Models (ERGMs). Finally, we address the issue of the stability of OCG relationships by including a temporal dimension in our analysis, thus enabling the study of the evolution of cooperation.

Title	**Structural resilience and recovery of a criminal network after disruption: A simulation study**
Authors	**Tomáš Diviák (University of Manchester)***
Abstract	Disruption of criminal networks has been in forefront of the application of SNA in this area of research. There have been several studies investigating resilience of criminal networks and the effect of various types of disruption on their structure. However, only recently has the research started to acknowledge the fact that criminal networks tend to recover after a disruption. The response of actors involved in criminal networks and the recovery the network structure is especially important considering the fact that interventions against criminal networks may trigger negative

	unintended consequences in the form of strengthening the networks' cohesion. This study contributes to this recent stream of research by using a real-world street gang network as a basis for simulating the effect of disruption and subsequent recovery on its structure. The cohesion of the structure is first described using various actor- and network-level indicators together with the dependent variable – compactness. Second, the generative mechanisms operating in this network are identified using stationary stochastic actor-oriented model. The model specification includes endogenous structural mechanisms (preferential attachment, triadic closure) as well as mechanisms related to actors' attributes (homophily, social selection). Third, disruption techniques based on centrality (highest as well as lowest degree and betweenness) and gang hierarchy are applied to the network. The last part of the analysis is using the parameter estimates (and the increase/decrease of their values) from the actor-oriented model to simulate how the actors might respond to the disruption and how this in turn affects the cohesion of the network in terms of its average geodesic distances and connectedness. Methodological and ethical ramifications of this approach are discussed at the end.

S08_1 13:30-15:00	**Network Analysis and Bibliometrics** *Organisers: Stefano Ghinoi, Guido Conaldi*

Title	**Social Network Analysis and graphical models. When connections matter**
Authors	**Giuseppe Giordano (University of Salerno)*; Giancarlo G. Ragozini (University of Naples Federico II); Maria Prosperina Vitale (University of Salerno)**
Abstract	The present contribution proposes to map the conceptual connection between two theoretical frameworks, Graphical Models and Social Network Analysis, by means of a bibliometric analysis. Both scientific fields use graphs as mathematical entities to highlight the system of relationships among objects of different nature and complexity. Moreover, the terms Graph and Network are often used interchangeably. However, if we think of network analysis, it comes to mind connections among entities in several applied contexts, such as computer science, transportation, sociology, business, and many more. Instead, if the focus is on statistical analysis, we refer to modeling approaches that use a graph as the conceptual representation of a set of causal relationships between observed or latent variables (e.g., linear regression models, structural equation models, PLS path-models, etc.). From the statistical modeling point of view, even if social network models and graph models represent dependencies with graphs, the underlying scenario is very different. Graph models are a class of models used to study the underlying conditional dependence relations between random variables, while network models are used to model dyads in the presence of dependencies among statistical units. Starting from these two perspectives of analysis, a bibliometric analysis is carried out by exploiting publications collected from the Web of Science online bibliographic archive in the period 1985-2021. The bibliometric approach is here adopted to study the production and the growth of these specific themes. Specifically, a co-word network analysis, using the most relevant keywords emerging from the bibliographic data archive, allowed to highlight the conceptual structure of topics developed around the two theoretical frameworks over time. The statistical analysis of authors' keywords is then adopted to build a map tracing the main topics and trends of scientific domains under study by examining the association among keywords. The main findings have shown that interesting and innovative applications could establish a cross-fertilized field, where different methodologies meet and join in studying the interconnections among units.

Title	**Portrait of citizenship regimes – Dynamics of scientific polarisation or consensus in the field**
Authors	**Lukáš Lehotský (Masaryk University)*; Eva Fernández G.G (University of Geneva); Manlio Cinalli (University of Milan)**
Abstract	This paper presents a bibliometric analysis of the scientific use and evolution of the Political Opportunity Structure (POS) analysis on contentious politics, building on the analysis of citizenship regimes and their interplay with political behavioural outputs. It unveils the predominant understandings and schools of thinking which have influenced the scientific use of the citizenship regimes in social movement studies. Citizenship regimes refer to predominant understandings of boundaries and rules to access the community and full citizenry rights, whose basic premise suppose an exogenous factor driving or inhibiting political mobilisation. Despite consensual research on how the citizenship regimes (POS) shape political action, ways of measuring the POS factors have been mostly contested. The main variation across the scientific community concerns the dimensions of study to differentiate between regimes. By focusing on the idea of rights and status, scholars have put out front two main schools of thinking in the field: one based on one-dimensional versus one based on multi-dimensional measurements of citizenship regimes. Yet, there is a lack of knowledge on whether these two scientific research trajectories converged over time, or polarised into scientific niches instead. Therefore, this paper evaluates the state and dynamics of scientific contestation on issue based on analysis of co-citation networks since 1995 to 2020. The goal is to find polarisation in the existing literature, which is indicated by specific citation patterns. In addition, it combines bibliographic networks with topic modeling. This will detect subcommunities within the research niches.

Title	**Talking about consumer food waste in scientific and grey literature: A bibliometric analysis**
Authors	**Elisa Iori (University of Bologna)*; Matteo Masotti (University of Bologna); Matteo Vittuari (University of Bologna)**
Abstract	Starting from early seminal works in 2010, food waste research expanded rapidly and in an extremely articulated fashion. The way food waste has been addressed encompasses several challenges and perspective in terms of goals (quantification, measurement, driver identification, impact assessment, management, interventions) and disciplines (economics, management science, political science, psychology, sociology, food technology). To unveil such complexity, this study builds on a bibliometric literature review on a dataset of scientific papers and grey literature published from 2010 to 2021 to analyse the literature evolution on consumer food waste. This work investigates authors and paper centrality in the scientific debate around consumer food waste, cross-country collaborations between authors and the presence of co-authorships and co-occurrence of keywords and topics. The search for scientific literature was conducted using the Web of Science research engine focusing on papers published from 2010 onwards that include the terms “food waste” and “consumer*” in the abstract, title, or among keywords, for a total of 1160 unique documents selected. Scientific papers have been integrated with grey literature in a two steps approach. The first step consisted in a Google Scholars search for documents related to consumer food waste published in English language from 2010 onwards. In the second step, documents suggested by a pool of food waste experts were selected and included, for a total of 78 documents. To make the grey literature documents suitable for the bibliometric analysis, a set of specific keywords was extracted from abstract, foreword and introduction sections using the YAKE! Algorithm. Results were interpreted by the authors and a final set of keywords for each grey literature document was identified. After the aggregation of scientific papers and grey literature, a final dataset (1238 documents) was completed on November 18, 2021 and analysed using bibliometrix R package. Results shows that in the last 11 years food waste literature increased exponentially with two important turning points in 2014 and 2017. In 2010-2013 food waste was mainly observed through hard science approaches, focusing on its valorisation, rather than to prevention. In 2014-2016 consumption, solid waste, and food waste have been addressed mainly with a life cycle assessment perspective. From 2017, behavioural analysis rose more consistently through the investigation of consumers attitudes, barriers, and habits and focusing mainly on prevention. Overall, two major clusters of topics can be identified in consumer food waste publications today, one related to consumer behaviour interventions and drivers, the other on the environmental dimension of food waste. Diving into the document’s productivity, USA, UK and Italy are three most producing countries, and also the most cited ones. Nonetheless, collaborations across countries are present, especially USA and Europe.

Title	**Business models towards circular economy: A bibliometric analysis**
Authors	**Cecilia Correggi (University of Modena and Reggio Emilia)*; Stefano Ghinoi (University of Greenwich); Paolo Di Toma (University of Modena and Reggio Emilia)**
Abstract	In the recent years, Circular Economy (CE) has become a key paradigm for pursuing environmental and economic development, and therefore it has gained importance in the society, the business sector, and the academia. Considering the environmental problems that characterize the 21st century, firms are aware that business as usual is not an option for a sustainable future (Bocken et al., 2014) and they need to rethink the way they generate and deliver value. These changes have been analysed in the literature under the Business Model (BM) lens (Zott and Amit, 2010) and BM Innovation (Chesbrough, 2010). Moreover, a growing debate has focused on the role of dynamic capabilities in driving the process of BM Innovation towards CE. Several studies analysing CE and BM jointly have been carried out to date, and an analysis of the evolution of the debate, its sources, and current trends can help to understand the “state of the art” of the literature and the paths that still need to be taken. More precisely, considering that during the last few years the topic has seen an exponential increase of publications, an updated literature review is nowadays necessary. By using a bibliometric approach, this paper aims to address this need. Our analysis explores a large volume of scientific publications and uses bibliometric techniques to map the cumulative scientific knowledge (Donthu et al., 2021) on how Dynamic Capabilities foster the process of BM Innovation towards CE. Bibliometric analysis has the potential to show how specific disciplines, scientific domains, or research fields are conceptually, intellectually, and socially structured (Cobo et al., 2011) and, thus, it enables to identify knowledge gaps and potential avenues for future research. Following an approach similar to Goel and Jones (2016), we use a specific combination of keywords to identify all documents on CE and BM in Scopus, one of the primary scientific sources for bibliographic data (Singh et al., 2021). Our analysis concentrates on 1,057 documents and applies science mapping for visualising and analysing citation networks and co-occurrence networks: this approach is suitable for detecting relational patters and conceptual structures underlying the research field, hence adopting network analysis techniques for quantitatively assessing the role of specific individuals and concepts in the literature. Results show that key themes for practitioners and policymakers are emerging in the literature as well – for example, the impact of digitalisation and big data, Industry 4.0, and social sustainability – while motor themes referring to traditional theoretical approaches – such as the resource-based view – continue to be central in the discussion but are re-enforced by specific links to novel elements, like the Sustainable Development Goals. These findings provide further advancements to previous works (e.g. Ferasso et al., 2020) on the evolution of the literature on circular BM.

S02_2 13:30-15:00	**S02_2 Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano*

Title	**Exploring inter-organisational collaboration networks in tourism disaster management: A case study of rural and nature-based destinations in New Zealand**
Authors	**Lucia Danzi (University of Otago)*; Caroline Orchiston (University of Otago); James Higham (University of Otago); Rodolfo Baggio (Bocconi University)**
Abstract	The main tourist destinations in Aotearoa-New Zealand include rural regions that are highly exposed to disaster risk and limited in emergency response resources and medical care capacities. Close collaboration between emergency management and tourism organisations is required, but there is currently limited understanding of the nature of their relationship and their actual operation. This research addresses this gap by investigating how tourism and emergency agencies work together during a crisis, through the perspectives of senior representatives from different levels of governance. Data are collected through purposive and snowball sampling, and cross-analysed via 'triangulation'. A mixed methods social network approach incorporates the qualitative content analysis of policies and plans, the quantitative analysis of survey responses, and the qualitative analysis of case-study interviews with key stakeholders from two major nature-based destinations in New Zealand, Queenstown and Milford Sound. Expected outcomes from this research will show the patterns of linkages among members of collaborative networks in tourism emergency management, and how these change across the different phases of an emergency. Findings from this research will help promote collaboration and integration between stakeholders involved in tourism disaster management, and, through improving disaster preparedness, build the resilience and response capability of rural New Zealand.

Title	**Shared governance network dynamics and unexpected shocks: an empirical study of hospitals after l'Aquila earthquake**
Authors	**Federica Angeli (University of York); Fausto Di Vincenzo ("G. D'Annunzio" University of Chieti - Pescara); Valentina Iacopino (Università Cattolica del Sacro Cuore)*; Daniele Mascia (LUISS University); Anna Piazza (University College London)**
Abstract	Network governance literature has broadly examined how organizations coordinate for public common goals. While scholarly interest has been focused on new forms of network governance arising in response to natural disasters or epidemics, little is known about how existing networks cope with unexpected shocks. These studies have mostly considered the evolution of governance networks that are mandated and/or display some forms of leadership – for example through lead public organizations or through devoted network administrative organizations. Self-organizing networks managed through shared governance have instead received less attention, despite their relevance to public service. In particular, it remains unclear how shared governance networks adapt and respond to institutional shocks. In this paper, we investigate how shared governance networks adapt their response over time to a major shock affecting one key organization of the network. We look at how the hospital patient transfer network in Abruzzo, Italy, reacted to the 2009 earthquake in L'Aquila. The sudden natural disaster led to the collapse of one main hospital infrastructure in the region and forced a sudden modification of patient transfer patterns to enable the maintenance of the regional healthcare systems functionality. By looking at hospital characteristics as well as at network structural effect, we focus on the multifaceted role of proximity in the process of re-organization of a shared governance network. We examine whether hospitals re-establish their social capital, looking specifically at the role played by several dimensions of proximity including social (measured at dyadic - e.g., reciprocity - and triadic levels - e.g., transitivity), institutional, organizational, cognitive, and geographical proximity. We use data collected on a regional community of hospitals over four years, capturing collaborative relations through patient transfers. We use Stochastic Oriented Models to explore our theoretical conjectures. Our results indicate that immediately after the disaster hospitals have a tendency to re-create social capital based upon their social proximity at dyadic and triadic levels. Using time dummies, we estimate the significant of the social proximity over time and we find that the effect of reciprocity is not anymore significant from time 2 to time 4, while transitivity remains significant. In addition, hospitals are more likely to select proximate partners and there is a preference to create collaborative relations between hospitals located in the same local health areas. Our study provides original insights to network governance literature and contributes to extant research that has focused on characteristics influencing tie formation between organizations in times of crisis. Moreover, our findings advance existing knowledge on current approaches in public management research illustrating network resilience.

Title	**Unpacking centrality of key creatives in screen sector collaboration networks**
Authors	**Pete Jones (University of Alberta)*; Kaska Musial-Gabrys (University of Technology Sydney); Aresh Dadlani (University of Alberta); Deb Verhoeven (University of Alberta)**
Abstract	As a project-based labour market marked by harsh and continuing inequalities and cultural mechanisms of exclusion, the screen industries are a particularly interesting case study for thinking about patterns of collaboration and their intersection with power. Traditionally, analysis of cultural sector inequalities focuses on summary statistics over time. However, with more and more data available about individuals and their interactions and collaborations with others, new opportunities arise to build deeper understanding about how and why we observe those summary statistics. A

	natural way to analyse such interaction data is to use social network analysis, which offers a wide range of techniques allowing us to understand the prominence of nodes in different substantive settings and to account for the impact of their behaviour at the community and network levels. One of the most important tools in the network analysis toolkit is node centrality, which helps to assess the standing, prestige and importance of individuals within the network. Over the years, several methods to evaluate centrality have been proposed and their interpretations vary across the board. For example, in social networks, node degree helps to assess how important a person is in their local environment; closeness centrality indicates how important an individual is in the context of the whole network; and betweenness centrality enables to find nodes that can control information flow in the network. While centrality measures are constructed around and mainly utilise network structure, if combined with information about the nodes' and edges' attributes, they can help us to understand the ways in which individual actors hold power and influence in a network. Thus, in this paper we take a close look at how different local measures and centrality metrics capture different (gendered) elements of power in the Australian and Canadian screen industries. We present two comparable datasets consisting of the writers, directors and producers of television and feature film projects in these countries. We rank nodes by various centrality measures and consider how different production roles and genders are privileged by certain measures. Based on this, we explore how we might understand, on the one hand, how to make sense of network centrality in this particular but important kind of collaboration network and, on the other hand, how power operates in the networks. By looking at a range of centrality measures, we are able to build a fuller picture of these particular screen industries, especially when identifying powerful individuals, both at local and global scales.

Title	**Learning in collaborations: assessing interdisciplinary collaborative networks of vocational interns in four health care organizations in The Netherlands**
Authors	**Thomas Teekens (University of Groningen)*; Francesca Giardini (University of Groningen); Rafael Wittek (University of Groningen)**
Abstract	Interdisciplinary work is a key element of modern health care professions: health care workers are increasingly required to successfully engage in interdisciplinary collaborative relations in order to help patients in the broad and varied forms they take. This growing importance of interdisciplinarity as a competency of health care workers necessitates vocational schools to cultivate this professional skill in health care students in their educational programs. One possible avenue for this cultivation is interns' participation in vocational internships, where students work in a real-world health care organization in an apprenticeship-style function. This study looks at four health care organizations in The Netherlands, in which health care interns participated in interdisciplinary collaborative teams with other interns, supervisors, and other professionals. These interns participated in so-called "learning networks", aiming to increase their interprofessional capacities through collaboration with others. Our study surveys the participating students' (n=51) collaborative ego-networks in these four health care organizations, with the aim of mapping their relations, the contents of these relations, and individual interprofessional attitudes and motivations. For all collaborators, we asked for disciplinary background and function in the organization, and we inquired how often the intern collaborated with the person, how high the mutual understanding is in the relation, and the extent to which the collaborators' tasks are interdependent. Combining the student's ego-networks resulted in four separate collaborative networks of these care organizations from the interns' points of view. The question we aim to answer is how the structure and nature of these collaborative ties affect the students' interprofessional attitudes. We emphasize on one hand the task interdependence and cooperation frequency in the collaborative relations, and on the other the structural elements, such as having a particular supervisor or a joint collaborator, may have on student's motivations. We attempt to model the nature and structure of the four collaborative networks through ERGM models, restrained by the absence of information from the professionals themselves in the organization, who are present in the networks, but who did not provide information on the collaborative relations themselves. The student data, however, contains a lot of information as we inquired deeply into the different facets of their collaborations. Altogether, we hope to provide some insights in how vocational internships networks, through collaborations, may help to increase the interdisciplinary capacities of new health care workers.

S14_2 13:30-15:00	**S14_2 Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk*

Title	**Mobile-tracked visits to millions of places reveal socioeconomic inequality of daily consumption in the United States**
Authors	**Yuanmo He (London School of Economics and Political Science)*; Milena Tsvetkova (London School of Economics and Political Science)**
Abstract	An important aspect of socioeconomic inequality is the difference in daily consumption practices by socioeconomic status (SES). It is not only a manifestation of inequality but also a trigger for further inequality in other life outcomes. In this study, we use population-scale data from SafeGraph on physical store visits and co-visits in the US to investigate the socioeconomic inequality in daily consumption.

	Differential daily consumption patterns result from both economic constraints and social processes. Sociologists Veblen and Bourdieu suggest that people use different consumption behavior to distinguish their SES, and people in similar SES tend to have similar consumption preferences. Empirical evidence also shows that lifestyle choices could become correlated with demographic characteristics due to homophily and social influence. Therefore, we hypothesize that SES is associated with different consumption preferences for consumer brands, that these preferences are correlated across service categories such as supermarkets, department stores, and gas stations, but that they do not necessarily correspond to economic constraints driven by the product prices. We combine data from multiple sources to test the hypotheses: SafeGraph and various price comparison websites. SafeGraph collects mobile tracking data for a large sample of US smartphones; it provides data on visits to the stores of 7,700 distinct brands, covering all the major brands in the US. The data include the brand's NAICS category, the store's street address, counts of visits, home census block groups(cbgs) of the visitors, and other brands that the visitors visited on the same day/week/month, etc. For the analyses, we calculate three different measures of the SES associated with the brands: 1) we create a Big Mac Index equivalent using the price of a typical product, 2) we estimate the visitors' average income from their cbgs, and 3) we use correspondence analysis to project the weighted network of brand co-visits on a unidimensional scale. We estimate the correlation between the three measures and identify outliers that indicate unexpected lifestyle correlations. The study adds valuable descriptive detail to our understanding of the socioeconomic inequality in daily consumption and provides behavioral evidence for the arbitrary correlation of consumer and cultural preferences. We note that in contrast to previous studies that analyze either stated preferences or purchasing decisions, we investigate behavioral evidence for preferences (physical visits) that are not necessarily limited by financial constraints (e.g., the possibility for "window shopping"). Given our focus on inequality, we particularly aim to identify specific brands that low-SES individuals frequent for social/cultural reasons, against their own economic interests. The findings will contribute to the omnivore-vs-highbrow debate in cultural sociology and more generally, to stratification and consumer research.

Title	**Urban mobility networks during the COVID-19 pandemic**
Authors	**Thomas Marlow (New York University Abu Dhabi)*; Kinga Makovi (New York University Abu Dhabi)**
Abstract	Recent advances in data access have enabled a new wave of research focused on population-level daily mobility networks in cities. Mobility networks are an important area of study because they have broad implications for heterogeneity in social phenomena, including the spread of diseases, crime, and environmental exposures. However, our understanding of the stability of these networks and their responses to disruptive events is still limited. We use a mobility dataset derived from cell phone location data provided by Safegraph to investigate weekly network dynamics in the 25 largest U.S. cities during the COVID-19 pandemic (2020-2021). We use three recently developed measures of mobility network structure: the Equitable Mobility Index (EMI) to capture the average degree of isolation in a neighborhood's mobility network; the Concentrated Mobility Index (CMI) that measures the importance of mobility hubs such as downtown areas to the overall mobility network; and the Segregated Mobility Index (SMI) that characterizes race and ethnicity-based neighborhood mobility isolation. Building on previous work, we show that prior to the COVID-19 pandemic, mobility patterns were stable over the course of a year. In the pandemic's initial phases, however, city-level interventions such as lockdowns and policies encouraging social distancing drastically altered mobility networks measured by all three indices. By the end of 2021, the importance of mobility hubs to the overall network structure (CMI) and the levels of racial and ethnic segregation in mobility networks (SMI) returned to pre-pandemic levels; however, neighborhood isolation (EMI) remained elevated. These networks evolved in 2021 as vaccinations became available and case counts fluctuated. In general, CMI and SMI remained close to pre-pandemic values, whereas EMI continued to regress to pre-pandemic levels. However, there is significant variation in these trends across and within cities. For example, in some places, EMI remained sensitive to changes in case rates during the summer Delta variant surge and the emergence of the Omicron variant later in the year. To better understand within city variation and how increasing vaccination rates interact with case rates to influence mobility between places, we fit a series of dyadic regressions in Chicago where weekly ZIP Code level case and vaccination data is available. We model mobility between neighborhoods at the census tract level as the outcome and evaluate its relationship to differences in the demographic characteristics of origin and destination neighborhoods along with the vaccination and case rates in a destination neighborhood. Our findings suggest that the COVID-19 pandemic introduced long-lasting structural changes in city mobility networks, mainly through the elevation of neighborhood isolation which has potentially significant ramifications for other urban inequalities.

Title	**Capturing the social fabric: Population-scale socio-economic segregation patterns**
Authors	**Yuliia Kazmina (University of Amsterdam)*; Eszter Bokanyi (UvA); Eelke Heemskerk (University of Amsterdam); Frank Takes (Leiden University)**
Abstract	Segregation is a widely studied issue traditionally explored from the point of the spatial distribution of different groups as defined by any individual attribute such as race, religion, social class, etc. Nevertheless, we argue that the issues of persistent segregation, specifically socio-economic segregation, are networked phenomena and should be studied as such. In this paper, we make a methodological contribution that would allow the scholarship and policymakers to move

	away from a traditional spatial understanding of segregation that ignores interactions beyond neighborhoods and shift the focus of segregation measurement to the social network aspect applied to a diverse set of previously unexplored distinct social contexts. The study is based on the Dutch population register data sourced from multiple existing sub-registers that contain information on formal ties and affiliations of ~17 million legal residents in multiple social contexts such as kinship, household, neighborhood, school, and work. With the multiplex network of geospatially embedded formal ties in hand, we aim to observe to what extent areas of social segregation are clustered in geospatially embedded social networks, and how each network layer contributes to the issue. More specifically, we measure to what extent Dutch residents in different municipalities are exposed to individuals of different socio-economic statuses in diverse social contexts and what social contexts provide diverse social contact opportunities with respect to the socio-economic status and, on the contrary, what social contexts play a role of socio-economic bubbles. Our findings suggest great heterogeneity in socio-economic assortativity between different social contexts (the layers of the analysed network) as well as different municipalities.

Title	**Measuring social capital in a population-scale social network**
Authors	**Bart de Zoete (Leiden University)*; Frank Takes (Leiden University); Eelke Heemskerk (University of Amsterdam); Eszter Bokanyi (UvA); Yuliia Kazmina (University of Amsterdam)**
Abstract	In this work we consider the measurement of social capital using population-scale social network data in the Netherlands. Social capital can be seen as the value and resources found in social structures which enable collective action. Having been linked to many societal phenomena, social capital has become a cornerstone of social science. It is most often measured indirectly using data on its expected outcomes, such as civic participation. Another approach, which we will utilize in this work, is to use social networks, which can capture the network structural aspect of social capital. However, with traditional social network data, the network aspect can be problematic due to data quality and completeness issues. In this work, we bring large-scale and high quality social network data and data on four key social capital outcomes together, in order to for the first time at the scale of an entire population assess the power of network measures of social capital such as average degree and attribute assortativity. We consider a population-scale social network with formal ties (e.g., family, work, school, and neighbor relations) of the entire Dutch population. This network has unique properties that make it highly interesting and well-suited for the measurement of social capital, and its validation. Indeed, the network contains various node attributes that can be used to group people by the geographical neighborhood in which they reside. This in turn makes it possible to use existing neighborhood data (i.e., proxies of community social capital) to validate our measure. Various statistics about Dutch neighborhoods are publicly available, some of which relate to common social capital outcomes. We represent four social capital outcomes using the percentage of people with good perceived health, that do volunteer work, that receive social assistance benefits from the government, and the number of reported violent crimes per one thousand people in the neighborhood. We use regression models to assess the precise relation between network measures and these social capital outcomes. The results show that all four conceptualizations are to some extent measurable through structural network measures. Our work presents the first major steps for the measurement of social capital using population-scale network data. The findings can be valuable to anyone measuring social capital in networks, paving the way for informed decision making aimed at increasing social capital of, for example, minority groups.

S17_1 13:30-15:00	**S17_1 Social Influence** *Organisers: András Vörös, Zsófia Boda*

Title	**Perceived discrimination among ethnic minority students: The role of ingroup socialization**
Authors	**Chloe Bracegirdle (University of Oxford)*; Nils Reimer (University of Southern California); Ralf Wölfer (University of Oxford); Nikhil Sengupta (University of Kent)**
Abstract	Friendships with members of our own group (ingroup) and others (outgroups) shape our beliefs about the world, including perceptions of discrimination against one's ingroup. Research to date indicates that, among members of disadvantaged groups, friendships with members of an advantaged outgroup are associated with less perceived discrimination while friendships with members of the disadvantaged ingroup are associated with more perceived discrimination. Past studies, however, considered ingroup and outgroup friendships in isolation and overlooked the various processes that could underlie these associations. In contrast, we tested whether disadvantaged-group members' perceptions of discrimination are shaped by their numbers of ingroup and outgroup friends and by those ingroup and outgroup friends' perceptions of discrimination through the process of socialization. We investigated our research questions in one cross-sectional social network study (Study 1) and one longitudinal social network study (Study 2) conducted in British schools. In Study 1, the 1,378 respondents (466 Asian, 160 Black, 666 White, 86 Mixed; 682 girls, 642 boys; aged 14–16 years) were nested in 9 school year group networks. In Study 2, the 1,170 respondents (829 Asian, 341 White; 612 girls, 558 boys; aged 11–14 years) were nested in 6 school year group

	networks. In both studies, the students completed surveys containing many measures, including a network measure of friendship and a self-report measure of perceived ethnic group discrimination. In Study 1, we applied Bayesian multilevel network autocorrelation models to investigate whether ethnic minority-group students' perceptions of discrimination were associated with their numbers of ingroup and outgroup friends, and their ingroup and outgroup friends' perceptions of discrimination. The results indicated no associations between friendships with outgroup members and ethnic minority-group students' perceived discrimination. Instead, we found that ethnic minority-group students with more ingroup friends reported greater perceived discrimination, and this effect was stronger if those friends also perceived greater discrimination against the disadvantaged ingroup. In Study 2, we applied RSIENA co-evolution models to explore the direction of the associations. We found that, over time, ethnic minority-group students' perceptions of discrimination became more similar to their ingroup friends' perceptions of discrimination. Together, the results suggest that friendships between ethnic minority-group members may shape perceived discrimination through the process of socialization. These findings lay the groundwork for a comprehensive theoretical account of how friendships shape perceptions of discrimination in disadvantaged groups.

Title	**The consequences of social influence for the secondary transfer effect of intergroup contact**
Authors	**Tibor Zingora (Czech Academy of Sciences, Institute of Psychology)***
Abstract	Intergroup contact can improve attitudes toward the contacted (primary) outgroup as well as other (secondary) outgroups. This is referred to as the secondary transfer effect (STE). In a school environment, having friends from one ethnic outgroup should improve attitudes also toward other ethnic outgroups. However, peers, especially friends, exert social influence over adolescents' outgroup attitudes. Thus, we propose that adolescents' secondary outgroup attitudes are affected by primary outgroup friends' secondary outgroup attitudes, as well as by having primary outgroup friends. An important implication of this is that the effect of friendship with the primary outgroup on attitudes towards the secondary outgroup is not automatically positive; instead, it depends on the valence of primary outgroup members' attitudes due to their social influence on adolescents' secondary outgroup attitudes. Consequently, social influence could reduce or facilitate the STE. Importantly, the social influence of primary outgroup members could shape secondary outgroup attitudes even if there is no STE and, thus, could be a crucial factor that should be always considered if the STE is investigated or applied. We conducted two empirical and one simulation studies to investigate whether having primary outgroup friends or/and the social influence of primary outgroup friends shape adolescents' secondary outgroup attitudes. We applied stochastic actor-oriented models of network dynamics to longitudinal network data representing friendships between adolescents. In Study 1, using a Bayesian estimation method, we found that Dutch-majority attitudes towards Moroccans were affected by the social influence of both primary outgroups – Turkish and other-ethnic origin – and by having Turkish-origin friends. In Study 2, we extended our investigation to the German context, analyzed three waves of data, studied attitudes of both majority and minority adolescents, studied a different secondary outgroup, and preregistered this study. Using a meta-analytical approach, we found that Turkish-origin adolescents exerted social influence over both majority and minority adolescents' attitudes towards Poles. The simulation study enabled us to assess a) the relative importance of the STE and social influence effects, b) hypothetical interventions whereby adolescents were confronted with primary outgroup friends whose secondary outgroup attitudes were either of the same or different valence, and c) attitudes of all adolescents, including those without primary outgroup friends. These results highlight the importance of considering social influence when studying the STE. The social influence effect was found in all three cases, whereby the STE was found only in one case. The simulation study demonstrated that the social influence effect can cause a large change in adolescents' secondary outgroup attitudes, including attitudes of adolescents without primary outgroup friends.

Title	**Multi-issue and multiplex network lens on social influence in a university context**
Authors	**Ivana Smokovic (ETH Zürich)*; Christoph Stadtfeld (ETH Zürich); Timon Elmer (ETH Zürich)**
Abstract	The role of social influence in shaping our behaviors has been the subject of widespread attention, particularly as it has related in recent times to large-scale health and democratic outcomes, such as behavior through the Covid pandemic, and increasingly polarized elections. Existing literature has often aimed to tackle influence processes through the lens of single issues within a given social context, focusing on the adoption of a single behavioral and network variable. This study aims to build on such work by studying the influence process through a multi-issue and multiplex network lens. Drawing from the unique longitudinal dataset of the Swiss StudentLife study, collected across three cohorts of university students, we investigate social influence processes on a selection of behaviors through students' multiplex social networks. The analysis explores both study-related behaviors (e.g., studying hours) and more personal ones (e.g., those related to mental health). We expect to find evidence of social influence only within networks that are closely contextually related to the specific behavior (e.g., studying behavior within networks of study collaboration). We contend that this expectation is in line with arguments about selective disclosure, with discussion topics focused around the contextually most salient issues. This would suggest that people rely on different elements of their personal networks for different purposes and that social influence is not strictly confined to a specific close portion of one's network, but rather distributed across it according to contextual factors. The study therefore aims to contribute to social theory and a body of empirical insights, by challenging the assumption that uniplex networks such as friendships are sufficient to understand influence across issues, arguing instead that attention should be paid to the specific social

	contexts in which influence is likely to happen.

Title	**Too late? Complex contagion and delayed responses**
Authors	**Thomas U. Grund (RWTH Aachen University)***
Abstract	Simple contagion requires actors in social networks to be only exposed once for a behaviour to spread. In contrast, complex contagion refers to the phenomenon where exposure to multiple sources is required for actors to change. Applying thresholds to the spread of behaviours, opinions, norms or innovations is often more in line with social processes, which, unlike the spread of a disease, frequently requires multiple exposure for contagion to occur. But so far, research on complex contagion has ignored one fundamental property of social actors. Behaviour change is not always instantaneous. Instead actors often exhibit heterogeneously distributed delayed responses, which correspond to different information processing or decision making capabilities. Such delayed responses, we argue, can have a profound effect on contagion dynamics. We demonstrate that while contagion processes might appear to be of complex nature, simple contagion with delayed responses can evoke similar contagion patterns in clustered networks. We apply different incubation periods to actors in simulated networks and show how and when delayed responses can lead to false conclusions about the presence of complex contagion. More broadly, our research shows the need to think more about the interplay of delayed responses and network structure in social contagion studies.

S02_3 15:30-17:00	**Collaboration Networks** *Organisers: Giancarlo G. Ragozini, Maria Prosperina Vitale, Giuseppe Giordano*

Title	**Inventors' collaboration networks and the future use of brokers' output**
Authors	**Ecem B Delicik (Ecole Polytechnique de Paris)***
Abstract	Although collaboration is generally thought to increase innovation performance, there is still controversy over the optimal structure of those collaborations and, in particular, over the relative benefits of brokerage and a closed structure. A key insight emerging from this stream of research is that being a broker increases the inventor's own creativity while it decreases the reuse of inventors' ideas. It is important to notice that being useful requires the acceptance and reuse of the generated ideas by others. While the effects of sparse networks have been evidenced by the literature, cognitive proximity among collaborators - which leads to the similarities in the way inventors interpret, perceive, and evaluate generated ideas- and structural characteristics have not been studied separately, which limits our understanding of their independent and contingent effects on the reuse of broker's ideas. This paper investigates how the cognitive proximity of ego network members affects the relationship between brokerage and reuse of inventor's output by their local network. I distinguish between structural disadvantages brought by sparse networks and accompanying downsides (i.e., cognitive distance) and scrutinize their effects on the future use of generated ideas. To test my hypothesis, I conduct an empirical study relying on extensive panel data of French inventors to examine the within-subject variation over time. I used European Patent Office worldwide patent statistical database to construct collaborative networks and variables (including inventors' creativity, experience, past performance, self-reuse of their inventions, network size, tie strengths, and so on). Following the likelihood ratio tests, a random effect (panel) Negative Binomial estimator is used as it allows controlling for overdispersion and inflation which the data exhibits. The analyses include more than 80.000 inventor-year observations in the period from 1995 to 2010. The results demonstrate that although brokerage decreases the usefulness of the inventor's ideas for global network members (i.e., not only very closed ones) the story reshapes contingent upon the cognitive proximity of collaborators when it comes to the reuse by local networks. The dynamics of knowledge diffusion are quite different for the local network members, and way faster compared to other global network members. Contrary to the literature, being embedded in a specialized knowledge clique generates the conditions conducive to collaborators' understanding and reusing of the broker's ideas even if it is a sparse network. It enlarges our understanding to what extent the sparseness of collaboration networks hinders the reuse of generated ideas and provides scenarios in which knowledge redundancy may help to overcome the dark side of a sparse network while continuing taking its advantage of the inventor's creativity.

Title	**Knowledge spillover in the French biotechnology industry: From a polarized to a unified coordination scheme**
Authors	**Alvaro Pina Stranger (Université de Rennes 1); German Varas (Université de Rennes 1)*; Valentin Gerard (Université de Rennes 1)**
Abstract	Biotechnology is a knowledge-intensive and collaborative industry in which the interpersonal advice network tends to be polarized among entrepreneurs claiming scientific or financial expertise. Polarization in biotech is the outcome of a process in which stakeholders negotiate the conditions for the transformation of scientific knowledge into a therapeutic innovation. Considering "advice exchange" as "knowledge spillover", we intend to capture the interactive and strategic dimension of knowledge exchange, in which start-up executive managers may or may not spillover knowledge, and thus affect work and collective learning. More specifically, we aim to identify homophilous factors that may promote or constrain collective learning among entrepreneurs in the French biotechnology industry. Homophilous factors were grouped in four dimensions leading to 4 hypotheses: a) status, b) personal profile; c) geographical co-affiliations, and d)

	normative co-affiliation. Using inferential statistics, we study advice networks in two populations, corresponding to 138 entrepreneurs in 2008, and 126 entrepreneurs in 2013. In relation to status, we found that in 2013 epistemic authorities in research asked for advice to epistemic authorities in finance and vice versa. Thus, when entrepreneurs gain importance in the network and are considered as epistemic authorities by others, they overcome polarization and collaborate. In relation to personal profile, we found that, in 2008, there was a clear polarization between entrepreneurs with different background (i.e., those with experience in research, in finance, CSO, CFO), which reveals the importance of the sense of disciplinary community as a signal of trust. In 2013, however, our results demonstrated that polarization between the two communities became less clear. Indeed, research-oriented entrepreneurs still exchanged advice among peers with a similar scientific background, but such exchange was no longer significant; and, in the case of entrepreneurs with experience in finance, advice exchange was negatively significant. As for geographical location, we found that, in 2008, scientific entrepreneurs based in Paris tended to ask for advice to colleagues with similar background who were also in the French capital city, unlike entrepreneurs with a background in finance, who exchanged advice across the French territory. Interestingly, in 2013, we found that attributes of entrepreneurs, such as a similar education or similar status, were crucial only when they were far from each other. Finally, as for controversies, we found normative topics, such as "science-oriented entrepreneurs are more capable than financial-oriented entrepreneurs in running biotech firms", "those who have funded firms have a stronger entrepreneurial experience", "technology clusters are irrelevant" and "VCs have no value", which could explain in part the polarized or coordinated knowledge exchange among entrepreneurs.

S14_3 15:30-17:00	**Population-scale Social Network Analysis** *Organisers: Eszter Bokanyi, Laszlo Lorincz, Guilherme K. Chihaya, Frank Takes, Eelke Heemskerk*

Title	**Understanding the multi-scale structure of macro-level internal migration networks**
Authors	**Gergely Mónus (Corvinus University Budapest)***
Abstract	The network theory of migration is a rich field, where the focus is mostly on networks of individuals. These theories approach networks from the direction of social capital, and try to explain who tends to move personally. Macro-level migration patterns are mostly understood through geographical space (gravity models) or individual unit characteristics (push-pull theories). In the last decade this aspect of migration started to gain attention, with the number of studies dedicated to macro- level migration networks tripling. This research aims to contribute to this emerging literature by analysing the hierarchical structure and scaling of migration between Hungarian settlements. In the post-suburban period of urban development, mobility patterns between settlements cannot be described easily by central place models. A polycentric structure emerges, with different urban functions evolving through different center-subcenter structures. This requires the understanding of how migration behaviour scales with the settlement hierarchy – which settlements become local attractors or redistributor of migrants, how different residential subcenters connect to each other. Besides the settlement hierarchy, other factors influencing spatial mobility also have different effects at different scales. Physical proximity raises the probability of connections between settlements, while geographical boundaries and obstacles can reduce them. The hierarchy of administrative units, like counties or regions also influence mobility patterns within and between them. To be able to observe these effects, we utilize the infomap algorithm. The main advantage of this method is that it can be used hierarchically, detecting community formation on different levels. For example, a large town and its agglomeration can be treated as a community with certain parameters of the algorithm. But this does not mean necessarily that different parts of given agglomeration have high migration between them, just that these parts are all strongly connected to the same centers. Infomap enables us to observe this multi-level structure of centers and peripheries at all scales. Our analysis can also identify the role of geographical proximity in defining migration patterns in a new way: on which scales do communities emerge from close distance moves, and from which scales do the effect of closeness fade. Through the analysis of an official statistical data set, which contains all recorded permanent migration events in Hungary on the settlement level between 1990-2019, we connect the scaling of macro-level migration networks to polycentric development, with a special focus on the role of the settlement hierarchy.

Title	**The Small-World structure of a population-scale social network**
Authors	**Frank Takes (Leiden University)*; Eszter Bokanyi (UvA); Eelke Heemskerk (University of Amsterdam)**
Abstract	The analysis of social networks at the level of an entire population provides a unique opportunity to revisit what is perhaps the most fundamental universal finding in the field: the small world phenomenon. Popularized as "six degrees of separation", it refers to the remarkably low average node-to-node distances and typically high amount of clustering observed in real-world social networks. In this talk we revisit this concept from the perspective of the multilayer population-scale social network of the Netherlands consisting of over 17 million people and five characteristic layers of connectivity based on family, household, school work and neighborhood relations. By means of a comparison with artificially simulated networks originating from the well-known Watts-Strogatz and Newman-Watts-Strogatz models, we show that each type of connectivity (i.e., each layer) in the considered population-scale social network has a different characteristic function in realizing the small-world structure of the network. In particular, we show how highly clustered family relations form the

	backbone of the network, akin to the initial regular (ring-shaped) graph in the WS model. Then, work and school relations primarily act as "random" bridges between different parts of the clustered (yet, on its own not-so-small-world) family network. Such edges are ultimately crucial for realizing the actual small-world connectivity patterns in the complete population-scale social network. Apart from the explicit multilayer aspect of our population-scale social network data, we can also take advantage of node attributes (i.e., people's demographic characteristics) in understanding how the low average distances of the network are realized. We find distinct patterns of assortativity between node pairs that are unconnected in one layer (e.g., family) and connected in the other (e.g., work). Subsequently, these patterns are used to improve the rewiring step of the Watts-Strogatz model in an attempt to more accurately represent our population-social network data. Specifically, this step takes into account empirical patterns of homophily, utilizing the extent to which connections are more frequently formed between nodes with close spatial and similar demographic attributes, such as level of education. On the theoretical side, the talk provides insights into the relevance of the WS model, more than 20 years after its inception. Moreover, it highlights the importance of multilayer approaches in explaining the connectivity of multilayer networked systems in the real world, as well as the relation between similarity of node attributes and links spanning larger distances. Substantively and empirically, the talk contributes to an understanding of how distances are bridged in a social network. The work has important implications in processes that may take place on networks, such as diffusion of information, dissemination of resources, or epidemic spreading.

S17_2 15:30-17:00	**Social Influence** *Organisers: András Vörös, Zsófia Boda*

Title	**Social preferences and position in signed friendship networks in school classrooms**
Authors	**Eszter Bokanyi (UvA)*; Luca Flora Drucker (KTI); Daniel Horn (KTI); Hubert Janos Kiss (KTI); Flora Samu (KTI)**
Abstract	Theoretical works suggest that people are more inclined to choose prosocial individuals as cooperation partners, because it reduces the uncertainty of costly cooperations or even produces returns. In this study, we investigate the connection between social preferences and friendships in the classroom among young children. To measure social preferences, we use decision making games that are widespread tools in social sciences, because they enable us to observe actual behavior instead of self-reported expressions or attitudes. Among many decision games that have been designed to measure social preferences, we are focusing on the dictator game, the trust game and the public goods game. The data collection took place in 12 classes of a Hungarian school in March 2019. Pupils aged between 14 and 17 years (av. 16.1 years of age). Out of the total 145 participants (49% female), 35 pupils were absent at the time of the data collection. We asked pupils to rate how much they like or dislike each of their classmates on a 5-point scale (good friend, like, neutral, dislike, absolutely not friend). We then define a directed friendship network of students from the same class by only using their 'good friend' nominations, and measure indegree, outdegree, clustering, network density, and closeness and betweenness centralities in this network while accounting for absent pupils. By using regressions, we were able to show that decisions in a real dictator game with classmates and in a hypothetical one with schoolmates are not related to friendship indegrees, but rather to outdegrees, and as such, central positions in the friendship network. Furthermore, network density within a classroom positively correlates with collected public goods without any individual association. Lastly, decisions in the trust game show no relation to friendship nominations. Thus, we were able to confirm that certain social network structures are related to prosocial behaviour at both the individual and a group level in a classroom setting, which might direct future research at a larger scale.

Title	**Tie formation strategies do not foster polarization of communication networks in consensus decision making**
Authors	**Nico Gradwohl (Centre for the Advanced Study of Collective Behaviour, University of Konstanz)*; Ariana Strandburg-Peshkin (Biology Department and Centre for the Advanced Study of Collective Behaviour, University of Konstanz, Department for the Ecology of Animal Societies, Max Planck Institute of Animal Behavior); Helge Giese (Centre for the Advanced Study of Collective Behaviour, University of Konstanz)**
Abstract	Groups often need to come to consensus despite the presence of different opinions and communication being constrained to ties organized in networks. Thereby, network structures can shape consensus formation through a biased representation of majorities or impede it through polarized opinion clusters. We ask how individuals strategically choose and control their network ties in these tasks and how their strategies shape their communication structures. Across many real-world social networks people frequently associate with likeminded others forming opinion clusters, which impede consensus formation. However, the fact that such network structures exist and impact consensus decision making does not address how individuals strategically choose and control their network ties in these tasks and how often they result in such communication structures. In order to elucidate how individuals choose network ties and how this impacts consensus formation, we used an online color-coordination experiment with 272 networks of 6 individuals each. Individuals were incentivized to agree on one of two colors as quickly as possible. Each individual received an additional reward if the group came to consensus on one particular color, creating conflicts of interests. For up to 50 rounds each player selected one of two colors until all

	individuals agreed on one color. Network ties determined which other players' color choices a player could observe. We varied (1) whether network ties were static, changed randomly in each round of play, or were controlled by the participants, (2) the direction of network ties chosen by individuals (i.e. whether they chose who to observe or who to sent to), and (3) whether there was a majority of individuals rewarded for one of the colors (vs. an equal split of preferences). Our results show that individuals preferentially targeted previously unobserved and differently minded others, rather than others who had previously made the same choice as them. Overall, strategies appeared to be in line with the goal of seeking new information and convincing dissimilar others. As a result, we did do not observe a decrease in probability and speed of consensus among groups in which individuals control their network ties, and found no spontaneous polarization of communication networks based on individual communication strategies. Moreover, the majority stably exerted their influence and typically won independent of network choices. Groups with a majority were able to come to consensus faster than those with an even split of preferences, but only when individuals chose their outgoing communication ties. Accordingly, polarization observed in real-world networks cannot simply be explained by clustering through low-level communication strategies. At least in small networked groups, individuals embrace strategies that counteract polarization instead of creating it. This implies certain boundary conditions for polarization observed in real world networks.

Title	**Toward malaria eradication. The importance of social influence in the adoption of mosquito bites preventive measures in Meghalaya, India**
Authors	**Elisa Bellotti (University of Manchester)*; Andras Voros (University of Manchester)**
Abstract	Interventions to reduce malaria incidence in low income and hard to reach populations have mainly focused on the provision of Indoor Residual Spraying (IRS) and the distribution of Long-Lasting Insecticidal Nets (LLINs). As both methods aim to protect individuals while they are at home, when outside other measures could be adopted to prevent mosquito bites, for example insect repellent spray, body cream, coils, protective clothing, and the like. Most studies that measure uptake of – or the resistance to – personal protections look at how individuals' or households' characteristics (gender, education, economic background, number of children, living conditions, etc.) relate to knowledge and practice of malaria preventive and treatment behaviours. Less attention has been paid to the role of social networks in favouring or hampering the diffusion of protection from mosquito bites. This study aims to observe the rate of adoption of mosquito bites preventive measures in ten indigenous villages in a rural and remote area of India. We construct ten social networks, one for each village, where individuals are nodes and discussing health related matters represent the ties. For each villager we collected information about their individual characteristics, and their use of preventive measures like LLINs, coils, insecticide creams, vaporisers, protective clothing, and burning materials. To analyse the data we fitted linear regression models to explain how many preventive measures were adopted by each villager, and logistic models to explain the adoption of each individual measure in each village. We then conducted a meta-analysis of the results to identify the common factors contributing to adoption of preventive measures across villages. Our results indicate that more than any individual characteristic it is the rate of exposure within the social network both inside and outside households that explain the adoption of preventive behaviours. These finding are in line with social contagion theories that state that health behaviours need reinforced network exposure to be adopted."

Title	**Identification with informal groups**
Authors	**Alejandro Espinosa-Rada (Social Networks Lab, ETH Zurich)*; Andras Voros (University of Manchester); Christoph Stadtfeld (ETH Zürich)**
Abstract	The study of informal groups has been a relevant topic in social science to investigate the importance of social identities, the disposition toward collective action, or the formation of local norms and meanings (Lindenberg, 1997; Fine, 2012). Most studies using a social network perspective concentrate on identifying common social categories (Tajfel et al., 1971; Turner et al., 1987; Hogg et al., 1995) or identifying inductively cohesive subgroups (Alba, 1981; Freeman, 2003; Girvan and Newman, 2002) to understand groups. However, less is known about how actors identify with specific informal groups. The following article aims to understand why students identify with informal groups. To explore potential explanations of the identification of actors toward informal groups, we consider the relevance and characteristics of different focus of activities, the composition of the perceived ego networks, and similarity among sociodemographic attributes of the actors. We develop this argument using longitudinal network data of students' perceptions of informal groups' belongingness (The Swiss StudentLife Study; Vörös et al., 2021). Using this longitudinal design of the third cohort of the study (N=660), we asked students about the informal social groups in the cohort that they felt they belonged to and to mention peers in their cohort with whom they perceived where the members of these informal groups. Each actor was asked about the level of identification with the group for each group mentioned. We used multiple membership cross-classification models for the analysis to consider overlapping ego network structures (van Duijn, 2013; Tranmer et al., 2014; Mollenhorst et al., 2016; Vacca, 2019). Our main results indicate that some social activities are more relevant for social identification than others. The similarity in attributes and composition of the networks is likewise relevant to distinguish whether the actors identify more with these groups. Hence, to explore cohesive subgroups, further research should distinguish the relevance of some of the focus of activities and the group's composition to understand group formation.

Abstracts
Wednesday, September 14th 2022

S07_1 09:00-10:30	**Multiplex Networks and Individual Outcomes in School** *Organisers: Andras Voros, Zsófia Boda, Elisa Bellotti*

Title	**Social role attribution networks in school**
Authors	**Andras Voros (University of Manchester)***
Abstract	Social roles are key for understanding individual outcomes and the dynamics of student communities at all levels of education. While the importance of roles is widely accepted in sociology, social psychology, and network research, a variety of concepts are used across these fields to define what a role is. A relatively understudied form of roles are so-called informal social roles. They represent roles that are defined and distributed in the process of interactions. For example, some students may be leaders of group activities or effective mediators in group conflicts. Such roles arguably exist to a large part because they are attributed to students by their peers in specific groups. Their other intriguing characteristic is that peers may disagree on who plays a given role. Informal roles are difficult to study by classic approaches, because they are strongly contextual and based on peer consensus. In this talk, I explore the study of informal social roles through role attribution networks. I discuss how roles may be defined based on such networks and what concepts we may use to describe them. I examine the empirical patterns of role attributions across seven types of informal roles measured in 27 high-school classrooms in Hungary. The results present a first step in understanding the dynamics of social role attribution networks and individual and group-level outcomes.

Title	**Should I go to college? How social networks based on friendship, extra-curricular activities, and academic help exchange predict rural and urban students' college aspirations above and beyond scholastic abilities**
Authors	**I-Chien Chen (Michigan State University)*; Lysann Zander (Leibniz University Hannover)**
Abstract	Peer networks, particularly friends can crucially affect adolescents' and young adults' academic choices. Yet, social networks of adolescents' can be highly differentiated. The present study examines the distinctive role of three partly overlapping types of social networks (friendship, shared participation in extra-curricular activities, academic help networks) in shaping students' aspirations and plans to attend college and by accounting for SAT achievement. Participants included 518 (urban=336, rural=182) 10th to 12th-grade students in the College Ambition Program (CAP). Initial results of a social influence analysis suggest that urban students' college-going aspirations were strongly predicted by friends' aspirations and plans, especially friends who participated in the same sports and extra-curricular activities. Rural students' college aspirations were more strongly predicted by their friends' GPA, homework seeking behavior and own SAT scores.

Title	**An investigation of the impact of COVID on student academic engagement and mental health: A longitudinal study**
Authors	**Matt Kammer-Kerwick (UT Austin)*; Kevin Swartout (Georgia State University); Kara Takasaki (UT Austin); Jeffery Sternberg (UT Austin); Amy Schaeffer (Georgia State University); Noel Busch-Armendariz (UT Austin)**
Abstract	The COVID-19 Pandemic dramatically altered the way that most students experienced college life. Our presentation reviews outcomes for measures of academic disengagement, satisfaction with life, and general mental health, over five waves of longitudinal survey data that spans the year prior to and the first year of the pandemic. Students at a large public university in the southwestern United States were recruited (n=639) from the same on-campus, college dormitory where they were going to live during their first year at college. The campus shifted to remote learning late in the Spring of 2021 and remained in that operating mode through the end of our data collection. Participating students reported baseline survey measures prior to starting their first semester of college. The next four waves of data were collected every semester for the next four semesters from Fall 2019 through Spring 2021. For each wave, students named up to ten men, ten women, and ten gender non-binary students that were living in the same dormitory in the Fall of 2019 that they interacted the most with, since the previous wave of the survey. We investigate the role that gender identity, sexual orientation, race, and ethnicity as well as social network connections play in improving understanding of how the COVID-19 Pandemic affected student academic outcomes and mental health. Across the four waves, the full network analyzed includes 614 nodes and 2,227 edges. Our network density is 0.59% with an average degree of 3.63. We employ an RSienna computational framework and stochastic actor-oriented models that simultaneously formulate a joint impact of peer selection and influence on network (social context) and behavior (academic disengagement, well-being, and general mental health). This strategy allows us to estimate reciprocal relations between network and behavioral evolution by simultaneously modeling individual-level network and behavior changes aggregated at the network level. The model assumes unobserved network and behavior changes between assessments and accounts for interdependence of individuals within networks. We estimate an objective function for behavioral and network change across time. The model parameters can be interpreted as the degree to which individuals have a tendency to change in line with previous network and behavior states. Academic Disengagement was assessed using an 8-item measure of behaviors such as missing class, doing poor

	classwork, and sleeping in class. Satisfaction was assessed using the 5-item Satisfaction with Life scale. General mental health status and general well-being were measured using 5 items assessing Emotional Well-Being and 1 item assessing General Health Perceptions items from the MOS 36-Item Short-Form Health Survey. Preliminary analysis suggests that COVID-19 led to an increase in academic disengagement and a decrease in well-being, but that general mental health did not decrease as expected.

Title	**Data collection for temporal networks in higher education: A study on the evolution of study profiles**
Authors	**Nidia G Lopez Flores (Reykjavik University)*; Anna Sigríður Islind (Reykjavik University); María Óskarsdóttir (University of Reykjavík)**
Abstract	Temporal networks, formed by a set of layers representing the relationships between the same group of nodes over different time periods, are a special case of multiplex networks. The study of temporality in educational settings has called for the attention of learning analytics researchers in the latest years. However, despite being pointed out as an essential dimension to understand learning processes better, many of the effects of time on educational settings are still unexplored. In our previous research, we have focused on using Social Network Analysis and community detection methods to study the identification of study profiles among undergraduate students in higher education. We have discovered insights about the transformation of study profiles as the students go through their academic studies. Furthermore, we have investigated the structural differences between networks belonging to different teaching modalities by studying the evolution and differences of network centrality measures and their relationship with academic performance. This presentation will focus on the data collection approach followed to construct a multiplex network designed to study the evolution of learning profiles in undergraduate settings and their relationship with the students' academic performance. This approach includes four data sources: (1) The learning management system, an (2) Online discussion forum, a (3) video-recording platform, and a (4) survey on learning preferences and educational values. We will present the characteristics of each data source emphasising on the structure of the data, how it fits into the research design, and the limitations and problems encountered on both the data collection and management. Examples of the different networks (layers) created based on the data sources will be provided, alongside with highlights on their structure and meaning in the educational context. Finally, we will present a set of recommendations for practitioners working with similar data sources to create multilayer networks based on educational data.

S12_1 09:00-10:30	**Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa*

Title	**It's about "Who Agrees with Whom When": Opening the black-box of group consensus and network interactions in strategic decision-making**
Authors	**Guido Conaldi (University of Greenwich)*; Carmine Basile (Cranfield University)**
Abstract	To date, strategic consensus research is mostly silent about the identity processes accompanying the dynamics of consensus and their joint influence on group behavior and outcomes. Applying the lenses of self-categorization and social identity theory to strategic consensus research, this paper examines the interaction between identity configurations (i.e., demographic faultlines) and particular distributions of strategic orientation within decision-making groups in their influencing information-processing behavior. We develop hypothesis on how 1) sharing a strategic orientation more with similar group members than dissimilar ones and 2) divergent orientation between two individuals from opposing demographic subgroups influence group interactions over time. Longitudinal data was collected from 78 groups undertaking a strategic business simulation at a UK University. The data include multiple relations (communication, emotions, influence) as well as ego-level and dyadic-level attributes. The data provide support for some of our predictions when the network dynamics of task-performing groups are considered. Our results shift the debate from consensus as an outcome to consensus as an input of information-processing behavior. Furthermore, they underscore the importance of considering 'who agrees with whom' and when certain distributions of strategic orientation occur as individuals interact in decision-making groups.

Title	**Cooperation and productivity. The influence of network cooperation on the output of projects in teaching education**
Authors	**Dumitru Malai (University of Kassel)***
Abstract	This study was conducted at the University of Kassel (Germany) in the project PRONET (professionalization through networking) supported by BMBF. PRONET consists of 35 sub-projects. The key idea behind it is that active cooperation can help the participating sub-projects come together and collectively elaborate new products, such as concepts, materials, seminars, and workshops, this way fostering the research, teaching, and practice of teacher training. The evaluation of the cooperation between the sub-projects was conducted via an online survey at three points in time (winter 2015, summer 2017, winter 2018). The academic members were asked, among other things, who their cooperation partners are. The emerged connections between sub-projects were then processed using organizational

	network analysis. The aim of the evaluation of the project PRONET was to show the effect of the cooperation on the activity of the sub-projects. In the research on cooperation, there is evidence that members of a network tend to adopt the behaviors and attitudes of fellow members. The first question is whether there is an influence of the network cooperation on the outcome of the sub-projects e.g., on the number of publications, seminars, and conference presentations. The second question is whether there is an influence of cooperation partners' productivity on the sub-projects' own productivity. The longitudinal analysis was translated into a stochastic actor-oriented model (SOAM), which was specified under the control of the network tendencies (e.g. transitivity, outdegree popularity), selection (e.g. homophily), and influence effects (e.g. average similarity). One main finding was the tendency of sub-projects to become more similar to their cooperation partners regarding publication activity.

Title	**Effects of COVID-19 on the Swiss board interlock network: An exploratory analysis**
Authors	**Malte Doehne (UZH Zürich)*; Katja Rost (UZH Zürich)**
Abstract	In this paper, we draw on a comprehensive roster of managerial assignments that have been registered with the Swiss Commercial Registry since 2005 to reconstruct region- and industry-specific corporate interlock networks at an unprecedentedly granular level. We employ an ecological framework to characterize, model, and explain how these interlock networks have evolved over time. We consider how changes in topological features of the interlock network coincide with exogenous shocks (notably the COVID-19 pandemic) with a focus on the gender composition of top managerial teams over time. Our overarching aim is to contribute to a burgeoning literature that models and studies how context shapes network processes and the outcomes that obtain.

S20_1 09:00-10:30	**Social Networks and Personal Communities in Migration and Migrant Incorporation** *Organisers: Raffaele Vacca, Başak Bilecen*

Title	**Building ties in a new home country: a closer look into the social network characteristics of foreign-born populations**
Authors	**Minna R. Tuominen (University of Turku)*; Elina Kilpi-Jakonen (University of Turku); Regina García Velázquez (Finnish Institute for Health and Welfare); Anu Castaneda (Finnish Institute for Health and Welfare); Hannamaria Kuusio (Finnish Institute for Health and Welfare)**
Abstract	Much research has been done on the importance of social networks, but less is known about how social networks are built. This paper explores underlying factors that may contribute to the development of foreign-born populations' social relationships in Finland. More specifically, it measures the extent to which (Q1) migration-related characteristics, (Q2) socioeconomic status, and (Q3) contextual elements can explain the formation of social networks, and (Q4) whether the effect of these factors varies between higher and lower education levels. The study builds on Granovetter's dyad of strong and weak ties; considering the many positive outcomes that previous research has attributed to both strong and weak ties, this paper takes the abundance of both types of ties as the most favourable network combination. The study uses a spectrum of social connectedness as a dependent variable, and conducts multinomial regression analyses separately for the tertiary educated and those with secondary education or less. The data comes from the Survey on Well-Being among Foreign Born Population in Finland (n: of 5,343). The study finds notable differences in social network composition between the education groups. Overall, one out of four foreign-born persons has developed only limited strong and weak ties. This pattern is notably more common among those with lower education levels. Among those with higher education, the most common combination is extensive strong and weak ties. According to these results, for those with secondary education or less, the main elements facilitating extensive social network formation included advanced-level local language skills, having attained some education in Finland, and having a sufficient level of income. The only significant element that appeared to hinder the lower education group from forming extensive social networks was migration during the sensitive teenage years. For the tertiary-educated group, the most apparent elements facilitating the development of extensive social networks included migrating for the purpose of studies, having a sufficient level of income, and living in a peri-urban rather than an urban context. Local language fluency did not appear to be a significant facilitator for this group, which may be due to proficiency in another widely spoken language, probably English. Nevertheless, Finnish/Swedish language skills seemed to protect them against a limited network composition. Other protective elements included migrating for studies or for work instead of only family reasons, migrating before teenage years rather than in adulthood, having a sufficient income, living in a peri-urban area, and living in a neighbourhood with a high number of other foreigners. The only predictor that appeared strongly and consistently relevant for both groups was a sufficient level of income, which facilitated the development of extensive social networks and protected against limited networks.

Title	**Composition of Immigrant's Social Networks and National Attachment to the Host Country**
Authors	**Ashraf Rachid (Department of Political Science, Aarhus University)***
Abstract	Does the composition of immigrant's social networks matter for how attached they feel to the host country? Drawing on newly collected Personal Network data of more than 1.800 immigrants in Denmark, I will examine the degree to

	which the ethnic composition of immigrant's social networks matters for their feelings of belonging in Denmark. In addition, I will examine whether the educational composition of the network conditions this relationship between ethnic composition and national attachment. This paper is going to have two contributions. A theoreti-cal contribution on the mechanisms linking social networks and national attachment to the host country. I will here draw on earlier work as well as my own work to propose a theoretical model. Empirically, the paper will provide insights into the degree to which immigrant's social networks matters for their national attachment in a Danish context; a context where the political rhetoric about who belongs and who does not has become increasingly salient throughout the past two decades. The survey is connected to Danish registry data, making it possible to control for various confounding factors. Since feelings of national attachment to the host country might matter for immigrant's political and societal participation, it is of importance to increase our knowledge on how their relationships to others in the host country might impact their national attachment. In Denmark, an often-held assumption in the public debate is that immigrants must establish relations to majority-Danes to become well-integrated over time. This paper will examine whether this is the case when it comes to feelings of belonging.

Title	**A systematic comparison of personal networks between migrant generations in the US**
Authors	**Raffaele Vacca (University of Milan)*; Başak Bilecen (University of Groningen)**
Abstract	Scholars of international migration have long studied the central role that personal networks play in the lives of migrants at different stages, from the decision to move to initial settlement at destination and subsequent incorporation trajectories. Studies of personal networks in specific immigrant communities, and of their influences on migration and incorporation, have grown in number in recent years. However, comparisons of migrants' personal networks with those of nonmigrants – even via proxy measures of social capital, support or participation – are still rare. Yet these comparisons could be key to understanding disadvantages, resources, and inequalities linked to migration, as personal networks influence a variety of outcomes in people's lives – from residential trajectories to occupational attainment and health. In this paper we undertake the first systematic and comprehensive comparison of personal networks between first-generation migrants, second-generation migrants, and individuals with no migration background in the US. We consider (1) personal relationships in different domains (e.g., family roles, social companions, providers of social support); (2) the composition, structure and size of personal networks at single points in time; and (3) the dynamics of personal networks over time. Our main goal is to understand if and how, net of confounding factors such as gender, age, race/ethnicity, and socioeconomic status, the condition of being migrant or migrant descendant is associated with specific configurations and dynamics of social networks. We use longitudinal data from the UCNets study, a panel survey of personal networks conducted in the San Francisco Bay area of California (2015-2018). Drawing from existing literature, we especially focus on the hypotheses that personal networks of first-generation migrants are characterized by greater prevalence of kin ties; higher frequency of strong and close ties; concentration of support exchange among fewer, multiplex relationships; higher ethnic homogeneity; higher geographical dispersion; more instability and churn over time. Preliminary results lend support to some of these hypotheses but not to others. Levels of social support vary significantly between migration groups, with first-generation migrants having, on average, significantly smaller networks overall, the lowest number of confidants, and more geographically dispersed networks, compared to the second generation and nonmigrants. First-generation migrants also nominate slightly fewer emotionally close ties and fewer providers of practical and emergency support. In regression models controlling for standard sociodemographic characteristics, certain differences remain notable. The average first-generation migrant has a significantly smaller personal network and more limited access to social support in all domains – particularly in the dimensions of practical and emotional support – compared to nonmigrants and the second generation.

S05_1 09:00-10:30	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*

Title	**A fast approximation method for Bayesian regularization**
Authors	**Diana Karimova (Tilburg University)*; Joris Mulder (Tilburg University); Roger Leenders (Tilburg University); Sara van Erp (Utrecht University)**
Abstract	Latest studies show that statistical models are becoming increasingly complex with large numbers of parameters to model intricate relations between the variables that are measured. This can be explained by the rapid growth and availability of data due to digital technological developments (online panel surveys, digital databases, etc.) which allow researchers to collect more information and to measure many more variables. Numerous interdisciplinary studies can now exploit these richer data to fit more complex statistical models with a lot of parameters to solve substantive research questions. Social network analysis is a good illustration where we see this trend as social network researchers tend to consider larger statistical models with many potentially important predictor variables. For example, Butts (2008) considered more than thirty different network effects for modeling radio communication patterns of responders during World Trade Center disaster, and Perry and Wolfe (2013) considered more than two hundred endogenous and

	exogenous statistics for analysing Enron email data. For this reason, it is becoming increasingly important to further develop statistical methods for filtering the true important effects out of the many potentially important effects that are considered by substantive researchers. This paper presents a regularisation method which combines classical and Bayesian methodologies and aims to resolve important issues when fitting large models with many potentially important effects, such as inflated Type I error rates, inconsistent standard errors, and computational complexity. The idea is to first fit an unconstrained model, e.g., using maximum likelihood estimation, resulting in a multivariate Gaussian approximation of the likelihood as function of the unknown parameters, where the mean vector is equal to the obtained estimates and the covariance matrix is the corresponding error covariance matrix (following large sample theory). Subsequently, we perform a flexible Bayesian regularisation algorithm on the approximated normal likelihood together with a preferred shrinkage prior to control the complexity of the fitted model by regularizing negligible effects. This method (i) resolves the computational burden of the fully Bayesian regularization algorithm, (ii) avoids the underestimation of standard errors in certain classical regularization procedures, (iii) allows virtually any, possibly nonconcave, shrinkage prior (or penalty) without any serious computational issues, and, perhaps most importantly, (iv) allows researchers to apply statistical regularization for virtually any set of parameters after fitting a model using existing statistical software. The proposed method can be applied to a large class of complex models, including models for social network analysis. To exemplify, this paper illustrates the application of the proposed method to regularize relational event models for dynamic social network analysis.

Title	**PyERGM: A gateway to ERGM modeling in Python**
Authors	**Mowafak Allaham (Northwestern University)*; Noshir Contractor (Northwestern University)**
Abstract	Data and statistical sciences are foundational to network science and analysis. One popular statistical method for modeling and analyzing graphs is Exponential Random Graph Models (ERGM). Since the inception of the ergm R package in 2008, modeling and simulating networks have become more accessible to the research community which has led to a remarkable growth in the utilization of ERGM models in network research across numerous disciplines. However, the fast and widespread adoption of the ergm R package comes with a limitation to other researchers who prefer to use general programming languages such as Python rather than R which has its roots in statistical analysis. With many academics and data science practitioners shifting towards Python for its ability to build data science pipelines and machine learning products, it is essential to expand the capabilities of the ergm R package to prepare future generations of network researchers with an alternative that better integrates with other libraries in Python that are related to their own research. In this presentation, we introduce PyERGM – a Python interface to statnet and ergm packages – which allows researchers, data, and network scientists to build and run ERGM models in Python. Unlike existing network analysis libraries in Python such as NetworkX and igraph that focus on network construction and visualization, PyERGM is primarily developed for statistical modeling and analysis of networks using Python. This presentation will showcase a tutorial of PyERGM and open the floor for the research community to share their feedback prior to releasing PyERGM to the public as an open source project. We are also hoping to engage with the broader International Network for Social Network Analysis (INSNA) community by crowdsourcing and creating opportunities for developers and researchers to contribute to PyERGM with enhancements and additional functionalities that will enable this Python library with a suite of statistical analyses and models that will be accessible to the research community.

Title	**Community detection and reciprocity in networks by jointly modeling pairs of edges**
Authors	**Martina Contisciani (Max Planck Institute for Intelligent Systems)*; Hadiseh Safdari (Max Planck Institute for Intelligent Systems); Caterina De Bacco (Max Planck Institute for Intelligent Systems)**
Abstract	To unravel the driving patterns of networks, the most popular models rely on community detection algorithms. However, these approaches are generally unable to reproduce the structural features of the network. Therefore, attempts are always made to develop models that incorporate these network properties beside the community structure. Here, we present a probabilistic generative model and an efficient algorithm, namely, JointCRep, to both perform community detection and capture reciprocity in networks. Our approach differs from previous studies in that JointCRep jointly models pairs of edges with exact 2-edge joint distributions, without relying on pseudo-likelihood approximations or conditional independence assumptions. In addition, it provides closed-form analytical expressions for both marginal and conditional distributions. Specifically, JointCRep is a probabilistic generative model that estimates the likelihood of network ties with a bivariate Bernoulli distribution where the log-odds are linked to community memberships and pair-interaction variables. The numerical implementation uses an Expectation-Maximization algorithm that is efficient, as it exploits the sparsity of the network, and we provide open-source code online. We validate our model on synthetic data in recovering communities, edge prediction tasks, and generating synthetic networks that replicate the reciprocity values observed in real networks. We also highlight these findings on two real datasets that are relevant for social scientists and behavioral ecologists. We observe that we capture reciprocity well, but with substantial improvement in community detection tasks while also improving in edge prediction tasks. That is, by considering 2-point joint distributions, and thus relaxing the common conditional independence assumption, our model is able to overcome the limitations of both standard algorithms and of the model that incorporates reciprocity

	but relies on a pseudo-likelihood approximation. To the extent of our knowledge, JointCRep is the first such method for jointly modeling pairs of edges with exact 2-edge joint distributions. In addition to providing standard analysis tools, it also allows practitioners to reply more accurately to questions that were not fully captured by standard models, for instance predicting the joint existence of mutual ties between pairs of nodes. The preprint is available online at https://arxiv.org/abs/2112.10436.

Title	**Towards stochastic generalized blockmodeling**
Authors	**Aleš Žiberna (University of Ljubljana)***
Abstract	The aim of this talk is to explore possible ways towards stochastic generalized blockmodeling that towards generalized blockmodeling with elements of a stochastic blockmodeling or vice versa (stochastic blockmodeling with elements of generalized blockmodeling). The first option seams easier, as at least for binary networks, - log-likelihood could be used as a measure of variability within homogeneity generalized blockmodeling and with some additional ""tweaks"", a usable approach could be achieved. The focus of the talk will be on this option. The second option that is stochastic blockmodeling with elements of generalized blockmodeling, could be said that is on one hand partly accomplished. Stochastic blockmodeling with restrictions on connectivity parameters could be thought of as a move towards generalized blockmodeling by allowing estimation a kind of a pre-specified model. However, achieving different types of connections among clusters, that is different block types in generalized blockmodeling terms, seams a more difficult task, especially if one wants to keep the ""generative"" nature of the model. The use of such approaches for blockmodeling linked networks will also be discussed.

S10_1 11:00-12:30	**Networking Historical Past** *Organisers: Paolo Cimadomo, Anna Collar, Maria Carmela Schisani*

Title	**Networks and resilience: Understanding the resilience of Mesopotamian settlement networks via Exponential Random Graph models and Agent-Based Modelling**
Authors	**Deborah Priß (Durham University)***
Abstract	Understanding the connectivity of past complex societies, in terms of their functioning and structural patterns, can shed light on how these societies were able to cope with significant disturbances in the form of droughts, warfare or diseases. By developing an understanding of the role connectivity played in the collapse or resilience of ancient societies, we may potentially gain insights into modern challenges such as climate change in a globalized world. Therefore, my research aim is to to assess if, how and to what extent connections between past settlements helped them overcome crises and improved their resilience. The so-called hollow ways in northern Mesopotamia build the foundation of my analyses and comprise one of the earliest and best-preserved route networks with more than 6000 km of paths. They date back to the Late Chalcolithic/Early Bronze Age (c. 4000 – 3000BC) and were still visible on satellite images from the 1960s before most of them were eventually destroyed by erosion or irrigation and development measures. These data are freely available as a shapefile (https://www.arcgis.com/home/item.html?id=07d85b03ab204a9084d59f89ef3b813c). In addition, several open source and non-public data sets for the settlements are utilised for the analysis. I use Exponential Random Graph Models (ERGM) to assess which key configurations are present in the route network, to gain understanding of how these configurations can be linked to notions of resilience in the network as a whole and for certain settlements in particular. With the ABM, I simulate the evolution of the settlement network through time, i.e. from the Early Bronze to the Iron Age (c. 3300 – 600BC) to better understand how the system functioned and evolved. As with all archaeological data, information about the hollow way system and the settlements are fragmented and incomplete. Hence, I address the issue of missing data via a combination of interdisciplinary computational approaches in collaboration with neuroscientists and computer scientists. In summary, this paper will present an overview of the project, the settlement and route network data and the network approaches I am using. Time is also given to the issue of missing data and the computational approaches used for handling missing data. Initial results on the settlement network will be provided.

Title	**Towards a network analysis of Hans Sloane's collection: A preliminary study**
Authors	**Daniele Metilli (University College London (UCL))*; Andreas Vlachidis (University College London (UCL)); Marco Humbel (University College London (UCL)); Victoria Pickering (Natural History Museum (NHM)); Mark Carine (Natural History Museum (NHM)); Kim Sloan (British Museum (BM)); Julianne Nyhan (University College London (UCL))**
Abstract	"The Sloane Lab: Looking back to build future shared collections" is a 3-year project funded by the UKRI Towards a National Collection programme. The project aims to re-establish connections between Sloane's collections and catalogues and to mend the broken links between the past and present of the UK's founding collection in the catalogues of the British Museum (BM), Natural History Museum (NHM) and the British Library (BL). Engaging with interested communities and employing digital technology, the project will integrate a fragmented cultural heritage collection and

	enable its unification through a participatory lens. The collection was amassed by Sir Hans Sloane (1660–1753), who gathered and, with his amanuenses, catalogued more than 70,000 disparate objects which formed the initial nucleus of the original British Museum (the collection was then dispersed across the present-day BM, BL, and NHM). The project will integrate disparate data sources, ranging from historical catalogues to contemporary records, and will enable a wide analysis of Sloane's extensive social network. As shown by James Delbourgo, Sloane's collection was "not the achievement of a single individual, but rather the result of exchanges involving countless people across the globe" (""Collecting the World"", 2017, p. 202). Sloane's historical catalogues contain many references to people and places, but this data has never been studied extensively through network analysis methods. Our goal is to build a graph of Sloane's social network by analysing mentions of people in the catalogues, to further understand the connections between them. In addition, we hope to devise computational approaches that can focalize the "data absences" that affect the collection, centring the biases that affected heritage description practices, and drawing attention to people who had an important role in the collection, but whose contribution has been historically overlooked or is now lost. At present, we have access to the digital versions of five of Sloane's historical manuscript catalogues, which have been encoded in TEI-XML format in the Enlightenment Architectures project. We have started our study from the Miscellanea manuscript, which actually contains seven separate catalogues, plus two indices. We have built a parser to extract data about people and places from the catalogues from the XML files, and gathered more information about them through VIAF and Wikidata. We have then analysed the networks of people and places in the whole dataset, visualised the data, and compared the individual catalogues to understand how their social networks are linked, how they differ from each other, and how they relate to the places and to the objects themselves. In this presentation, we will show the results of our initial analysis, which will then be expanded to other historical catalogues and data sources, laying the foundations for a more complete understanding of the social network behind Sloane's collection.

Title	**On the effects of rooted family ties in business networks: The South of Italy in the 19th century**
Authors	**Roberto Rondinelli (University of Naples Federico II)*; Giancarlo Ragozini (University of Naples Federico II); Maria Carmela Schisani (University of Naples Federico II)**
Abstract	In the economic literature, rooted family ties, mainly associated with backward areas, are related to factors disruptive to economic growth. We study the effects of bonding family ties (associated with family firms) in the entrepreneurial environment of the 19th century South of Italy to answer some crucial questions about its economic delay over the national Unification. Using original data coming from the IFESMez database (www.ifesmez@unina.it) and the analytical approach to the informational content of surnames, we compute the assortativity of surnames (as a proxy of family ties) within firms. We find that the presence of bonding ties, scattered over all the business networks, is highly differentiated by sector, by time span, and related to the number of economic actors involved in a firm.

Title	**The declining power of Swiss Patrician families during the 20th Century**
Authors	**Pierre Benz (University of Lausanne)*; Michael A Strebel (University of Lausanne); Emilie Widmer (University de Lausanne); André Mach (University of Lausanne); Steven Piguet (University of Lausanne); Legentilhomme Geoffroy (Univerisity of Zurich); Pedro Araujo (University of Fribourg)**
Abstract	Scholars have demonstrated the important role of inheritance and dynastic patterns for the perpetuation and deepening of inequality. Switzerland is a country without royal dynasties. Historians have shown that patrician families – those that occupied positions of power in important Swiss cities before the French revolution – continued to play an important role in Swiss cities until the beginning of the 20th century. However, little is known about the evolution of this 'patrician power structure' over the course of the 20th century. Social network analysis is of crucial help to analyze the changing place of the patrician family members in the different spheres of power by combining structural with 'ego'-level perspectives. At the structural level, it helps to compare the size and form of families' network at different degrees of kinship. At the ego-level, it allows us to observe in more detail the reproduction of local patrician elites through up to six generations. To cope with the challenges of historical data sources, we combine historical with sociological approach. Building on a systematic database of local elites in the three major Swiss city-regions (Basel, Geneva and Zurich) from 1890 until 2020 that hold positions of power in the main economic, political, academic and cultural institutions, we propose to analyse the evolution of kinship networks of the Swiss urban power elite over 130 years. We focus on both the form and the composition of such networks by combining social network analysis, kinship analysis, and prosopography on historical/biographical data on about 9,300 local elites. Our analyses proceed in three steps. We first analyse the long-term presence of representatives of old patrician families at the head of different local organisations and institutions. This also allows us to uncover the long-term evolution of the presence of these patrician elites in different social spheres – economic, political, academic and cultural – and in different city-regions. In a second step, we study the cohesion of these patrician families through an analysis of marriage and lineage patterns. For instance, we look at the percentage of old patrician family members of the same local elite cohort that are linked through a marriage or lineage link. In a final step, we present some illustrative

	examples of patrician families, and how their descendants have maintained or abandoned their elite positions during the 20th century.

S12_2 11:00-12:30	**Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa*

Title	**The coevolution of leader identity, social network buy-in, and leader effectiveness**
Authors	**Andrew Parker (Durham University Business School)*; Christian Waldstrøm (Aarhus University)**
Abstract	In this paper we examine the evolution over time of the association between leader identity, leader effectiveness, and employee centrality in the buy-in work-based network (i.e., the extent to which others perceive an individual as an important source of support and buy-in for initiatives). We develop three hypotheses. First, individuals who identify as being a leader will be more sought out for buy-in. Second, individuals who identify as being a leader will be more likely to reach out to other self-identified leaders in the buy-in network. Third, individuals that are central in the buy-in network are more likely to see increases in their level of leader effectiveness. Fourth, individuals that are connected to others who are effective leaders will also see increases in their level of leadership effectiveness. We integrate theories of leader identity and social network dynamics to explain our model. We test our hypotheses on 150 employees in a Danish consultancy firm in the construction industry. To analyse our data, we use a stochastic actor-orientated model that allows the simultaneous modeling of changes in work-based buy-in network ties, leader identity, and leader effectiveness.

Title	**Do busy female directors affect corporate governance quality? Evidence from the UK publicly listed companies**
Authors	**Claudine Salgado (Heriot-Watt University)*; Yasaman Sarabi (Edinburgh Business School, Heriot-Watt University); Dimitris Cristopoulos (Heriot-Watt University)**
Abstract	Gender diversity in the boardroom has become an increasingly important issue in past decades. This has resulted in a variety of initiatives in a number of countries to improve representation in the boardroom, ranging from quotas (such as in Norway) to recommendations. In some institutional settings (such as in the case of Norway), these initiatives have resulted in a small number of women being appointed to a large number of corporate boards. These women are often referred to as “golden skirts” or busy female directors. This study investigates how the presence of busy female directors impacts corporate governance quality. An analysis of the two-mode interlocking directorate network is used to identify busy directors. More specifically, this study will draw on various measures of centrality (such as degree and eigenvector) to categorise a director as busy or not. We will then explore the relationship between busy directors, in particular busy female directors, and corporate governance quality. To measure corporate governance quality, we have created an index to categorise different governance practices and provide a broader view of corporate governance effectiveness. The study uses data from public companies listed in FTSE350. This study contributes to the knowledge space on the benefits of women in the boardroom as well as those on the board subcommittees on the corporate governance quality index, taking into consideration the role of over-boarded directors.

Title	**Holey Diamond! Brokerage in signed networks**
Authors	**Paul Schuler (University of Edinburgh)*; Srebrenka Letina (University of Glasgow); Károly Takács (Linköping University)**
Abstract	Despite its popularity and wide use in social network research, brokerage has been considered exclusively in networks of positive ties, neglecting negative ties. It is therefore an open question to what extent the overlook of negative ties overlaps with the importance attributed to structural holes in social networks. We argue that the central role that tension between bridged actors plays in brokerage justifies a potentially strong theoretical link with the literature on signed networks and structural balance theory. Structural holes might not always be empty but filled with antagonistic relationships and hence brokers may face a higher imbalance as they positively connect adversarial individuals. To understand the otherwise unexplained gap in the structural holes, the perspective of the actors bridged by the broker needs to be included, which makes it necessary to expand the conceptualisation beyond the triad. We propose a novel theoretical account of unbalanced diamonds where actors connected via a broker in an open triad are also connected to another common contact but with ties of opposite sign. According to this theory, the desire for structural balance hampers the evolution of positive ties, facilitating structural holes. To illustrate our point, we use descriptive statistics and correlation analyses on cross-sectional signed network data of employees in eight Hungarian work departments (N =16-43). At the network level, we find no positive association between the number of negative ties and average brokerage. However, we find a positive association between the share of negative ties in an actor’s personal network (ties among alters) and the node’s constraint and betweenness brokerage. Contrary to our expectations, higher brokerage is positively associated with balance in an actor’s triads. At both the network and the micro level, brokerage is correlated with a higher prevalence of unbalanced diamonds. We conclude that not the share of negative ties but their location in the network is associated with brokerage. The theory of unbalanced diamonds can help explain structural holes where balance and structural holes exist in symbiosis.

Title	**The multifaceted effects of multiplexity on job satisfaction: An empirical investigation in a large organizational setting**
Authors	**Ali Al Busaidi (University of Greenwich)***
Abstract	Job satisfaction has consistently been found to be associated with a number of desirable individual and organizational outcomes, including job commitment, turnover intention, and productivity. This study explores the relational antecedents of job satisfaction, by focusing in particular on the role played by relational pluralism in organizational settings. Relational pluralism, or multiplexity, is the existence of multiple types of relations among social actors. In an organizational setting, employees are often connected simultaneously by multiple relations, such as formally prescribed collaboration ties, informal transfer of knowledge or advice, or friendship. One line of research suggests that multiplexity exerts a positive effect on job satisfaction. According to job embeddedness theory, this happens because as the variety of connections that an employee maintains in the workplace increases, the more the employee will feel bound to the job, and the whole organization. The second line of research, on the other hand, suggests that multiplexity exerts a negative effect on job satisfaction. According to relational identity theory, this happens because multiplex relations may involve the simultaneous enactment of multiple conflicting roles, leading to suboptimal outcomes such as inter-role conflict and low levels of job satisfaction. In this paper, these two lines of research are brought together to suggest the existence of a curvilinear effect of multiplexity on job satisfaction. A first hypothesis suggests that multiplex ties have a stronger effect on job satisfaction than uniplex ties. More specifically, maintaining multiple types of relations with colleagues is expected to be more strongly and positively associated with job satisfaction than holding one type of relationship only. A second hypothesis suggests that the effect of multiplex ties on job satisfaction is curvilinear. More specifically, maintaining multiple types of relations with colleagues is expected to increase job satisfaction up to a point, after which job satisfaction decreases. Finally, a third hypothesis suggests that the structure of multiplex ties also matters: employees embedded in open network structures of multiplex ties are expected to exhibit higher levels of job satisfaction than employees in closed network structures. The empirical opportunity to test these hypotheses is provided by unique data collected on job satisfaction and various types of relations among employees at the Central Bank of Oman. A questionnaire was administered to all 726 employees. The response rate was 83%, with 604 usable questionnaires. Controlling for a number of individual and organizational factors, preliminary results provide support to the proposed hypotheses, and offer new insights into the multifaceted aspects and effects of multiplexity in organizational settings.

S20_2 11:00-12:30	**Social Networks and Personal Communities in Migration and Migrant Incorporation** *Organisers: Raffaele Vacca, Başak Bilecen*

Title	**Better schools, better parties, better lives? Investigating the drivers of student mobilities in Europe**
Authors	**Micol M Morellini (University of Oxford)*; Monika Verbalyte (Europa-Universität Flensburg)**
Abstract	Due its connection to high-skilled migration, the international mobility of university students has been the subject of growing scholarly attention. However, to this date, most quantitative studies analyze either long-term (or degree) or short-term (or credit) student mobility. In this project, instead, we investigate and compare the determinants of both degree and credit mobility within a unified framework. Using novel data on degree and credit mobility in Europe between 2009 and 2019, we generate longitudinal mobility networks of 30 European countries. Drawing from theories of high-skilled migration, as well as social network principles, we hypothesize that patterns of student long- and short-term mobilities are shaped by profoundly different factors. On one hand, degree mobility is expected to resemble high skilled migration networks and be influenced by long-standing geopolitical and economics determinants, where students choose to enroll in higher education abroad to pursue “better lives”, or improved career and life chances. We argue that trajectories of credit mobility, on the other hand, resemble more tourism routes, where students exploit their short-term experience abroad for entertainment purposes and to explore a new country and culture. Thus, to investigate the push and pull factors of educational migration, we build further networks, measuring migration flows, tourism flows, and other factors we control for, such as trade flows. On top of that, we investigate whether processes such as band-wagoning and the rich-club effect emerge an evolve over time in the country network, which might point to structural limitations to migration. Our approach allows for the evaluation of migration drivers operating at different levels of analysis, and thus for the assessment of competing interpretations. Finally, the comparison of different complex social networks of high-skilled mobility offers a unique perspective by considering the intersection of social network analysis and migration studies.

Title	**Changing networks: Network trajectories of high-skilled returning migrants**
Authors	**Dorottya H oor (University of Trento)***
Abstract	The eastern enlargement of the EU in the 2000s, together with the establishment of common European labour market, completely redrew mobility patterns within Europe. It has induced a severe problem of brain drain from the post-socialist countries of Central and Eastern Europe to the high-income countries of Western Europe, making return

	migration a highly timely topic in the region. Even though the importance of social networks has long been established in the context of migration studies, it has been barely used to study return migration. Moreover, social networks are also inherently dynamic thus returnees' post-return networks are likely to be the product of several changes throughout the migrations cycle, including life course changes, their different integration and reintegration processes, and identity changes. Therefore, the paper fills these gaps by presenting a mixed-methods longitudinal analysis of high-skilled Hungarian return migrants' personal networks. Pre-and post-return ego networks of thirty-four returnees have been obtained through face-to-face interviews, where returnees reflected on their return experiences and the associated changes in their personal networks. As a result, two networks of each interviewee were generated, overall consisting of more than two thousand alters, including, amongst other information, their geographical location, nationality, gender, age, length of relationship with ego and emotional closeness. The paper takes a novel approach to the longitudinal analysis of personal networks, by establishing different network trajectories through combining network typologies of networks obtained at different time points. As a result, using hierarchical clustering methods three different kinds of pre- and post-return network profiles were identified based on the composition of returnees' networks. Accordingly, returnees' pre-return networks can be divided into the distinctive profiles of assimilated, ethnic oriented and transnational networks, while their post-return networks show the typical profiles of ethnic oriented, transnational and dispersed networks, reflecting their different (re)integration strategies. The paper also shows that the different combinations of these network profiles are accompanied by distinctive (compositional) network changes. Consequently, five distinct network trajectories, pertaining to changes in returnees' personal networks throughout the migration cycle, were identified as: ethnic maintenance, ethnification, transnationalism, dispersion, and host country attachment. Lastly, using multi-level logistic modelling techniques at the tie level, it was also found that these trajectories are associated with distinctive patterns of acquiring and dropping social ties, underlined by returnees' different cultural identity changes.

S05_2 11:00-12:30	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*

Title	**Advancements for Bayesian ERGM – Handling missing nodal attributes, model constraints, and off-set values**
Authors	**Robert W Krause (Free University Berlin)***
Abstract	Recently, there have been many advances made in the Bergm R package. While some of them, proper handling of model constraints and off-set values for parameters, are adding functionality long available in other packages, like the ergm R-package. Another forthcoming change is far more substantial. By incorporating the imputation of missing nodal attributes the new version of Bergm will finally be able to estimate Bergms not only when some of the tie-variables are unobserved (a feature already available in ergm and Bergm), but also when some of the attributes of the nodes have missing data. So far, missing nodal attribute information, for instance, because one of the participants did not fill out part of the survey, is a major issue for ergm estimation. One has to either exclude nodes with missing attributes entirely or has to impute their missing values before the ergm analysis, and thus condition all results on this initial imputation. The new functionality in the Bergm package in contrast is not dependent on a single a-priori imputation, but does internally impute missing attribute values multiple times together with missing tie variables. These imputations take into account both available attribute information as well as network information (e.g., degree and attribute level of alters) and can be retained after model estimation to be used in further (non-network) analysis.

Title	**Specification of attribute effects in statistical models for social groups**
Authors	**Marion Hoffman (Institute for Advanced Study in Toulouse)***
Abstract	The composition of self-assembled social groups generally reflects the biological imperatives, personal preferences, and strategies of the group members. Drawing inspiration from network modeling, a handful of statistical models have recently been proposed to explain the composition of social groups and uncover the mechanisms driving their formation. However, we still know very little regarding the specification of such models and their ability to test theories of group formation. One major issue is that many theories related to social preferences (or propensities) are defined at the individual rather than the group level, that is, preferences are stated for individuals with specific traits, not to distributions of traits in a group. In this presentation, I examine the definition of statistics related to individual attributes in statistical models for social groups. I consider two types of models, actor-oriented models and group-oriented models (similarly to the divide between models like the SAOM and the ERGM in the network context). In actor-oriented models, the propensity to join a particular group containing certain attributes can be defined in a similar way as the propensity to pick a partner with a given attribute in a network model. The easiest way to do so is to directly transpose the definition of selection functions recommended for SAOMs using one summary statistic for the distribution of an attribute in the group (e.g., the mean). To include more information on the distribution of an attribute in a group, one needs to extend such definitions and consider higher dimension selection functions. In group-oriented models, one can leverage methods from cooperative

	game theory (e.g., coalition formation games and solution concepts) to interpret model statistics as group utilities and potential individual payoffs. These individual payoffs should then contain the selection functions similar to the ones previously described in the actor-oriented case. For both types of models, I describe different statistics related to the distribution of attributes in groups and discuss their interpretation, both individually and jointly. I also discuss base cases, simulations, and empirical examples to illustrate their use in practice. The goal of this work is to provide statisticians new insights regarding the specification of models for group observations and open up the opportunity for social scientists to rigorously test hypotheses related to group formation processes.

Title	**Interactive network graphs online to analyze surveys and other databases**
Authors	**Modesto E Escobar (Universidad de Salamanca)*; Cristina Calvo López (University of Salamanca)**
Abstract	Graphs have been employed not only to solve topographic problems and to represent social structures, but also to show the correlation between variables according to casual models. Path analysis and structural equations models are indeed well known by social scientists, but both were restricted to quantitative variables at their early stages. In this paper, we will propose a new way to display the connections between qualitative variables in a similar way to the correspondence analysis, but using another set of multivariate techniques, such as lineal and logistic regression, mixed with network analysis. The NCA (Network Coincidence Analysis) is to be used for the exploratory analysis of survey data. For this purpose, nodes represent the different categories of the selected variables, while links symbolize the relationships between the different variables. One of the specific uses of this analysis technique involves the characterization by diverse sociodemographic variables of different response profiles. Besides correlation measures, the proposed analysis can estimate log-lineal models to study multivariate relationships including interactions Furthermore, to increase the analytic power of these tools, they have interactive characteristics online, which include either the selection of the elements according to their size or attributes, and the filter of the most central and strongest links. The first part of the paper deals with the statistical basis of these representations; the second proposes a web page to apply this analysis to your own data, and the third gives examples of their use in international comparative surveys, such as the World Values Survey and the European Social Survey.

S10_2 13:30-15:00	**Networking Historical Past** *Organisers: Paolo Cimadomo, Anna Collar, Maria Carmela Schisani*

Title	**Population dynamics in Dudelange from 1800 to 1950**
Authors	**Laura Silva (Sciences Po)*; Franco Bonomi Bezzo (Università Statale di Milano and INED); Sonia Schifano (University of Luxembourg); Antoine Paccoud (LISER)**
Abstract	We aim to study the consequences of a big wave of economic-led migration across 150 years and to look at its consequences on the evolution of the social fabric of the receiving place. We, indeed, look at the installation of a new steel factory in 1886 in Dudelange (Luxembourg), which led to the development of a new industrial sector and reconfiguration of the economic and social structure of the town. We exploit genealogical data from the 1800 to 1950 and use social network analysis to assess, in the first place, changes to the city dynamics and relationships. We find that that the opening of the steel factory led to a shock to the urban population dynamics. We observe a sharp increase in population number but the city network becomes less homogeneous, more “connected” at its core and more “fragmented” at its borders. Nonetheless, the shock does not last over time and it is gradually reabsorbed, as in the 1950 the characteristics and the level of integration of the urban network come back to pre-factory opening levels. In a second step, we explore the characteristics of those who are more central, in different ways, to the network at the different time points. We use as outcomes three measures of network centrality and study the extent to which parental country of birth (ethnicity), industrial sector and social class contribute to make individuals more central or not. Overall, Dudelange passed from being an agriculture-based to an industrial-based society. This is reflected in the urban network of actors, as those whose ethnic background and economic activity represent the interests of the time seem to be more central to the city's social structure at each time point.

Title	**Lost at home. A historical Social Network Analysis of the Italian community in post-independence Lybia, 1943-1970**
Authors	**Maddalena Zaglio (University of Geneva)***
Abstract	My thesis deals with the Italian community which continued to stay in Libya after the latter gained independence from Italian colonial rule in 1943 and until Qadhafi expelled them in 1970. During this post-colonial phase, Italians stayed in Libya, still holding major roles in the administration, economics, and cultural fields. I order to explain (i) the continuous and productive stay of the Italian community in Libya after independence and (ii) when and how their situation started to deteriorate, leading to their final expulsion in 1970, I'll conduct a historical social network analysis on the Italian community. Indeed, I assume that either (hypothesis 1) the Italian elite was integrated with the local elite and/or with foreign elites in place, or (hypothesis 2) the Italian community as a whole was

	integrated in the Libyan society. For both hypotheses, I assume that the connections within and between the Italian community provided its members with a set of possibilities and constraints, hence a certain degree of power, which may have impacted the possibility to preserve and promote their interests, thus to stay in Libya after independence. In order to test hypothesis 1, I'll reconstruct the egocentric networks of the Apostolic Vicar of Tripoli, Camillo Facchinetti (1936-1950) and that of his successor, Vitale Bertoli (1950-1967), by studying their private correspondence, both on a quantitative (Python and Gephi) and qualitative level. Which connections existed between the networks of the bishops – hence their opportunities, constraints and power – and the possibility for the Italian community to preserve their interests, thus to stay in Libya after independence? Letters metadata, close reading of the letters, and complementary qualitative sources will enable me to detect the evolution in the bishops' networks over time. To test hypothesis 2, I will conduct a Whole-network on the Italian community as a whole, extracting the quantitative data from the community's parish registers (1943-1970). Subsequently, I will produce a "Network prosopography", based on Italians' oral and material recollections. To what extent can the connections –and subsequent flows of resources – within and between the Italian community explain their possibility to stay in Libya after independence? I'll probably adopt the strategy by Kennedy et al. (2018) in order to treat change as a dynamic process rather than as a "series of snapshots". An overview of the scholarship on other post- colonial European communities in North Africa will be useful as well. A first exploration of Mons. Facchinetti's private correspondence has provided evidence of the validity of my first hypothesis, showing a variety of ties between Facchinetti and other members of a cross-boundaries elite; ties which are described by some sources as crucial for the recovery of the Italian community in Libya after WW2 and for the Italian clergy to be spared from concentration camps.

Title	**Interactive representations of celebrity networks across time and space**
Authors	**Cristina Calvo López (University of Salamanca)*; Modesto E Escobar (Universidad de Salamanca)**
Abstract	Given the emergence of big data generated by massive digitalization, as well as the growing access to information from the so-called second digital revolution, scientists face several methodological challenges to better represent history in areas such as data collection, new ways of sampling, automatic coding, and statistical analysis of information. This presentation proposes an analysis of information based on data binarization. The idea is to build forth-dimensional data matrices formed by 1) time, 2) space, 3) topics, and 4) events o characteristics, augmented by other matrices furthering their information. The treatment of this structure is based on the methodology of evolving two-mode networks, combined with information and statistical tools for the location, selection and location of nodes and edges. The proposed analysis, which runs in the cloud, will be explained using a variety of historical examples that range from the fields of literature and art to those of mathematics, physics, economy, sociology, political science, and other scientific areas with data extracted from Wikipedia and Wikidata.

S12_3 13:30-15:00	**Organizational Networks** *Organisers: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti, Paola Zappa*

Title	**Who decide what computers see? Studying AI datasets production through relational chains**
Authors	**Maxime Cornet (Telecom Paris)*; Clément Le Ludec (Telecom Paris)**
Abstract	In recent years, artificial intelligence (AI) and automated decisions systems have taken an increasing role in many aspects of our daily lives, powering among other things digitized administrative services, web infrastructures and "augmented" devices. Those algorithms are reliant on data-labourers to produce, clean, verify, standardize and classify data. This data work is generally externalized by AI companies to badly-paid and precarious workers, often situated in the Global South. To produce usable datasets the literature suggests that data labellers act upon socially constructed classification practices. Those practices define as well as reinforce specific world views, by imposing hierarchies and meaning on perceived phenomena: What is deemed important enough to figure in the dataset? Under which form? There is evidence that this meaning is at least partially imposed upon data workers by actors situated higher up in the AI value chain through managerial constraints. We propose to study relational chains involved in data production decision processes. More specifically: what happens when doubt arise regarding classification? Which resources (human or non-human) do data workers mobilize? We study both the kind of issues data workers face in defining categories, and the way they solve those issues. To do so, we mobilize data obtained through semi directed interviews with 100 Malagasy data-workers employed by specialised outsourcing companies, with resources-access sequences coded according to the ""quantified narration"" method. We adopt a mixed method approach, complementing the quantitative coding of the sequences with a qualitative analysis of the context in which the doubt arise, and of its resolution. We follow the path laid down by Granovetter, questioning the embeddedness of resource-access within relational-ties, however, we extend the concept to coordination resources, in an organizational context. Doing so, we are able to study at the same time the AI production process, and the embeddedness of managerial constraints in interactional structures. We show that even though clients are rarely directly involved in decision processes, some coordination resources assure a normative understanding of categories. We also show that despite this normativeness, the decision process is still collaborative, and often consensual, mobilizing rarely formalized data-labourers' socially constructed representations.

	Our approach has numerous implications. First, a better understanding of decision chains in algorithms design is necessary for algorithmic explainability. Secondly, It allows to understand exactly what is implied in datasets production process, and the relational embeddedness of micro-decisions underlying it. Finally, it proves useful to observe the position of annotators in a long, two-continent spanning, externalized production chain, and the amount of control on the client part in the product delivered by externalized contractors.

Title	**Understanding search strategies at networking events: An exploratory study using sociometric badges**
Authors	**Balint Dioszegi (University of Greenwich)*; Anne ter Wal (Imperial College Business School); Valentina Tartari (Copenhagen Business School); Daniella Laureiro-Martinez (ETH Zurich); Stefano Brusoni (ETH Zurich)**
Abstract	Structuralist network research has portrayed attribute-based search – approaching people with relevant expertise and following chains of referral – as the predominant strategy in the search for expertise. It is unclear, however, to what extent this logic extends to professional event settings, where socio-cognitive considerations also shape the effectiveness and desirability of different search approaches. To integrate socio-cognitive and structuralist explanations we designed an interactive experiment with sociometric badges and treatment conditions varying the quality and salience of participants' knowledge of others. In line with structuralist research, we find that individuals with high-quality background knowledge preferred to engage in attribute-based search and that such a direct approach proved most effective. Yet, a socio-cognitive perspective is necessary to explain why participants with low-quality background knowledge were better off following an indirect approach but did not always do so. Although reciprocal search – helping others before pursuing one's own goal – yielded more referrals, participants with low-quality knowledge who planned their search preferred to maintain initiative in approaching others – a potential manifestation of the Einstellung effect that compromised the number of referrals they received. Our findings contribute to the understanding of social search processes by reconciling structuralist and socio-cognitive explanations.

Title	**The impact of audience characteristics on third order inferences in sponsorship decisions**
Authors	**Andrew J Kloeden (University of Exeter)*; Cécile Emery (University of Exeter); Andrew Parker (Durham University Business School)**
Abstract	Despite progress in the past 60 years, gender inequality in the workplace persists. Women on average receive lower wages than men, face inequality in hiring, inequality in performance evaluations, inequality in their access to and returns from social networks at work and are less likely to be promoted. Women also experience inequality in the characteristics of their social networks at work and the returns to their network positions. Much of the existing scholarship about the impact of gender bias in the workplace has focussed on the personal biases of decision makers based on, for example, stereotypes of women's innate characteristics and appropriate social roles, or biased expectations of women's performance. However, a recent and growing body of scholarship identifies a source of gender (and other) bias that is activated in the presence of a third party or audience, a process known as third-order inferences. When a decision maker must determine how his or her choice will be viewed by a third party, the decision maker makes a choice depending on his or her perceptions of which choice the third party will prefer, a judgement referred to as a third-order inference. The decision maker then falls back on status-markers, choosing higher status options over lower status options. Since gender stereotypes contain assumptions about status which are activated in mixed-gender contexts or contexts where gender is salient, third order inferences can be a source of gender bias. This impacts the creation, mobilisation, and activation of the social networks of professional women. Much of the theoretical and empirical research related to third order inferences has so far not considered the characteristics and make-up of the audience and how this might moderate the impact of third order inferences. This research will extend the theory of third order inferences by asking whether the nature and impact of the audience structure, in particular its gender balance, is a moderator of third order inferences. This research will be based on an experiment that uses sponsorship to examine the impact of third order inferences in the presence of role incongruity in an organisational setting, whilst testing the impact of audience gender balance as a moderator. Sponsorship is defined as a senior employee (the sponsor) using his or her power or influence to the benefit of a more junior employee, usually referred to as a protégé. Given sponsorship is an inherently triadic activity, done in the presence of an audience, it is expected to be impacted by third order inferences.

S21_1 13:30-15:00	**Social support and Health** *Organiser: Guy Harling*

Title	**Visualisation of personal network: the experience of patients with severe mental illness**
Authors	**Hélène Garin (Université catholique de Louvain)*; Vincent Lorant (Université catholique de Louvain)**
Abstract	Visualisation has long been an important aspect of research on social networks. Sociograms not simply allow to collect and analyse data, but also to materialize people perceptions of their relational live. Visualisation gives participants a tangible, unique, perhaps unexpected view of their interpersonal relationships and the social context within they are embedded. Few studies have investigated the impact induced by this network visualisation, which can be positive or

	negative, affect the participant but also the researcher. According to previous research, network visualisation exposes presentation of the networked self, that is the way in which individuals present themselves when disclosing information about their own network. There is also little research on how respondents create narratives of the network-self, particularly when their social situation is highly vulnerable, as for individuals with severe mental illness (SMI), who often have poor social integration and feel isolated. We used mixed method design, with 140 SMI individuals completing a personal network sociogram. We asked respondents how satisfied they were with their personal support network before and after the visualisation of their sociogram. Then we conducted qualitative interviews with a smaller sample (n=15) to identify the main categories underpinning the experience of visualization of the networked-self. After visualization, satisfaction with their personal network remained unchanged for 34% of participants; 19% of participants were less satisfied while 47% of them reported a higher satisfaction degree. Emotional reactions ranged from being surprised by the resulting sociogram to having a feeling of coherence with what was expected. Participants emphasized different topics: network composition, size or structural features of alters (the central or peripheral position of a network member, connections or absence of connections between individuals…). Effects of visualisation requires researchers to adopt a reflexive approach during research encounters. Network visualization is a relevant intervention for recovery practices.

Title	**Getting by with a little help from our friends – Predicting students' mental health outcomes post-transition to university with combined ego and cohort network parameters**
Authors	**Maria Kempnich (University of Oxford)*; Ralf Wölfer (University of Oxford); Miles Hewstone (University of Oxford); Robin Dunbar (University of Oxford)**
Abstract	Supportive relationships are key to a healthy, long, and fulfilled life. While much is known about the general structure of our personal relationships (i.e., ego networks) and self-bounded communities (i.e., complete or cohort networks), we still know little about how the social support these networks offer can help us adapt to critical life events, such as the transition from school to university. Investigating the mental health developments of students during this transition and which network factors predict mental health outcomes allows us to better understand how young adults experience and, if necessary, cope with this important life event. Using a prospective longitudinal design, I examined the self-reported anxiety (GAD-7) and depression (PHQ-9) scores of two consecutive undergraduate student cohorts (n1 = 90; 41 women, 49 men; aged 18-23 years; 73% White & n2 = 81; 41 women, 40 men; aged 17-20 years; 74% White). First, I assessed anxiety and depression levels at baseline (pre-move to university), during the transition (across participants' first year as students), and post-transition (towards the end of their studies, i.e., almost three years after the baseline assessment). I then predicted the post-transition anxiety and depression scores using the baseline measures of mental health, demographics, personality traits - and combined social network parameters. By including both ego network and complete cohort network parameters in the multiple linear regression models, I could more completely capture students' social worlds, which crucially included both the number of and emotional closeness to each participant's friends and family, as well as the number of friendship nominations participants had received and made within the bounded college cohort of participants. Results showed that the average participant entered university neither clinically anxious nor depressed. Self-reported mental health scores increased somewhat during participants' first year at university and beyond. During the transition, female participants generally reported higher anxiety and depression scores than did male participants. Towards the end of their studies, post-transition scores characterised the average participant as both mildly anxious and depressed. These post-transition scores were most reliably predicted by the respective baseline scores and, somewhat surprisingly, by the personality trait agreeableness, but not any of the included social network parameters. Combined, these results seem to indicate that mental health developments during the transition to university may be subtle, at least temporarily diverging for female and male students, and not necessarily dependent on social network parameters. They moreover raise interesting questions about the seemingly paradox possibility that measures of perceived social support might trump those capturing social support more objectively, when it comes to ascertaining its effects on mental health and well-being.

Title	**Social network-based HIV Post Exposure prophylaxis uptake among female sex workers in Iran**
Authors	**Yahya Salimi (Social Development & Health Promotion Research Center, Health Institute, Kermanshah University of Medical Sciences)*; Zahra Jorjoran Shushtari (Social Determinants of Health Research Center, University of Social Welfare and Rehabilitation Sciences)**
Abstract	Post-exposure prophylaxis (PEP) is the use of short-term antiretroviral therapy (ART) to reduce the risk of acquisition of HIV infection following exposure. It is recommended starting a 28-day ART regimen within 36–72 hours of HIV exposure. PEP can have an important role in HIV prevention among people who are exposed to HIV. Non-occupational PEP, which mainly is for sexual exposure, plays an important role in HIV prevention especially for most at risk people such as female sex workers (FSW). Female sex workers are a hidden and under-reported population whose risk behaviors such as not using condoms, having multiple partners, using drugs or alcohol before sexual relationships are one of the most at HIV risk in Iran. However, due to social stigma and negative attitude of the government and society

	regarding sex work, there is little information about this vulnerable population. To ensure that PEP is used to its maximum capacity in any HIV prevention plan, eligible people must be aware of it and have access to it. However, some structural barriers, such as stigma and discrimination that limit access to HIV health services, also may contribute to disparities in PEP awareness and uptake. Social network is a context in which health information can easily disseminate through network ties. This strategy may improve PEP information and access in settings like Iran where HIV is concentrated and very high among those with high risk sexual or injection behaviors. This cross-sectional study will be conducted among 50 FSW and their eligible at-risk network members by using network-based PEP uptake strategy in four main phases including: formative study, recruitment of FSW, training them about PEP, recruitment of eligible at-risk network associates. Under the network-based PEP uptake strategy, eligible FSW will be interviewed and then they will participate in a coaching session on PEP, how to teach it for their at-risk network members and refer those who need to receive PEP. Referred network associates will be interviewed to ensure if they are eligible to receive HIV PEP at a convenient place. Incentives will be provided to participants for participating and referring network associates. We will measure the acceptability by quantitative and qualitative methods. If our method found to be acceptable and feasible, it can be used to fully design a network-based intervention to improve HIV prevention in Iran.

S05_3 13:30-15:00	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*

Title	**The dual ordering of individuals and words in organizations: A positional dominance approach**
Authors	**Julian Müller (ETH Zürich, Università della Svizzera italiana)*; Alessandro Lomi (Università della Svizzera italiana); Ulrik Brandes (ETH Zürich)**
Abstract	Positional dominance describes partial orderings among network nodes as a function of their associated direct or indirect relationships. The concept builds on a generalization of the notion of position in a social space by incorporating relational dimensions. By design, positional dominance underlies various conceptions of role equivalence and is generally preserved by centrality indices. Using data that we have collected on managers in a multi-unit corporation and words they use to describe their organizational units (company level) as well as the overall corporation (corporate level) within which these units are integrated, we adopt concepts of positional dominance to examine the hierarchical structuring of organizational vocabularies. Organizational vocabularies have been defined as systems of words used by organizational members to make sense of their work environment, and to construct, interpret and share the meaning of social categories, identities, and work practices. According to a major line of sociological research on formal organizations, vocabularies can contribute to the typification of experiences, an essential feature of the process of creating and sustaining an identifiable culture. The distinctive merit of positional dominance analysis for our understanding of organizational vocabularies lies in the connection that it reveals between shared meanings in organizations, and the hierarchical structure of vocabularies. More specifically, we argue that positions words occupy in a more general meaning space spanned by organizational vocabularies induce dual orderings of words and organizational participants. The analysis using positional dominance simultaneously produces orderings of words and organizational members. The expressiveness of positional dominance allows us to incorporate prior classifications of words and individuals into the analysis in a way that is informative and straightforward. We discuss how the results of the analysis help us to identify differences in the hierarchical structure of organizational vocabularies both within (companies), as well as across (corporate vs. companies) levels. In general, we find that the results of the analysis are consistent with research on (and common experience of) organizational complexity as a direct consequence of the coexistence of multiple, and occasionally conflicting, vocabularies and meaning structures.

Title	**Patterns in the recall of friendship relations**
Authors	**Zoran Kovacevic (ETH Zurich)*; Christoph Stadtfeld (ETH Zürich)**
Abstract	Free recall name generators are a widely used tool in social network research to collect network data. Patterns in how individuals answer questions about their social relationships may open insights into how these are mentally organized. Previous research has indeed shown that specific memory patterns exist, for example, that individuals may recall alters following social contexts, social groups, and social roles. At the same time, the recall may be affected by the emotionality of the tie, its embeddedness, and the individuals' demographic attributes. The current study aims to provide an overview of various recall patterns discussed in the literature and test the extent to which they are relevant for the recall of emotionally significant ties such as friendship. Furthermore, we want to evaluate to what extent the patterns shown are consistent with existing cognitive theories about the mental organization of social relations. It analyzes responses to a friendship name generator taken from a unique longitudinal data set of three university student cohorts (total N > 1000) from the Swiss StudentLife study. Cognitive recall patterns are inferred from the friendship

	name generator's order and sequence of mentions. On the one hand, the findings may help to understand the extent to which the collected friendship networks are shaped by the collection process via name generators through implicit individual cognitive processes such as recall patterns. On the other hand, these patterns provide evidence for the fundamental social processes that affect individuals` perception and cognitive organization of the social networks they are embedded in.

S15_1 15:30-17:00	**Public Policy and Discourse Networks** *Organiser: Philip Leifeld*

Title	**Semantic hypergraph approach to semantic network induction and comparison**
Authors	**Telmo Menezes (Centre Marc Bloch Berlin); Ksenia Puzyreva (Centre for German and European Studies, St Petersburg University - Bielefeld University); Camille Roth (CNRS); Nikita Basov (CNRS)***
Abstract	Semantic network induction reveals contextual meaning by displaying relations between words and as such is particularly utile to gain an in-depth understanding of text. Two main approaches to semantic networks are distinguished: word co-occurrences and grammatical parsing, both with their strengths and weaknesses. We present a novel approach that combines the power of both while dealing with their drawbacks. The approach is based on Semantic Hypergraphs (SH), a recursive representation model that accommodates the hierarchical richness of natural language, while using a simple artificial grammar – as opposed to a "real" and more complex natural grammar (e.g. as is the case in dependency parse trees). This approach is illustrated by unveiling the overlaps between expert knowledge in the field of flood risk management and knowledge of local flood action groups. Since these types of actors are different in their positions and discursive behaviors, empirical data on them are of an heterogeneous nature: formalized official documents on the expert side and loosely structured interview transcripts on the local side. Furthermore, the expert corpus is approximately two times the size of the local corpus. Using popular co-occurrence networks, one would have to rely on simple statistical regularities and ad-hoc parameterizations, for example the window size. This drawback is particularly visible when comparing different types of texts that have different statistical properties not directly related to their semantic content, which makes application of the same parameterizations unfeasible. In contrast, the SH approach provides a semantically structured representation that connects concepts in a linguistically induced manner – by virtue of their co-participation in claims or utterances, automatically detecting the optimal level of generality. On one hand, concepts distant from each other (e.g. in the run-on sentences characteristic of oral speech) can be connected. On the other hand, words appearing close to each other (e.g., "lower flood risk", "flood risk" and "risk") can be disentangled. Grammar-based approaches, less dependent on the statistical properties of text than co-occurrences, are limited in other ways that are no less severe for social scientists who often deal with loosely structured cultural data, such as narrative interviews. E.g., grammatical parsing is often limited to subject-predicate-object triplets; is too brittle when dealing with ungrammatical utterances of oral speech; and focuses on what is said exactly in the sentence rather than the broader semantic context. SHs provide a middle ground between the lack of structure of co-occurrences and the excessive rigidity of grammatical methods. We empirically demonstrate utility of the approach by juxtaposing knowledge structures across the discourses of expert and local interest groups. We compare the SH with conventional representations, both computationally and via domain expert evaluation.

Title	**Does the climate matter? Discourse network analysis of climate delay in the Czech Republic**
Authors	**Lukáš Lehotský (Masaryk University)*; Petr Ocelik (Masaryk University); David Blazek (Frank Bold); Kristina Zakova (Masaryk University)**
Abstract	Legitimacy and scope of the necessary climate action have been discussed for decades already. Actors denying and challenging climate change are, however, still an integral part of these debates. One of the most important layers where these battles take place is the media discourse. There, a contested understanding of climate change shapes the debate in two fundamental ways: what is being discussed and how the issues are discussed. Research on media portrayal of climate change shows the climate denial actors use different strategies, ranging from questioning the existence of the warming trend, through the questionable human contribution, to rejection of any significant impact. The latter, a more soft-spoken set of strategies, have been recently recognized as discourses of climate delay that “accept the existence of climate change but justify inaction or inadequate efforts”. The ultimate goal of delay-based strategies is, however, very similar to the outright climate change denial - postponing or questioning the need for a robust mitigation response. We contribute to the study of the discourses of climate delay through the case of the Czech Republic, a post-communist EU member state, where doubting climate change has a long tradition due to a vocal denialist president Vaclav Klaus and due to a strong influence of the fossil industry. The country has an export-oriented industry-heavy economy and has only shown a lukewarm response to the more ambitious climate mitigation goals of the past decade. For all these reasons, we expect the presence of the climate-denialist actors in the media discourse. At the same time, external pressures to adopt more robust policies have been mounting and coming from many directions. Progressing scientific consensus, pressure from supranational bodies like the EU, but also emerging grassroots movements, or the presence of extreme weather events all put climate denial actors under considerable pressure. Thus, we want to see whether these actors transformed their positions and adopted climate delay strategies

	instead. We use discourse network analysis to explore what discursive strategies are used and by whom in the Czech public debate before and after the adoption of the Paris Agreement.

Title	**Exploring the latent social space arising from the network of COVID-19 Twitter superstars**
Authors	**Giacomo De Nicola (LMU Munich)*; Victor Tuekam (LMU Munich); Göran Kauermann (LMU Munich)**
Abstract	Governmental interventions have been at the center of the public stage since the start of the COVID-19 pandemic. Issues such as social distancing measures, and, later on, vaccine mandates, have particularly been dominating the increasingly polarized landscape of online discourse. This context saw the emergence of pandemic-related social media "superstars", accounts with a large following which regularly discuss the pandemic and the issues surrounding it. These actors can shape popular sentiment and public discourse, and thus have the ability to influence political decision making. Because of this, understanding the role they play and mapping the space in which they operate can have important societal implications. In this paper, we make use of publicly available Twitter data to model the network of COVID-19 Twitter superstars, which we here define as accounts that authored multiple popular tweets related to COVID-19. In the network, mostly composed of public figures, politicians and influencers, an edge between two actors is present if one of them follows the other. We make use of the latent position cluster model, which postulates that nodes in the network are embedded in a latent social space, and that the probability for two actors to connect is inversely related to their distance within the space. We argue that this model is particularly well suited for this application, where the premise of a latent social space is sensible from a substantive point of view: Political beliefs are generally understood and regularly modeled in a continuous, multidimensional spectrum. We are, therefore, interested in uncovering the (continuous) social positioning of actors relative to one-another, which is what latent space models enable us to do. Our results indicate that the positions of Twitter superstars in the network are strongly associated with their public stances on government mandates. From the politicians' estimated latent positions in the network, we can also appreciate how attitudes toward governmental interventions tend to follow party lines. Moreover, we show how the latent position cluster model is able to identify a partition of the network into two macro-communities. Despite substantial within-cluster heterogeneity on several issues, those two communities can, based on the actors' public stances, be interpreted as "generally pro" and "generally against" vaccine mandates. Finally, we find that the positioning of nodes within communities is also informative on the actors' beliefs, capturing the within-cluster heterogeneity mentioned. Specifically, more central (external) positions in the overall latent space are associated with more moderate (extreme) stances.

S04_1 15:30-17:00	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*

Title	**Uncovering the kinship matrix: A new study of solidarity and transmission in European families**
Authors	**Thomas Leopold (University of Cologne)*; Charlotte Becker (University of Cologne); Beyda Cineli (University of Cologne); Zafer Buyukkececi (University of Cologne)**
Abstract	What people regard as their family is usually a large network: children, parents, grandparents, siblings, cousins, aunts and uncles, nieces and nephews, stepparents and stepsiblings. Current data and research are limited to a small segment of this network – often only the 'nuclear family' of parents and children. The KINMATRIX project will extend the nuclear view to map out the family network in unprecedented scope and detail. At the heart of the project is a new multi-actor survey data collection (N = 10,000 families in five European regions). These data will show the family not as a nuclear unit but as a kinship matrix – a large, diverse and multigenerational web of relationships. Based on this view, the project will study how the family matters: as a private safety net insuring against health risks and financial hardship, as a social network protecting from isolation and loneliness, and as a source of capital promoting education and careers. This presentation will introduce the project and show first results.

Title	**Have personal networks changed over the last decades? Comparing cross sectional surveys in France (2001-2017) and in California (1978-2015)**
Authors	**Guillaume Favre (University of Toulouse)*; Eric Giannella (Code for America)**
Abstract	We compare results from cross-sectional name generator surveys in the Toulouse metropolitan area (France) in 2001 (N=399) and 2017 (N=709) and in Northern California in 1978 (NCCS survey; N=1050) and 2015 (UCNETS survey, N=1011) in order to study the evolutions of personal networks and sociability along last decades. The results are convergent: while in the 2000s various authors predicted major changes in personal networks, networks are stable in both their composition and their structure. We observe neither a reduction in their size nor massive changes in their composition (share of family, professional and neighborhood relationships, etc.). Nevertheless, we note changes parallel to certain developments in French and American societies (higher levels of education, increase in the age at first childbirth, peri-urbanization, etc.): a change in the contexts in which relationships are created for the 18-30 year-olds and the over-60 year-olds, a growth in the inter-society of the most highly educated social categories, and a decrease in the density of networks in rural areas (for France).

S21_2 15:30-17:00	**Social support and Health** *Organiser: Guy Harling*

Title	**Organizational network analysis of cross-sector providers serving medically complex people experiencing homelessness: Does relational coordination matter?**
Authors	**Amanda Anderson (State University of New York at Buffalo)***
Abstract	Ensuring safe and efficient care to people with health and social needs, such as medically complex people experiencing homelessness (MC-PEH), proves challenging. After hospitalization, MC-PEH often require extensively complicated care that spans many organizational sectors (health, social, legal, housing, etc.). Organizational integration necessary to collaboratively sustain cross-sector care transitions for MC-PEH in the immediate post-hospitalization period are poorly supported, or do not formally exist. Barriers include variance in organizational culture, role differences, service duplication, and lack of stakeholder support for collective structure, like communication portals. As such, MC-PEH suffer from inequitable transitional care, often incurring the greatest healthcare risk and cost. Considering the complexity of cross-sector coordination of MC-PEH, a novel analytic method is needed. Building on network analysis, social capital theory, and implementation science, Relational Coordination presents a validated benchmarking tool for understanding complex relational elements of teams across organizations. The study objective is to use Relational Coordination to analyze network relational patterns (coordination; integration) and the impact of member attributes on Relational Coordination characteristics and outcomes in an established cross-sector network providing collaborative care to MC-PEH. Participants will be recruited from an existing cross-sector care network of providers sponsored by the Robert Wood Johnson Foundation Clinical Scholars Fellowship program, and given a brief electronic version of the validated Relational Coordination Survey. Integration will be analyzed through network metrics by sector (centrality, density, etc.). Coordination will be representative of Relational Coordination characteristics. Regression analysis will be performed on member attributes and Relational Coordination characteristic data. Qualitative interviews with a proportion of participants using the Organizational Structures Assessment Tool (OSAT) will baseline cross-sector care experience by organization. Network models and outcomes will show extensive concentration of integration on certain sectors, and barriers in others. Relational Coordination findings will be suggestive of the influence of role attributes, impact of organizational culture and clinical licensure. Overall, qualitative results will expand on barriers inherent to cross-sector network baseline. This study will begin to shed light on whether the quality of coordination of MC-PEH transitional care is dependent upon attributes related to sector, clinical expertise, culture, or licensure. By establishing a network baseline, this study will establish a framework to further test organizational network impact on direct patient outcomes such as health system utilization, re-hospitalizations, patient experience, return on investment, and cross-sector provider valuation of care.

Title	**Comparing group detection methods in the context of school networks and health**
Authors	**Srebrenka Letina (University of Glasgow)*; Mark McCann (University of Glasgow)**
Abstract	Identifying naturally occurring peer groups among adolescents in school settings can have important implications in intervention planning when targeting specific health related outcomes like substance use (e.g. smoking) or general wellbeing (e.g. depression). Social network analysis offers many tools for detecting groups in networks that are based on block-modeling and community detection methods. Importantly, these different techniques result in different network partitions. This leads to the question how to choose the most adequate technique in the absence of the ground truth data. We build on Question Alignment Approach developed within health research literature and on the approach from networks science literature that deals with the comparison of different group detection methods, in aim to present several indices for comparing outputs of those methods. Datasets we use to demonstrate our approach are a cross-sectional study on 22 schools conducted in 2006 in Glasgow, Scotland (Pals) and a longitudinal study of one school in Glasgow over three time periods (Teenage Friends and Lifestyle Study). Both datasets contain information about network ties between students in a school and attribute data about basic socio-demographics and different kinds of health-related outcomes. We use ten group detection methods available in R package (Block-modelling – indirect approach, Stochastic block modelling, Clique Percolation, Edge-betweenness, Fast-greedy, Infomap, Leiden, Louvain, Label propagation, and Walktrap), and compare their outputs on several indices: modularity scores, mixing parameters, group sizes and other community properties, amount of explained clustering in relevant attribute data (socio-demographics and health-related outcomes), robustness to random rewiring, stability of partitions over time (for longitudinal data). Additionally, we include an index that provides information about the potential practical use of found communities for health-related interventions, resulting in a measure that looks specifically at so-called “high-risk” communities. Additionally, we introduce several ways to gauge the possible effect of missing network data on resulting partitions based on simulations of datasets with additional non-responders (that have no network data) and imputation of ties for non-

	responders based on link prediction algorithms. Finally, we synthesize the information provided from all the indices for two datasets, and ten group detection methods, and align them according to their relevance for analytical vs. intervention-oriented research goals. We discuss possible insights and limits of generalizability of our findings in the context of schools and health related research. Crucially, we try to answer whether there are more objective ways to choose the group detection method in such a way that avoids "cherry-picking" of the one method that gives a partition leading to the "best" results for a given analysis.

Title	**On a typology of negative ties as a further perspective in social support research**
Authors	**"Philip Adebahr (University of Technology Chemnitz)*; Sylvia Keim-Klärner (Thünen Institute of Rural Studies, Brunswick); Andreas Klärner (Thünen Institute of Rural Studies, Brunswick); André Knabe (Institute for Social Research and Social Practice e.V. Rostock)"**
Abstract	Relevance: We are blind in one eye if we are only focusing on social support. Empirical findings suggest that negativity from social relationships has a greater health-related effect than supportive aspects of relationships. We also know that the brain gives negative information greater significance than positive information (negativity bias). Recent findings indicate that 15% of all relationships are 'sometimes demanding or difficult'. These three reasons clarify why we have to consider negative ties as well. Offer states in her review on negative ties from 2021, that while the past decades generated further insights in negative tie research we still need a solid (theoretical) framework. Our research starts by asking what negative ties are. We then aim on developing a systematic differentiation of negative ties. Method: To develop a solid understanding of negative ties and identify different types of negative ties, we analysed qualitative interviews (N ego: 34) compiling alter specific dyad portraits. We generated the interviews in a mixed-methods project called Aspects of Poverty in Mecklenburg-Western Pomerania'. Results: We found eight types of negative ties, which can be differentiated according to the form of reciprocity violations. In further steps, we discuss the inner logic of the typology while considering a dyadic perspective and tie it back to the state of research. In further research, we are planning to develop a measurement instrument for quantitative research.

S05_4 15:30-17:00	**Methodological and Software Advancements in Social Network Analysis** *Organisers: Giancarlo G. Ragozini, Matteo Magnani, Roberto Interdonato, Maria Prosperina Vitale, Giuseppe Giordano, Stefano Ghinoi, Guido Conaldi*

Title	**The comprehensive framework of virtual power**
Authors	**Mohammad Mohsen Mehdizadeh Naeini (School of International Relations Ministry of Foreign Affairs)***
Abstract	Every network can be divided into two components: I. nodes (representing actors), and II. links (indicating the relationship between the actors). Network theory refers to some nodes that are far more connected than others as hubs and the pattern of the connectedness of nodes as topography. So, how these concepts can be translated into international relations concepts? The instant flow of goods, finance, and information between the borders, facilitated by globalization, has created a world in which everything became war. To understand the impact of globalization on the coercive ability of the states, Farrell and Newman appeal to network theory to introduce the Weaponized Interdependence Framework which takes into account two principal factors: 1- the topography of networks of interdependence, and 2- the degree of authority that states have over hubs. Regarding the first factor, the complex systems tend to produce asymmetric topographies. This means that in the real networks, some nodes are far more connected and influential in comparison to others. By imposing authority over these hubs—which the domestic institutions must permit—states can coerce their adversaries and appeal to chokepoint and panopticon effects—accordingly, cutting the adversary off from the network flows and utilizing the network position to extract information from the adversary. The internet network, just like any other complex system, is likely to be an asymmetric one. Giant platforms can be considered the hubs in the network. States in the position of enforcing their authority on them can exploit these hubs to monitor the adversary's data passing through, cutting off the access of the adversary to the vital services, and even transfer malware to the opponent's vital infrastructures. All these mentioned coercion mechanisms can be carried into effect in the attack in cyberspace. Therefore, the Weaponized Interdependence can be empirically implemented on the internet network to construct a comprehensive virtual power framework. The constructed framework calculates the cyber power of any nation by taking into account two principal resources: 1- the number of hubs that the state hosts, and 2- the local institutions which govern the behavior of the state toward the hubs. In addition, this framework can identify the vital services that two opponents can deprive each other of, the type of data that the two parties have access to, and the key infrastructures that are exposed to a cyberattack. Thus, this research is able to find a solution to the problem of constructing a framework to calculate the virtual power of the states, forecast the possibility of a cyberwar between them, and predict the possible attacks that they should expect in the case of a cyber confrontation. Having this framework at hand, the international relations scholars will be able to avoid getting caught among an immense amount of data that cannot be gathered, codified, and analyzed in a

	systematic way.

Title	**Community detection in tripartite 3-uniform hyper-graph**
Authors	**Giancarlo G. Ragozini (University of Naples Federico II)*; Giuseppe Giordano (University of Salerno); Maria Prosperina Vitale (University of Salerno); Vincenzo Giuseppe Genova (University of Palermo)**
Abstract	Many complex relational data structures can be described through multilayer, multimode, multiway networks in which nodes could also belong to different sets. Bipartite graphs represent the most common and studied multimode networks. In the case of tripartite networks when three types of nodes are present, different and more complex graph structures can be defined, including hyper-graphs. In such a case, clustering and community detection algorithms are still an open problem. In literature, it can be found methods deriving from generalizations of algorithms suited for one-mode and two-mode networks. One approach consists in adopting the usual community detection algorithms on a unique supra-adjacency matrix defined by combining all the possible two-mode networks in a block matrix. Alternative methods rely on projecting each two-mode networks and on applying separately the usual community detection algorithms on these matrices. In addition, there are methods adopting both an optimization procedure for 3-way networks by extending the idea of bipartite modularity, and an indirect blockmodeling approach. In the present contribution, we discuss an alternative approach for community detection in a weighted tripartite 3-uniform hyper-graph, or in the 3-way network. Starting from real applications on the Italian student mobility phenomenon in higher education, provinces of residence, universities and educational programs are the three modes of a 3-way network. The three modes are connected by hyper-edges in which the size of the mobility flow is the corresponding weight. In this contribution we proposed to simplify the network structure by exploiting the relationship among the universities and the educational programs, i.e. the fact that a given educational program is embedded in a given university. The set of hyper-edges is thus simplified into a set of edges connecting a province with a given educational program running in a certain university. The resulting simplified structure is two-mode weighted network. Hence, the Infomap community detection algorithm is adopted to partition the derived network. The results can be after interpreted in terms of the original data structure. Finally, we present the main findings from the analysis of student mobility data of Italian universities.

Title	**How to explore the potential of a tennis player using tools of SNA?**
Authors	**Antonina Milekhina (High School of Economics); Marialuisa Restaino (University of Salerno); Kristijan Breznik (International School for Social and Business Studies, Celje)***
Abstract	Professional sport is a world of high dedication and high investments having some unique features. Tennis is considered as an individual sport, where two players builds a dyadic relationship, the results of each player due characteristics of both opponents. Moreover, tennis match is played till the last point is won, which means time is not limited. Psychological momentum plays important role in a champion's mind setup. Another feature of tennis is the longevity of tennis player's career and frequent tournaments during it. Tennis players and matches were studied from different points. In the past, short-termly player's result could be examined on the level of a point, a match and a tournament. In the long-term prospective tournament results are evaluated by points and expressed in player's ranking progress. Some obvious characteristics as winning tournaments, achieving high ranking early may not be enough. We propose to evaluate characteristics of players based on the outcome of matches and the psychological characteristics of opponents. We would like to inspect features that makes one a champion with the help of a temporal network analysis of matches they played. Network analysis differs from other 'traditional' statistical methods in sense that it analyses the relations between statistical units directly, which is necessary in case of interactions. Our hypothesis is that a player's results are manifested in one's position in network of matches, which is built by dyadic interactions with other players. In order to have success, a player should show not only physical abilities, but also psychological treats. For instance, such as of winning a match against a significantly higher-ranked player, ability to win close matches (player's mental toughness), ability to win long matches (player's endurance), ability to change momentum are among them. Network structure of match played by a player provides us historical information about the player's abilities against other players. Players are considered as nodes of such a graph and directed links are represented by matches played between two players. It's obvious that the graph of matches is not random and some matches are more probable than others. We can represent the all tennis matches as a directed weighted graph and apply tools of social network analysis to evaluate which features best explain the evolution of such a network. The goal of the study is to predict which psychological treats results in higher probability of winning a match. For our analysis we used men's tennis matches database for years between 2000 and 2017, which provides us with more than 45,000 matches. This result was compared to the situation in women's tennis. We used SIENA tool (stochastic actor-oriented model) which tests whether the network effect explains observed network evolution. With help of SIENA we showed which psychological characteristics are crucial for male and female tennis players in order to win their matches.

Title	**Inducing optimal diffusion**
Authors	**Marco Pelliccia (Heriot-Watt University)***
Abstract	Influence maximization is a relevant problem in many fields, from marketing to development economics, public health, and computer science. A decision-maker (the designer) optimally targets a subset of agents with a message. The goal is to maximize the diffusion of the message across the population by peers sharing it via word-of-mouth. Two assumptions are commonly made in these models. Networks are usually fixed and, at least partially, known to a designer, and the probability of a message being passed between two peers is independent and homogeneous across individuals. Most of the literature discusses various algorithms that are able to efficiently select, given a specific model setting, the optimal subset of individuals to target. In this paper, we study the same problem but approach it differently. Instead of exploiting an existing social network, we study a way to incentivize individuals to diffuse the message efficiently by possibly forming communication links between themselves. Individuals differ in their ability to successfully pass a message (their type) and this is only a local knowledge – unobserved by the designer. We propose a direct mechanism expected to induce agents to both (i) report their own true type to the designer and (ii) communicate the message to other peers efficiently as equilibrium – building a communication structure that maximizes the expected diffusion of the message. By inducing the formation of an efficient communication structure, we avoid one of the common challenges faced by this literature represented by the often noisy information we have about existing social network structures. Moreover, we exploit possible differences in types in order to diffuse the message efficiently instead of relying on simplifying assumptions over types. In the mechanism, players are initially asked to report their own type. The designer then uses this information to compute the communication structure that maximizes the diffusion of a message (optimal), to seed a subset of players, and finally instruct agents to pass the message to other peers optimally. As a final step, the designer allocates transfers to the players. It is clear that a player can deviate in two different ways under such a mechanism. She could misreport her own type (adverse selection) and/or she might not comply with the instructions relative to the formation of communication links (moral hazard). We show that our mechanism induces an equilibrium where individuals form optimal communication links and report their own types truthfully.

Abstracts **Thursday, September 15th 2022**	
S23_1 09:00-10:30	**Teaching Social Network Analysis** *Organisers: Riccardo De Vita, Yasaman Sarabi, Matthew Smith, Guido Conaldi*

Title	**Open Education Resources (OERs) – Developing a resource hub for Social Network Analysis (SNA)**
Authors	**Yasaman Sarabi (Edinburgh Business School, Heriot-Watt University)*; Matthew Smith (Edinburgh Napier University)**
Abstract	As part of the Social Network Analysis in Scotland group (SNAS), we have developed an Open Moodle page to act as a resource hub for Social Network Analysis. This is a public facing Moodle page, that is open to all, called the SNA Hub. The SNA Hub aims to act as a resource hub for anyone starting out with SNA; it provides an overview of some methods and metrics, along with short introductory videos on relevant software packages for SNA and Network Science. This work will discuss the challenges of developing an SNA focused Open Educational Resource (OER), along with reflecting on how to increase participant engagement with the SNA Hub. We will conclude with details on the next steps to further extend the SNA Hub.

Title	**Social Network Analysis: a challenge to conventional sociological approaches taught in university courses**
Authors	**Andrea Salvini (Dipartimento di Scienze Politiche Università di Pisa)***
Abstract	The aim of this paper is to describe and discuss the experience of three years of teaching in the ""Laboratory of Social Network Analysis"", at the master's degree course ""Sociology and Management of Social Services"". It is a 21-hour workshop, attended on average by about 15 students and aimed at learning the theoretical premises of the SNA perspective as well as the ways in which to incorporate the its main tenets in empirical research, with particular reference to data analysis (through R). The presentation will also describe the results of the evaluation questionnaires that students have completed at the end of the Course. SNA constitutes a ""challenge"", as it introduces relevant ""discontinuities"" with respect to the contents that students have acquired in their studies, discontinuities that are placed both on the theoretical and methodological side. In particular, the most crucial aspects can be summarized as follows: 1) SNA constitutes a ""challenge"" on the theoretical level as it introduces significant ""discontinuities"" with the contents learned in the courses of sociological theory, which are centered on the explanatory relevance of social actions by social actors, rather than on the importance of the interdependence between actors and on the explanatory power of the relationship structures. The students find this approach particularly surprising and innovative, and, in turn, this reaction appears equally surprising to the teacher. 2) The SNA is methodologically challenging because it introduces ""discontinuities"" with respect to the way in which field surveys are designed and carried out, which are normally taught following conventional canons of quantitative methods. This dual dimension of ""challenge"" is a reason of great interest on the part of students who appreciate SNA as a perspective that proposes an intimate connection between the epistemological, theoretical, methodological and technical dimensions. From the teacher's point of view, the main commitment is to show how this character of coherence can be integrated with the "conventional" theoretical and methodological tools, enriching both the conceptual and the technical-procedural apparatus, to reach a more adequate understanding of the social phenomena analyzed, incorporating the structural perspective. A controversial aspect relates to the risk of SNA being seen as a set of technical procedures to be learned through the acquisition of specific computer skills with the use of specialized software. Although this procedural dimension is necessary to adequately govern the analytical process, the risk to be avoided is precisely that of not reducing the perspective to its technical dimensions. To be honest, students greatly appreciated the ""practical"" parts of the Course, oriented to the acquisition of skills related to the use of software – which they consider fundamental to be able to apply operationally – and therefore ""dominate"" – the perspective in any empirical experiences.

Title	**Teaching Network Science to undergraduate interdisciplinary students**
Authors	**Ebrahim Patel (The London Interdisciplinary School)***
Abstract	We report on progress in a new course for undergraduate students at The London Interdisciplinary School (LIS), a new university offering a degree in Interdisciplinary Problems & Methods. The curriculum is based around complex problems, such as Sustainability, Inequality, and AI, with students studying methods and short courses in the arts and sciences. Network Science was offered as one such short course to help first year students tackle the problem of Inequality. Topics taught included the friendship paradox, the majority illusion, centrality and assortativity, illuminated by demonstration tools using spreadsheets, Python coding, and NetLogo for simulations of network formation and segregation and polarisation. Central to LIS's ethos is the appreciation of an interconnected world, so this course is a tangible way to enable this

	further, giving students confidence and a platform on which to build later studies. Students at LIS come from a range of academic and subject-specific backgrounds, and this also leads to unique insights and ideas, such as a student assignment discussing the connection between the majority illusion, disassortativity and eigenvector centrality, potentially revealing an alternative vaccination strategy for virus outbreaks. Overall, we highlight the reciprocal benefits that network science provides when teaching with a view towards interdisciplinary understanding and research.

Title	**Combining social network analysis and complex networks for new generations of researchers**
Authors	**Paola Tubaro (CNRS)*; Floriana Gargiulo (CNRS)**
Abstract	Social network analysis (SNA) and complex networks (CN) have remained separate traditions for long. Anchored within social science, SNA uses measures that characterize network structure, link it to node and edge attributes, and shed light on the underlying relational behaviors. It is the best theoretical framework to analyze small network datasets rich of attributes, often collected as part of social surveys or fieldwork. CN developed in the field of complex systems, influenced by statistical physics and computer science. Focus is not on measures per se, but on their statistical distributions. Dynamic models unveil the micro-choices leading to the emergence of statistical properties or analyze the role of topological structures on the spread of, say, epidemics or opinions. CN is the right framework to analyze large graphs poor of attributes. However, new network data coming from digital platforms can be both large and rich in attributes, attracting attention from the two initially separated communities. It is thus important to make students, as future researchers, aware of both approaches. We have offered in the last five years at ENSAE, Paris, a 'Social and economic network science' course that is deeply based on the parallel teaching of the two traditions of SNA and CN. Starting from basic indicators, we first present the interpretative methods in SNA and then their statistical redefinition in CN. Each lesson includes an applied part with exercises, using a common programming language (Python). Each year, we take a broad social science theme (such as the spread of an epidemic, or scientific collaborations) and one or more suitable datasets, which become the leitmotif of the exercises: new measures and tools are applied to these data at each session. Students do weekly Python assignments that help us monitor progress (with sometimes optional, more challenging questions for the most motivated). They are also exposed to published papers on the selected topic, from both the SNA and CN literatures: they form groups that report to the class on the contents of relevant papers. We have also experimented with a mini-conference where we invite 2-3 external researchers to give a short presentation of a paper of their choice, to give students a view of the applicability of these tools. Their final assignment is a mini-project, where students choose and analyze a dataset that can address a precise social science research problem. We find that this approach works well in classes where students have diverse educational backgrounds. Especially in the last phase (project), a preference emerges in students toward one of the two traditions, usually in line with their prior training. Still, they all develop the ability to understand the potential and limitations of both approaches, to figure out which one fits best with a given network dataset, and to navigate the interdisciplinary literature on social networks regardless of the field where it was produced.

S04_2 09:00-10:30	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*

Title	**Being Your Own Boss: Network Determinants of Young People's Orientations towards Self-Employment**
Authors	**Vacchiano Mattia (UNIVERSITY OF GENEVA)*; Eric Widmer (University of Geneva); Vera de Bel (University of Turku, Netherlands Interdisciplinary Demographic Institute)**
Abstract	Young people today are being asked to manage an increasingly precarious labour market in an entrepreneurial way. However, while this seems to emphasize the importance of their aspirations and human agency, young people's career plans are often the result of more complex structural phenomena. Not only are social class and human capital central factors in shaping career aspirations, but personal networks also play a role by providing key resources in the labour market, such as information and social support. Using data on 9,999 young people's egocentric networks (CH-X project), this presentation tests a stepwise logistic regression model to study young people's willingness to move towards self-employed, freelance or entrepreneurial careers. The model takes into account indicators of three determinants: (1) initial social position (parental status), (2) human capital, and (3) social capital, in terms of the extent and diversity of resources embedded in personal networks. We test the weight of these factors on young people's orientations towards self-employment in social groups distinguished by gender and ethnicity. In doing so, we discuss preliminary evidences for the structural determinants of young people's work aspirations, thus contributing to the study of the role played by personal networks in processes of social reproduction and social mobility.

Title	**Revising Tie Strength in Latin American Labor Market: From Information to The ``Padrino'' for Income Mobility in Colombia**

Authors	**Thibaud Deguilhem (University of Paris)*; Jean-Philippe Berrou (Sciences Po Bordeaux)**
Abstract	The relevance of personal networks to explain how job markets work is commonly admitted by social scientists. However, the association between the strength of ties and labor outcomes constitutes one of the more debatable issues in economics and sociology particularly in emerging countries. On the one hand, a long and known tradition following Granovetter's work (1973) demonstrates the relevance of the strength of the weak ties (WT) to get a better job because of their capacity to convey novel information (Tassier, 2006; Zenou, 2017). On the other hand, more and more studies show the importance of the strength of strong ties (ST) to increase labor market outcomes because of the "padrino's effect". In other words, facing labor market failures clearly present in emerging contexts, ST based on trust and reciprocity are more useful than WT to solve uncertainty and asymmetrical information issues (Bian, 1998; Karlan et al., 2009; Obukova & Zhang, 2017). Focusing on income mobility, we offer an empirical test of WT and ST theories using original quantitative personal network data collected in Bogota (Colombia). In an emerging Latin American context, our results confirm that the Padrino's effect is more relevant than informational channel. WT are useful for marginal income mobility because they provide more information especially for lower-income groups. However, ST generate deeper and higher income mobility providing other kinds of resources. This result is explained qualitatively by the relevence of recommendation to solve asymmetrical information associated to income mobility. We finally discuss why the Padrino's effect for income mobility is crucial to understand the stability of inequality in the Colombian labor market.

Title	**Indirect effect of contact frequency with social network members on the link between residential mobility and psychological well-being**
Authors	**Cansu Yilmaz (Anadolu University)***
Abstract	Present study aimed to examine whether an increase in the number of past moves predicts lower levels of psychological well-being through reduced frequency of contact with social network members (immediate family, friends, and extended family). Participants reported the number of past moves, complete Ryff's Psychological Well-being Scale (1989), and list the initials of the people who were there for them in times of need and with whom they prefer to discuss important matters through a name generator. Participants were allowed to list the initials of up to 10 people. Mean number of people listed was 4.40 (SD = 2.56). Next, for each person listed, participants indicated the frequency with which they were in contact with these individuals face-to-face on a 5-point scale (0 = never to 4 = very often). To compute a composite frequency of contact score, we averaged across scores given for each confident. Mean frequency for face-to-face contact was 3.68 (SD = 2.27). Increased residential mobility predicted lower frequency of face-to-face contact with the immediate family, friends, and the extended family. However, out of the three, only frequency of face-to-face contact with the immediate family mediated the relationship between residential mobility and psychological well-being. Frequent moving in the past reduced the frequency of face-to-face contact with the immediate family, and in turn decreased psychological well-being. This study highlights the importance of maintaining contact with family to reduce adverse effects of mobility on psychological well-being.

S19_1 09:00-10:30	**Social Network Analysis and System Science for Social Change** *Organisers: Emily Long, Claudia Zucca, Mark McCann*

Title	**A collaboration network of a community-based action programme stimulating healthy growth and development during the first 1000 days of a child's life**
Authors	**Carline Wesdorp (VU)*; Vera de Bel (University of Turku, Netherlands Interdisciplinary Demographic Institute); Coosje Dijkstra (Vrije Universiteit Amsterdam); Wilma Waterlander (Amsterdam UMC, Universitair Medische Centra); Jaap Seidell (Vrije Universiteit Amsterdam)**
Abstract	Purpose In the last 10 to 15 years, there has been a growing public health interest in community-based whole-of-systems approaches to understand and act to prevent complex health problems, such as the risk of developing chronic non-communicable diseases (NCDs) in early life experiences. Collaboration networks are a critical element for effective development and implementation of community-based whole-of-system programmes. This study aimed to provide insight into the strength and structures of a collaboration network across community leaders, practitioners, local community members, child (health) care providers and formal and informal organizations related to the first 1000 days of life in a multi-ethnic and relatively low-income neighbourhood in Amsterdam, Netherlands. The study forms part of the Food4Smiles community-based research project that aims to stimulate healthy growth and development during the first 1000 days of a child's life, in cooperation with parents and other local stakeholders. Methods The collaboration network was mapped at baseline by assessing collaborations between people and across organizations. Participants of the collaboration network were identified based on their work activities related to the first 1000 days of life with the assistance of community members and local leaders from family and child health care services operating in the neighbourhood. Additional organizations were identified through snowball sampling. Seventy-seven participants filled out the network questionnaire in this study and described their work activities and

	professional relationships between June 2020 and June 2021 through an online survey. The collaboration network was descriptively analysed on one-mode and two-mode level and included multiple centralization scores to measure its strength and structure. Preliminary results Seventy-seven participants identified 214 actors (stakeholders) and 490 ties (relationships). We will present the collaboration network in more detail during the conference and describe how we selected the key stakeholders to be included in our community-based action programme. In short, the 214 actors worked for 91 different organizations and were categorized into 18 domains. The network density of the overall network was sparse (1.1%). We observed a core-periphery of 176 actors and 38 (18%) isolated actors who were not connected to the core-periphery. Conclusions The insights in the structures of this collaboration network enabled us to identify key stakeholders that we included in our community-based action programme. Further research is needed to study how the network structures develop over time and to identify if and how the intervention goals of community-based child (health) care programmes are accomplished.

Title	**A longitudinal Social Network Analysis of alcohol-related sexual violence**
Authors	**Kevin Swartout (Georgia State University)*; Matt Kammer-Kerwick (UT Austin); Ashlyn Swartout (Georgia State University); Amy Schaeffer (Georgia State University); Jeffrey Sternberg (University of Texas - Austin); Kara Takasaki (University of Texas - Austin); Noel Busch-Armindariz (University of Texas - Austin)**
Abstract	Sexual violence is endemic among college students: across their first year of college, 31% of women report experiencing unwanted sexual contact, verbal sexual coercion, rape, or attempted rape. At least four out of every five women who experience sexual violence report knowing the perpetrator before the incident. Additionally, college women who frequently consume alcohol are at relatively greater risk for experiencing sexual violence, and college men who frequently consume alcohol are relatively more likely to perpetrate sexual violence. Thus, alcohol use and alcohol-related contexts may facilitate college women's connections with potential perpetrators. Our presentation will explore those network processes that impact students' risk for experiencing sexual violence over five waves of longitudinal survey data collected across women's first two years in college. Data were collected from a sample of students co-habituating in the same dormitory at a large public university in the southwestern United States (n=639). Students' pre-college networks, behaviors, and experiences were assessed immediately upon matriculation; college networks, behaviors, and experiences were assessed at the end of the subsequent four semesters, respectively (Fall 2019 - Spring 2021). Sexual violence was measured using the 35-item Sexual Experiences Survey. Alcohol use was assessed using an NIH-endorsed measure of heavy episodic drinking (i.e., binge drinking), defined as how often the participant reported consuming 4 or more alcoholic drinks within a 2-hour period. The student network was assessed using a roster method at each wave based on the dorm resident list obtained from the university. Participants could select up to 10 male, 10 female, and 10 non-binary peers with whom they interacted the most during the assessment window. Across the four collegiate waves, the full analyzed network includes 614 nodes and 2,227 edges. The network density is 0.59% with an average degree of 3.63. Subsequent analyses will be conducted using the RSienna computational framework and stochastic actor-oriented models that simultaneously formulate a joint impact of peer selection and influence on network (social context) and behavior/experience (alcohol use, sexual violence). This strategy will allow us to estimate reciprocal relations between network and behavioral/experience evolution by simultaneously modeling individual-level network and behavior/experience changes aggregated at the network level. The model assumes unobserved network and behavior/experience changes between assessments and accounts for interdependence of individuals within networks. Findings from this study will inform primary, secondary, and tertiary prevention programming for campus sexual violence. These results will also contextualize the literature on alcohol use and sexual victimization, offering network-level interpretations that may reduce person-level causal explanations that tend to blame victims.

Title	**Outdoor nature-based play in Early Care and Education centers: Identifying the determinants of implementation using causal loop diagrams and social network analysis**
Authors	**Claudia Zucca (Tilburg University)*; Paul McCrorie (University of Glasgow); Avril Johnstone (University of Glasgow); Stephanie Chambers (University of Glasgow); Nai Rui Chng (University of Glasgow); Oliver Traynor (University of Glasgow); Anne Martin (University of Glasgow)**
Abstract	Young children learn through play, and nature-based play has been shown to benefit children's physical, cognitive, and social development. We applied a systems science perspective to understand the factors crucial to implementing nature-based play in Early Learning and Childcare (ELC). Using Group Model Building (GMB) with 20 participants in managerial and practitioner roles working in ELC settings across Scotland, we appraised crucial factors elicited from participants using Causal Loops Diagrams (CLD). Eleven thematic CLD emerged from the analysis. Also, we consider the forty-two elicited factors as nodes in a network with fifty-seven edges to achieve a deeper understanding of the reliability of the data collection process and

	the dynamics of the policy implementation. First, we employ exponential random graph models (ERGMs) to test whether there is an imbalance in the data collection process and whether the CLD structure represents the social process we aim to understand or the outcome of random speculation. Second, we employ centrality measures together with conditional uniform tests (CUG) to pinpoint leverage points in the network. Results show no imbalance in the data collection and the non-randomness of the CLD. Moreover, we explained the implementation process and identified five leverage points for the attention of stakeholders.

S06_1 09:00-10:30	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*

Title	**Modeling overlapping subgroups: Stochastic Actor Oriented approach**
Authors	**Stepan Zaretckii (University of Groningen)*; Christian E.G. Steglich (University of Groningen AND Linköping University); Tom A.B. Snijders (University of Groningen / University of Oxford); Marijtje van Duijn (University of Groningen)**
Abstract	Methods for community detection in social networks tend to partition actors into disjoint subgroups, which are densely connected within and sparsely between each other. The sociologically more interesting and statistically more challenging case is when actors can hold membership in several subgroups occupying a connector's position. For example, a student can have friendships that span several peer subgroups in a high school friendship network. In this study, we use the stochastic actor-oriented model (SAOM) for two-mode networks as a framework to recover unobserved overlapping subgroups. We represent affiliations of actors to subgroups as a two-mode network that follows a SAOM, where a mixed closure effect ensures that actors' unobserved affiliations align with their observed friendships. The method of moments procedure estimates model parameters that produce the desired features of the subgroup structure according to some "ideal scenarios". Simulating with these parameters allows us to recover the distribution of actors' co-affiliations with each other. The degree to which observed friendships can be understood as a mere reflection of these latent co-affiliations will be evaluated using quality criteria. To illustrate the usefulness of our approach, we infer latent subgroups in empirical friendship networks measured in more than 100 school classes in The Netherlands (Knecht, 2003/4). Next to investigating the quality of inferred subgroups, we determine whether peer effects on the subgroup level can be reliably differentiated from peer effects on the dyad level and on the class level.

Title	**Evaluating blockmodeling approaches for undirected dynamic networks with newcomers and departure nodes**
Authors	**Marjan Cugmas (Faculty of Social Sciences)*; Aleš Žiberna (University of Ljubljana)**
Abstract	The aim of ""ordinary"" one-mode blockmodeling is to find groups and ties among them in a single one-mode network, that is based on a set of ties among a single set of units that are measured only once (at one point in time). In contrast, the aim of blockmodeling dynamic networks is to find groups and ties among them in the dynamic network for each point in time, by considering the possible dependencies among the networks observed at different points in time. Considering this dependency can increase the validity of the results. Several blockmodeling approaches for analyzing dynamic networks were proposed in recent years. Many of these approaches are in the process of comprehensive evaluation (the results are not yet published), assuming the directed real-world-like networks with the same set of units at all time points. However, some blockmodeling approaches for dynamic networks (e.g., Matias and Miele 2017, Bar-Hen 2020, Žiberna 2020, Škulj and Žiberna 2021) allow considering some newcomers and departure nodes and can be applied to the undirected networks. The evaluation of these blockmodeling approaches in such circumstances will be presented. The study is based on Monte Carlo simulations, in which several factors are taken into account (including the network size, number of clusters, the share of newcomers and departure nodes, block densities), and the networks are generated by considering some local network mechanisms which makes them more similar to the real-world networks.

Title	**Reciprocity, community detection, and link prediction in dynamic networks**
Authors	**Hadiseh Safdari (Max Planck Institute for Intelligent Systems)*; Martina Contisciani (Max Planck Institute for Intelligent Systems); Caterina De Bacco (Max Planck Institute for Intelligent Systems)**
Abstract	Many real networks are dynamical, i.e., the patterns of interactions between their nodes vary over time, e.g., citation networks. As a consequence, many inference methods have been generalized to the dynamic case with the aim to model dynamic interactions. Particular interest has been devoted to extend the stochastic block model and its variant, to capture community structure as the network changes in time. While these models assume that edge formation depends entirely on the community memberships, recent work for static networks shows the importance to include additional parameters capturing structural properties, as reciprocity for instance. Remarkably, these

	models are capable of generating more realistic network representations than those that only consider community membership. To this aim, we present a probabilistic generative model with hidden variables that integrates reciprocity and communities as structural information of networks that evolve in time. The model assumes a fundamental order in observing reciprocal data, that is an edge is observed, conditional on its reciprocated edge in the past. We deploy a Markovian approach to construct the network's transition matrix between time steps. At each time step, the transition rates of appearance and disappearance of a directed edge between two nodes depend on the current community membership of the nodes, as well as on the existence of a reciprocated edge between them. The parameters' inference is performed with an Expectation-Maximization algorithm that leads to high computational efficiency because it exploits the sparsity of the dataset. We consider two varieties of our model. In one case, community membership vectors remain static over time and only the affinity matrix contains temporal information. In the other case, the affinity matrix is treated as a static parameter, similarly as the community memberships; in both cases, the reciprocity parameter and the rate of edge removal are kept static. These two scenarios enable us to thoroughly analyze the model and its performance in networks with different interaction patterns. For instance, in the case of a non-homogeneous community structure over time, the first version would be a more suitable approach, since it could capture the evolving community structures. We validate the applicability of the proposed model and its inference approach by performing experiments on real and synthetic networks for community detection and link prediction. The results on synthetic data show good performance in terms of link prediction. In addition, the analysis on real networks highlight that our model captures the reciprocity of real networks better than standard models with only community structure, while also performing well at link prediction tasks. The manuscript is available at doi.org/10.1088/2632-072X/ac52e6.

S04_3 11:00-12:30	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*

Title	**The ties that bother: Difficult relationships in older adults' personal networks**
Authors	**Lea Ellwardt (University of Cologne)*; Theo van Tilburg (VU University Amsterdam)**
Abstract	Background: Social gerontologists typically posit beneficial effects of network integration for aging well. Yet, previous evidence is largely driven by a focus on social support, strong relationships and positive ties. However, networks in older age likely also include criticizing and demanding contacts, defined as difficult ties. Although outnumbered, difficult ties are more salient and impactful than positive ties. One reason for this research gap is the scarcity of network data. Objectives: Our study addresses three research questions: First, what is the prevalence of difficult relationships in the personal network? Second, why do older adults maintain (rather than drop) difficult relationships? Third, what are potential implications of difficult relationships for mental health? Hypotheses: We expect the prevalence of difficult ties to be low overall and comparable to organizational settings. We further expect that structural as well as social-emotional constraints explain the persistence of such ties, that is difficult relationships will be more often reported in hard-to-avoid contexts (e.g., family and neighborhood), unsupportive networks and by individuals with low emotional resilience. Finally, we assume that having difficult ties constitutes a disadvantage during coping with critical life-events. Methods: We used the most recent wave of the Dutch population-based Longitudinal Aging Study Amsterdam (LASA), which contained data on social support and mental health. We supplemented the LASA data with two data collections: First, in a Side Study we assessed difficult relationships in the respondents' egocentric network, before the start of the pandemic. Second, in the COVID-19 Study we measured mental health after the first lockdown of the pandemic. Statistical analyses comprised of random intercept logit models, logistic regression models, and treatment effects-estimations with inverse-probability weights. Results: About 5% of the 4,142 relationships with network members were perceived as difficult, and 15% of the 883 study participants reported at least one difficult relationship. The probability of difficult relationships was higher for relationships with parents, contacts who provided little support, as well as networks with high turnover of network members and presence of difficult relationships between network members. Presence of difficult relationships was further associated with poor mental health, i.e., depressive symptoms and low mastery. Conclusion: Even though theories on aging have argued that people disengage from less useful relationships in old age, the prevalence of difficult ties compares to that in work life. This suggests that tie formation and maintenance are subject to circumstantial and individual constraints. The pressure to continue engaging socially with demanding others may impede some of the benefits of social integration in times of heightened need."

Title	**Ambivalent triads in the personal networks of young adults**
Authors	**Vera de Bel (University of Turku, Netherlands Interdisciplinary Demographic Institute)*; Eric Widmer (LIVES, University of Geneva)**
Abstract	How does embeddedness in triads with ambivalent ties, i.e., relationships that are simultaneously characterized by

	positive and negative valences, affect young adults' well-being? The ambivalent triad census, developed by de Bel, Snijders, and Widmer (2021), counts the frequencies of 18 non-isomorphic triads in which ties can be positive, negative, or ambivalent, and proposes linear combinations of three theoretical mechanisms (ambivalent balance, diffusion of stress, divide and conquer) predicting how embeddedness in an ambivalent triad affects individual well-being. The ambivalent triad census is developed for non-directed family networks. In this paper we investigate to what extent the ambivalent triad census can also be applied to non-directed personal networks, predicting young adults' well-being. Moreover, we study whether the predictions of the ambivalent triads on well-being differs for networks that mainly consist of family rather than non-family members (e.g., friends). The 2020 sample of the currently collected Swiss CH-X data are analyzed in which 10,000 young adults in Switzerland report about the relationships in their personal networks. Preliminary results show that embeddedness in ambivalent triads in personal networks affect well-being in the same extent as in family networks, supporting the replication hypothesis. However, young adults with family-oriented personal networks report higher proportions of ambivalent ego-alter and alter-alter dyads and the positive effect of being embedded in a higher proportion of triads exhibiting more ambivalent balance and low diffusion-of-stress is lower when the network consists of a higher proportion of family members.

Title	**Capturing the re-actualisation of ties: A biographical and formal analysis of personal networks**
Authors	**Cécile Plessard (Université Toulouse Jean Jaures)***
Abstract	The sociology of relational dynamics is concerned with understanding and exposing the way in which the social world and its different dimensions are articulated (Bidart, Degenne, and Grossetti 2011). Therefore, it seems difficult to study relational experience and its dynamics without involving the biographical approach both conceptually and methodologically. In the same way, the formalisation of links - as 'snapshots' - makes it possible to get a fine-grained illustration of the stages that characterise a life course. In this way, geographical, professional or marital ruptures will be crystallised in a recomposition or a fragmentation of the personal network. The understanding of such a recomposition - beyond the processes inherent to the specific characteristics of the network or relationships - can then be achieved through the concrete analysis of underlying biographical events; this is one of the main sources on which the persons interviewed will rely to interpret the disappearance or creation of a link. But what about relationships that weaken at a given time, fall asleep for periods of time, only to be reactivated later? How do we capture this dynamic? How can it be interpreted? To what extent can the analysis of life periods and/or biographical transitions shed light on this process of re-actualisation of ties? The data on which the work is based are part of a broader reflection on relational experience that allows us to understand relational practice (Grossetti, 2011) from a diachronic point of view and by taking into account the contexts in which it takes place. The interviews conducted were structured by the biographical framework, characterised by the various social circles of the individual. This contextualisation of experience allows the narrative to be structured not on the basis of specific dates but around cycles, stages and, more generally, significant spatio-temporal landmarks such as school, high school, university, first partner, first job, first flat, etc. Within the different contexts and their respective temporalities, we used a name generator, allowing the citation of alter, the corresponding relations and their characteristics. The data collected in this way gives rise to both a qualitative and structural analysis of the personal network. The analysis of the biographical process accounts for continuities and ruptures in the relational life of the individual. The personal networks studied will then be reconstructed at intermediate moments which are considered key from a relational and biographical point of view. These 'snapshots' thus complete the formalisation of all the links mentioned at the time of the interview. And it is through the cross-sectional analysis - formal and qualitative - of these different graphs and biographical 'cuts' that the dynamics, including the actualisation of ties, are revealed : certain relationships disappear only to reappear in the life course and events.

S13_1 11:00-12:30	**Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik*

Title	**Social-ecological fit and outcomes: a (rare) empirical assessment of a prominent hypothesis**
Authors	**Manuel Fischer (Eawag)*; Martin Huber (Eawag); Mario Angst (University of Zurich)**
Abstract	There are abundant claims that networks of collaborative governance among different types of actors involved in an issue, e.g., ecosystem management, are beneficial for many kinds of outputs and outcomes. Given that establishing and entertaining collaborative network ties is costly, the literature on social-ecological networks and social-ecological fit has argued that collaboration ties contributing to social-ecological fit are especially valuable. According to the fit hypothesis, high levels of social-ecological fit would promote sustainable ecosystem governance, good ecological states, and other "desirable" outcomes. Yet, despite many claims in this direction, there is hardly any empirical knowledge on how different levels of socio-ecological fit in governance networks influence different types of outcomes. Social-ecological fit can be operationalized through networks, most prominently in the literature dealing with social-ecological networks that rely on multi-level networks representing ecological as well as social elements. In this literature, social-ecological fit represents a situation in which different actors involved in the governance and management of linked ecological

	elements (first network level) do also collaborate (second network level). Different situations of social-ecological fit in multi-level networks can be represented by different types of network motifs. Given the importance of the argument about fit but the lack of empirical evidence on the fit hypothesis linking fit and outcomes, this paper asks: What types of network motifs representing social-ecological fit are related to different types of outcomes. In the analysis, the social level of the multi-level network is a collaboration network between different types of actors. The "ecological" level is represented by an issue network including governance issues (e.g., political support) and environmental issues (e.g., water quality). Different types of actor-issue motifs representing social-ecological fit (or misfit) in this two-level network are linked to different outcome issues. Outcome issues are characterized based on the average perceptions of all actors involved in the network. Motifs and outcomes are linked through network ties between relevant motifs representing social-ecological fit and different types of outcomes. The empirical analysis is based on interview and survey data from ten Swiss wetlands and related regional networks. Due to this comparative study design, the paper also responds to the claim in the field of social-ecological network studies for more comparative research designs. Our contribution can take into account how institutional context factors as well as relevant outcomes differ across cases.

Title	**Comparing egocentric networks to assess the impact of digital expertise and political conflict on the politicization of AI in the fields of health, finance and welfare**
Authors	**Nicole Lemke (University of Lausanne)***
Abstract	When new policy issues emerge, they compete for political attention with more established and institutionalized issues around which closed actor communities have already formed (i.e., policy subsystems). Emerging technological innovations like artificial intelligence (AI) are typical examples of such new issues entering policymaking. How new issues like AI are dealt with politically, is likely influenced by how the established actor communities in existing policy subsystems react to and politicize them. This article therefore explores the nexus between the nascent AI policy subsystem and three established policy subsystems in Germany: Health, Finance and Welfare. All three fields are directly affected by AI technologies. Yet, they differ in two characteristics that are likely to impact on their capacity to handle the issue of AI within the subsystem, i.e., to absorb it: Availability of digital expertise and conflict potential. The article therefore investigates how these two variables affect who established organizational policy actors interact with in their AI advocacy efforts by comparing egocentric networks across policy subsystems. If communication within the established policy subsystem (intra-group ties) prevails over communication with actors external to the subsystem (inter-group ties), this is considered a sign of absorption. The present article thus contributes to literature on policy subsystems by exploring the link between established policy subsystems' characteristics and nascent policy subsystem development. Moreover, whether or not established subsystems absorb the issue of AI could have substantial impacts on the integration of certain aspects of the issue into policies as well as the coherence of said policies. Clarifying how actors in established communities handle the issue of AI can therefore also contribute to understanding the way policymaking on AI develops, including the capacity of the State to manage AI policy.

S06_2 11:00-12:30	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*

Title	**What influences interaction in group work in elementary classrooms? An exploratory study using dynamic network actor models**
Authors	**Tomas Lintner (Masaryk University)***
Abstract	Group work in elementary classrooms plays an important role in pupils' both learning and socializing processes. Based on the sociocultural theory of Vygotsky, group work allows pupils to learn through collaborative dialogues by internalizing gained knowledge in social settings. However, students do not benefit from group work equally. Some students actively participate in group work more while some struggle to participate at all and are sometimes not included in any interaction with the rest of the group whatsoever. Previous research has shown a negative relationship between the lack of individual student's participation and their academic performance. It is therefore crucial to understand what enters interaction processes during group work at schools. This research will aim to investigate interaction in group work in elementary classrooms using dynamic network actor models (DyNAMs) and address the question what influences interaction in group work in elementary classrooms. The study will be based on around twenty group work lesson recordings – each containing several pupil groups of four to six – from Czech elementary classrooms allowing time-stamped and fine-grained network analysis. Several student-level variables including gender, SES, and friendship relations will be included. The DyNAMs grasp interaction in the form of temporal and relational network data aiming to incorporate both larger social context and personal preferences and attributes. The resulting models will be aggregated and will provide an insight into why some students interact with others during group work while others do not with a focus on influence of student friendship relations, student characteristics, and structural effects.

Title	**Stochastic Actor-oriented Models for Different Group Sizes**
Authors	**Tom A.B. Snijders (University of Groningen / University of Oxford)***

Abstract	The comparison between different group sizes (i.e., number of actors in the network) of values of parameters in the Stochastic Actor-oriented Model (SAOM) is known to be questionable. The same holds for the Exponential Random Graph Model (ERGM). For the latter class of models, offsets depending on log group size have been proposed, with the aim to make parameter values better comparable between networks with different group sizes. This presentation proposes offsets for Stochastic Actor-oriented Models, aiming at comparability of results for different group sizes. Because of the longitudinal nature, these are of a somewhat different kind than the offsets proposed for ERGMs. Comparisons are presented to exhibit how well these offsets meet their purpose. These are for group sizes ranging from 30 to 1000.

Title	**Change detection in dynamic networks using flexible multivariate control charts**
Authors	**Jonathan Flossdorf (TU Dortmund University)*; Carsten Jentsch (TU Dortmund University)**
Abstract	We focus on dynamic networks, i.e. temporal graphs that may evolve over time. The identification of differences in the resulting sequence of networks between various time points is an important task for various application fields and involves statistical procedures like two-sample tests or change-point detection. Due to the rather complex nature of temporal graphs, the statistical analysis is challenging which is why the complexity is typically reduced to a metric or some sort of a model. Whereas model-based approaches require the fulfilment of restrictive assumptions on the network dynamics that are rather unrealistic for the highly dynamic nature of social processes (e.g. fixed node set), approaches based on the characterization of the network by one or few scalar-valued metrics at each time point can be applied ad-hoc. However, as the reduction to such metrics can result in a heavy information loss, the understanding of their behaviour in various change scenarios is crucial. To this purpose, we firstly propose a categorization of different types of changes, which can occur in dynamic network data. We analyze the suitability and limitations of common network metrics in such situations with respect to their mathematical properties and give comprehensive explanations of their behaviour. This leads to a well-founded advice of which metrics to use in various application scenarios. Based on this foundation, we secondly develop an online monitoring approach usable for flexible network structures and able to handle various types of changes. It uses a sound choice of a set of the analyzed network metrics that are jointly monitored in a suitable multivariate control chart scheme, which performs superior to a univariate analysis and enables both parametric and non-parametric usage. The user benefits from a handy interpretation of the structural reasons for the detected changes, which is a crucial advantage in the rather complex field of dynamic networks, particularly for the high dynamics in social processes. All our findings are supported by extensive simulation studies and real-world examples with a particular focus on social networks.

S18_1 13:30-15:00	**Social Network Analysis and International Business** *Organisers: Kim Bui, Pi-Chi Chen, Bruce Cronin, Lena Langosch*

Title	**Guanxi networks within the Chinese exhibition industry: the impact of internationalisation**
Authors	**Yehui Hu (University of Greenwich)***
Abstract	In China, the surrounding social structures are often nepotistic in nature, therefore Guanxi has been seen as a very important strategy in China business networks. However, due to the growing market economy and China market transition (due economic liberalization), the traditional business network in China is becoming exposed to international business practices. China has becoming one of the top three exhibition destinations around world. How do Guanxi networks differ with international exposure? How has Guanxi influenced Chinese exhibition industry? To address these questions, data on Guanxi networks have been generated and analysed through social network analysis and qualitative analysis. This includes an analysis of the closure, structural holes, brokerage and small- world features of the Guanxi network in the exhibition industry. A Guanxi network structure model has been tested, which based on the level of network brokerage and different degrees of internationalisation. It shows the Guanxi network structure differs with different degrees of internationalisation within the Chinese exhibition industry.

Title	**The application of ego-centric networks in the impact of 'guanxi' on Chinese OFDI in the UK**
Authors	**Feng Zhang (University of Greenwich)***
Abstract	This paper systematically examines the impact of guanxi on Chinese outward foreign direct investment (OFDI) in the United Kingdom (UK) at the individual manager-levels. We test different hypotheses that Chinese firms with managers in the UK who have greater guanxi forms (ganqing, jiaoqing, renqing, mianzi, xinyong) are likely to be more or less effective operators in the UK business environment. This study uses quantitative data that were collected from a sample of 69 Chinese managers at 22 Chinese subsidiaries in the UK, while undertaking ego-centric network and econometric analysis. It can be found that mianzi and renqing are positively associated with Chinese OFDI in the UK, whereas other forms of guanxi are not. These results also imply that the reputation and social position of these Chinese managers influence their parent companies' OFDI levels towards the UK. High levels of renqing are possibly associated with lower levels of OFDI because this is being expended to build mianzi, the main guanxi driver of OFDI. Conversely, high levels of OFDI are associated with lower levels of renqing because this form of guanxi is not required at this time. Additionally, jiaoqing is significantly correlated with the structural hole measures of density and efficiency, ganqing with hierarchy, and xinyong with constraint, the structural hole measures were independently

	regressed. No direct association was found, and the fit was poor. It is therefore unlikely that the structural hole effects decreased the effects of jiaoqing, ganqing and xinyong.

Title	**Huawei's battle with influence networks in the UK**
Authors	**Bruce Cronin (University of Greenwich)*; Francisca Da Gama (University of Greenwich); Kim Bui (University of Greenwich)**
Abstract	In 2017 China-based telecom company Huawei became the world's leading producer of 5G base station infrastructure with deals with 45 national operators, including BT in the UK. Conservative Prime Minister David Cameron had welcomed Huawei's £1.5 billion investment in the UK in 2012 as confirmation that "we have a leading role in the telecoms and mobile industries, and it thinks that this is a Government who are open to business." But in May 2019, amidst an escalating trade dispute with China over alleged unfair competition, the US Government banned US companies using telecom equipment from Huawei or supplying components to it. Presenting this as a national security issue, the US began lobbying other governments to follow them, threatening termination of intelligence sharing otherwise. Initially few governments shared the US concerns, with French, German and UK officials arguing any security risks were containable. An April 2019 review by the UK National Security Council authorised Huawei's continued participation in the UK's 5G network. However, in July 2020 the UK government announced that Huawei would be completely removed from the UK 5G network by 2027. This paper examines the abrupt volte face by the UK Conservative Government in little over a year. It considers the changing themes in official and media discourse relating to Huawei from its first arrival in the UK through the rapid change in assessment 2019-20. It has long been established that overseas based firms need to carefully manage their relationships with governments and other non-market players when operating in foreign markets. But this generally focuses on government relations activity. However, the speed of the change in government policy in this case, suggests that traditional approaches to managing the non-market environment may be insufficient. The paper explores the interaction of wider set of actors in this case than are normally considered in firms' non-market strategies, a network of influencers on the edge of UK government policy making. Using social network analytic techniques, including Relational Event Modelling, we map the changing assessment of Huawei in the UK as expressed in news media reporting and commentary and parliamentary debates during the period. We examine the way increasingly negative assessments of Huawei spread through the influence network and into government and how various themes emerged and receded. We identify key influencers and events in the process, finding this involved a more complex interplay of actors and motives than a simple response to US lobbying.

S04_4 13:30-15:00	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*

Title	**Social support networks of trough life histories: transitions and dynamics of the networks until retirement**
Authors	**Francisca Ortiz (Millennium Institute for Care Research (MICARE), Santiago, Chile.)***
Abstract	In general, the literature about social support networks (SSNs) has been divided into two different statements: On the one hand, social support is a safety net that helps the ego confront disadvantages in life. On the other hand, studies have shown how SSNs could act as sources of constraints for ego, especially in poverty. In this study, we looked into the SSNs of older people over time and found how those two paths co-exist and depend on the socioeconomic status of ego. This research aims to discover how cumulative social inequalities intersect with social networks in facilitating or hampering social support over time, impacting retirement experience. Specifically, we want to observe how the transitions between one and another events of older people's lives change their social support networks, in terms of structure and composition. This study was a mixed-method project that collected qualitative life history interviews from 30 older women and men in Santiago, Chile. The results show that socioeconomic status plays a role in shaping individual experiences of retirement but that these experiences are shaped through SSNs structural and compositional characteristics. People identify salient life events and the relevant networks and conjointly discuss supportive and/or exploitative aspects of their networks. The amount of support they give to others or that they receive from their alters accumulates over time, resulting in a progressive social inclusion or exclusion mechanism.

Title	**Distant social contacts, distant social identities? A social network approach to national identity and well-being of binational youth in Switzerland**
Authors	**Anahita Mehrpour (University of Lausanne)*; Paul Schuler (University of Edinburgh)**
Abstract	Transition to adulthood entails both gradual and abrupt changes in social identities. This includes changes in salience, function, or strength of social identities and groups that individuals are attached to. Dual identities bring about greater complexity and regulatory mechanisms in social identities which in turn affect well-being intricately. To address this complexity, we adopt an interdisciplinary approach to social identities and spatial personal networks of the individuals where the interrelation between the transnationality of personal networks of young adults with dual citizenship and the functionality of their social identities determine their subjective well-being. We analyze the 2020 subsample of a cross-sectional survey of young adults (age range 15-30) recruited in the Swiss Army and Civil Participation Program (n=3344; 13.7% female and 86.3% male) in the framework of the Swiss Federal

	Survey of Young Adults (CHX-YASS). The questionnaires were administered either in-person or through an online survey. In a personal network design, we calculate indices regarding network size, density, and composition, including geographical information using the igraph package in R. We calculate social identification scores using questions regarding identification with social groups (national and second nationality groups). Furthermore, we measure cognitive evaluation of subjective well-being using a single item. We argue that the highly pronounced transnationality of personal networks of young adults with dual citizenship may indicate a potential vulnerability in the identification with their first nationality. A high share of long-distance transnational ties in combination with a low 'in-country' density of their personal networks could mitigate the positive effects of national identity on their well-being. Accordingly, we test alternative models to elucidate the potential associations between network indices and social identification. Our study will contribute to the emerging interdisciplinary approach concerning the social determinants of well-being. Taking into account the spatial networks of individuals, as the meso-level of analysis sheds light on the overlooked complex effects of social identities on well-being.

Title	**The role of past and current personal networks in social support to individual**
Authors	**Vida Česnuitytė (Mykolas Romeris University)***
Abstract	The aim of the research is to explore interrelation between personal network and support to individual. The main research questions are the following: in case of need and social risk, how personal networks interrelate with support to individuals by their socio-demographic characteristics? How personal networks that individual had in childhood influence social support in adulthood? The research hypotheses formulated: H1: socio-demographic characteristics of individual determine personal social network ready for support in case of need and social risk; H2: personal networks that individual had in childhood influence behaviour concerning of social support in adulthood. Research methodology: For the fulfillment of the research aim and test of the hypotheses, empirical data of the research project "Reasons, Extent and Methodology of Identification of Non-Receipt of Social Assistance Benefits in Lithuanian Municipalities and Nationwide – NON-TAKE-UP" (Contract No. S-REP-21-6) used. The project was implemented in 2021 at Mykolas Romeris University, and funded by the Research Council of Lithuania. The project focuses on monetary and non-monetary social support provided as by the state, as by the personal networks. The quantitative survey questionnaire include questions on needs for social support, personal networks that is able to provide it in case of need, and that already provided support. Empirical data represent adult population (18+ years) of Lithuania (N=1015). The research results revealed that individuals who evaluate own life quality as very poor or poor, usually, have a narrower personal network ready to provide social support with less family members in it, and in opposite, those who evaluate own life quality as very good or good, have larger personal network ready to support in case of need and social risk. It was also found that need of social support, and it's provision interrelated to the structure of household, especially – to the number of unemployed adults in the household. But the most important finding is the correlation between the personal network that adults had in childhood and the behaviour related to social support. Particularly, those which personal networks in their childhood lived from the state social support, in the adulthood, likely, also will rely on the state social support. Meanwhile, those which personal networks in their childhood have no need for social support, likely, will try avoid state social support even in need or social risk. Instead, these individuals will rely on themselves or members of personal network.

S13_2 13:30-15:00	**Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik*

Title	**For all the right reasons: using network entailment models to examine UK support for military intervention**
Authors	**Lorien Jasny (University of Exeter)***
Abstract	How do the motivations to support the use of armed force in times of conflict affect the outlooks of those well-versed in security matters? Do those who support use of national troops out of concern with national interests display similar thought processes? What about those who perceive a nation should intervene militarily out of a moral obligation to act? Questions such as these are tricky to tackle, and the field of international relations has typically attempted to address such issues using qualitative methods such as in-depth interviews. In this exploratory paper, we analyse the first-ever national survey of security elites in the United Kingdom (UK) to help examine these issues from a networks perspective. Using entailment models, we search for shared network structures in terms of what threats are considered critical and what foreign policy goals should prevail among future military commanders, staff officers, and security experts who support military intervention.

Title	**Networks and participation in cultural associations**
Authors	**Mario Diani (University of Trento)***
Abstract	Social movement theorists have devoted substantial attention to the role of network ties as facilitators of participation in collective action. This paper explores the extension of network concepts to instances of participation

	in voluntary collective action on non contentious issues. Evidence comes from a survey of over 1,000 members of brass bands in the Italian region of Trentino.

S06_3 13:30-15:00	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*

Title	**Modeling social network evolution over time using Graph Neural Networks to detect polarisation**
Authors	**Victor Chomel (CNRS)*; Maziyar Panahi (CNRS); David Chavalarias (CNRS)**
Abstract	Social networks, and in particular Twitter, allow collecting a set of digital traces in real time such as mentions, comments or retweets. From these interactions, a graph can be constructed with the users as nodes and the predefined interactions as links. Social evolutions such as polarization can be understood through networks structural evolution over time. To measure and to understand these transformations, we have developed a geometry-based approach. Graphs are represented with node embeddings using spring layouts or Graph Neural Networks and graph alignment is used to keep track of nodes at different time steps. Changes in the latent space between timesteps are represented as a speed vector field and properties of the latent space can be identified and linked to social evolutions. Communities are at the heart of the propagation of information and therefore of misinformation. They channel the propagation of information online. The appearance and disappearance of communities allows us to understand the games of influence between narratives in a debate. Focusing on the borders that lies between communities thus enables us to study the evolution of narratives over time. Using a Twitter dataset of more than 300 million tweets on the French political landscape over six years and a dataset of more than 100 million tweets on the climate change debate over three years, a long-term reconstruction of latent spaces has been computed. It allowed us to understand the construction of opinions, such as climate skepticism or vaccine hesitancy, in a unique way. These informational landscapes change organically with the natural evolution of the network, but also under the impact of exogenous shocks. Modeling the stability of online communities allows us to understand more fundamental issues such as the emergence of social movements or the polarization of a political landscape, but also to detect sources of these evolutions such as disinformation. A few cases of localized disinformation campaigns have been found using this method.

Title	**Too many networks, outcomes, and time-points: Network modelling of support and fighting, mood, self-harm, drinking, productivity etc. in shared houses during lockdown**
Authors	**Per ER Block (Oxford)***
Abstract	A substantial proportion of young adults live in shared houses with non-kin (flat-shares or house-shares of students or young workers). During the COVID-lockdowns, these groups were forced to limit their in-person socialisation to others within their household. Twice a day, we collected network data of positive and negative interactions of seven of such households over two weeks each, as well as daily data of a host of individual outcomes of the house-sharers. We use this data to improve our understanding of interactions within small groups, in particular focussing on social influence dynamics of various individual outcomes. A substantial part of the paper is about the methodological challenges of specifying models for such high-dimensional data.

Title	**Exponential Random Graph Models for dynamic signed networks: An application to international politics**
Authors	**Cornelius Fritz (LMU Munich)*; Marius Mehrl (LMU Munich); Paul Thurner (LMU Munich); Göran Kauermann (LMU Munich)**
Abstract	Substantive research in the social sciences regularly investigates so-called signed networks, where edges between actors are either positive or negative. For instance, relations between countries can be positive, mirrored by regular cooperation, or negative expressed by conflicts. Similarly, individuals may relate to each other as friends or foes. Due to the emergence of structural balance theory as one of the first network theories, signed networks are also among the most frequently studied matters in social network analysis. While the theorization and description of signed networks have made significant progress, the inferential study of tie formation within them remains limited in the absence of appropriate statistical models. In this paper we fill this gap by proposing the Signed Exponential Random Graph Model (SERGM), extending the well-known Exponential Random Graph Model (ERGM) to networks where ties are not existent or non-existent but negative or positive if a tie exists. Since most networks are more naturally perceived as dynamically evolving systems, we specify the model for both cross-sectional and dynamic networks. With structural hypotheses implied by structural balance theory in mind, we formulate interpretable signed network statistics, capturing dynamics such as "the enemy of my enemy is my friend". In an application, we use the SERGM to analyze cooperation and conflict between countries within the international state system.

Title	**Modeling the dynamics of network perceptions**
Authors	**Nynke Niezink (Carnegie Mellon University)***
Abstract	Studies of network dynamics often rely on longitudinal complete social network data. Current models for such data assume individuals make network decisions - creating and dissolving ties - based on a shared understanding of what

	the network looks like. However, as has been observed consistently in work on network perception accuracy, individuals perceive and cognitively represent the networks they are embedded in differently. To understand differences in perceptions, and how perceptions drive (network) behavior, we need to explicitly model network perception data (or cognitive social structure data), as can be captured in a three-dimensional (perceiver-sender-receiver) array. I will discuss the state of the art in network perception modeling, present a stochastic actor-oriented model analysis of the dynamics of the perceived friendship network ties among twenty undergraduate students in a six-week summer program, and discuss potential extensions.

15:30-17:00	**Social Network Analysis and International Business** *Organisers: Kim Bui, Pi-Chi Chen, Bruce Cronin, Lena Langosch*

Title	**Community relations and political ties for operational licenses in international business: A social network analysis**
Authors	**Shuna Shu Ham Ho (Dalhousie University)***
Abstract	Corporate political activity (CPA) and corporate social responsibility (CSR) are two main nonmarket strategies for managing socio-political environment in international business. On one hand, CPA strengthens the political ties of a multinational corporation (MNC) attempting to alter governmental policies in ways that are advantageous to obtaining a legal license to operate (LL). On the other hand, CSR supports an MNC to show that it is meeting its obligations and behaving in a manner acceptable to a community, which in return, will grant the MNC a social license to operate (SL). Prior literature has revealed that an SL represents a trust-based relation between a community and a corporation. The literature has, however, overlooked the interaction between SL and CPA, which manifest community relations and political ties respectively, regarding the obtainment of LL. Using deliberative democracy theory, this paper examines the conditions under which community relations and political ties increase or decrease an MNC's difficulty in obtaining LL. Deliberative democracy enables local communities in society to engage in public discourses for establishing a common ground concerning government policies and regulations. Although government agencies addressing community interests may consider whether a corporation has received an SL by satisfying a local community before an LL is granted, an SL is biased towards a focal community as opposed to communities in society at large. Hence, it is likely that a corporation can obtain LL, when it has already attained SL from a diversity of communities in society. Meanwhile, deliberative democracy embraces political equality in society. As CPA, in contrast, allows part of society, specifically stockholders, to disproportionately engage in political processes, it may not be deemed acceptable to society at large. In other words, CPA may be antithetical to a society-wide SL, which is required for LL. This paper operationalizes SL and CPA as community relations and political ties through a social network analysis on a unique sample of MNCs in the global mining industry, where the concept of SL is originated. Specifically, the strength of community relations is measured based on the level of trust and is weighted by degree and inverted closeness centralities to address the number of local communities in which an MNC operates across geographic space. The strength of political ties is measured as degree centrality of political appointments associated with an MNC. News articles are used as data for identifying the trust-based relations between communities and the sampled MNCs as well as the political appointments associated with the MNCs, where the level of trust in a community-MNC relation is quantified through sentiment and emotion analysis. Geographic distances are taken into account for the dispersion of local communities.
Title	**International business within and cross-continent: A case study of Social Network Analysis in the European Union and America**
Authors	**Jurema Luzia Luzia Ribeiro Pereira (ICAP Costa Rica)***
Abstract	I. Context and problem: this study has as purpose to construct and to analyse the social network between The Europe Union (EU) and America (1.North: 1.1 United States of America; 1.2 Canada; 1.3 Mexico; 2. Central: countries of the Central America Integration System / Sistema de Integración Centroamericano (SICA): 1. Costa Rica, 2.Panama., 3.Dominican Republic ,4. Guatemala, 5. El Salvador, 6. Honduras, 7. Belize, 8. Nicaragua) and 3. South: the South America Common Market / Mercado Común Sur Americano (Mercosur): Brazil, Argentina, Uruguay, Paraguay, and its partners Chile, Colombia and Peru); and the above American countries among each themselves. II. Object: the Policy Trade approved by the parliaments (the European Parliament; the North Americans of the citted countries; the Central American Parliament / Parlamento Centro Americano (Parlacentro); and the Sourth American Parliament / Parlamento Sur Americano (Parlasur). III. Theoretical framework: Policy trade; Social network analysis (SNA); Parliament policy IV. Research questions: 1. The commercial interactions of the American countries whitin themselves will be smaller or larger than each one (country or economic block) with the Europe Union, reflecting the choices of the national / multinational parliaments and governments? V. Sample / Data collection: The Free trade agreements (FTA) resulted by the policy trade. VI. Methodology; nature of the research ;data treatment and analysis: Multiple study case; empirical qualitative and quantitative approach of secoundary data (official documents available in the web); data treatment and analysis with the UCINET Software. VII. Proponent profile: the author is a policy maker in Brazil; she finishes a doctorate at the School of Government of

	the Central American Integration System; was a Professor at the University of Costa Rica; was a Trade Supervisor Global Operation (TSGO) Brazil Sub Region Manager in an international enterprise placed in free zone / industrial park in Costa Rica; acted as former Consultant of the Inter-American Development Bank (IADB) in Brasília; is graduated of pionner training course promoted by the Ministry of Foreign Affairs of Brazil for to train the personnel to be expert in cooperation in the area of the Common Market of the South "Mercosur"; and she is a researcher on the Foreign Direct Investment (FDI) movements, competitiveness of National States and at the subnational level, policy cycle and civil society.

Title	**Measuring the Spaghetti Bowl of Regional Integration**
Authors	**Justine MT Miller (Ghent University and United Nations University Institute on Comparative Regional Integration Studies)***
Abstract	The continuous increase in trade and integration agreements since WWII has given rise to a complex tangle of international trade policies. These agreements often overlap, both in their membership and content. This complicated situation, often referred to as the global Spaghetti Bowl (SB), leads to inconsistencies in trade policies. Overall, the SB lowers the gains from trade agreements and may even impede multilateralism. Research has yet to provide a holistic picture of the SB despite these critical implications. The literature also lacks a detailed evaluation of the impact of the SB on trade flows or how individual actors contribute to it. In this article, we use network analysis tools to estimate the degree of entanglement within the SB. We also study its evolution over time and the contribution of individual agreements or organisations.

S04_5 15:30-17:00	**Family Networks and Personal Networks through the Life-course** *Organisers: Vera de Bel, Thomas Leopold, Marlène Sapin, Eric Widmer*

Title	**The impact of friendship structures on marital quality of heterosexual couples**
Authors	**Julia Sauter (University of Geneva)*; Olga Ganjour (University of Geneva); Rita Gouveia (University of Lisbon); Eric Widmer (University of Geneva)**
Abstract	In this research, we consider how various structural aspects of friendship networks relate to marital quality according to gender. To investigate this issue, we draw on data from a large longitudinal survey on marital functioning based on 903 heterosexual couples living in Switzerland. Using reports from male and female partners, we explore the extent to which joint contacts, transitivity, and overlap in friendship structures affect various indicators of marital quality for husbands and wives in the long run. Our results indicate that separate, low transitive friendship networks affect marital quality negatively for women, but not for men. We also discuss the importance of the results for understanding the dynamics of heterosexual couples within larger relational contexts beyond dyadic interactions, as well as the relevance of separately analyzing husbands' and wives' marital dynamics.

Title	**Changes in formal social participation and their effects on friend ties in old age: Evidence from the Survey of Health, Ageing and Retirement in Europe (SHARE)**
Authors	**Jing-Yi Wang (University of Edinburgh)***
Abstract	One of foci in the gerontological research is to understand what factors relate to older people's social connectedness, as this is closely related to their segregation in societies. Recent longitudinal studies showed that in old age, instead of network shrinkage, older people experience network turnover over time and tend to report network size growth. Formal social participation such as voluntary organization, religious and other types of communities provide social environments to expand older people's social contacts and reorganize their social life. This study investigates whether formal social participation impacts older people's social integration as well as age integration, using two consecutive waves of egocentric network data in Europe. Besides the total friend number change across waves, we examine whether changes in the number of social activities (including voluntary or charity work, an educational or training course; sport, social or other kind of clubs and political or community-related organizations) people join over time would relate to two types of network change separately: loss of old friends and addition of new friends. Subsequently, we consider to what extent changes in social participation is related to the presence of new friends of same and different cohorts. Using the Survey of Health, Ageing and Retirement in Europe (SHARE) wave 6 and wave 8 core network data, which were collected in year 2014-15 and 2019-2020 respectively, we analyse respondents who report at least a friend at either wave. The results show that, despite there is no significant association between social participation and friend number change on the surface, compared to people who did not take part in any social activities in both waves, those who engaged in the same number or more activities in the later time point were more likely to report new friends. We also find that social participation is only positively associated with the addition of friends who are of the same cohort or of older cohorts, but not with younger cohorts. On the other hand, changes in social participation are not significantly related to loss of old friend in the later time point, which shows that while people might cultivate new friendships through these social activities, they did not drop old friends in the same period. Decreasing social participation did not lead to lose friends either. The findings

	underscore the importance of social participation in staying socially connected. The fact that social participation only partially fosters age integration might reflect the majority of participants tend to be in their old age.

Title	**Women's and men's partnership trajectories are differently associated with wellbeing in older age – Findings from Finland**
Authors	**Elisa Tambellini (NetResilience)*; Anna Rotkirch (Vaestoliitto); Miika Maki (Vaestoliitto); Mirkka Danielsbacka (Vaestoliitto)**
Abstract	A lifelong union is known to benefit health and resilience at older age for both men and women. However, only a few studies have adopted a holistic approach to partnership histories over the life course and explored their associations with well-being in later-life. In this article, we investigate how union trajectories (consisting of states entered via the formation or dissolution of cohabitation and marriage) are associated with life satisfaction (used as an indicator for subjective well-being) and the CASP index (used as a quality-of-life indicator), adopting a life-course perspective. The focus is on Finnish older adults (60+), using data from SHARE, SHARELIFE and the Finnish drop-off questionnaires. Based on previous studies we predict that a continuous union will relate to higher wellbeing, and that absent or fractured partnership histories will have worse effects on men than on women. So, the first aim of this study is to describe partnership situations over the life course of men and women born in Finland. Specifically, the idea is to identify types of trajectories from ages 20 to 60, applying the methods of sequence analysis and cluster analysis. To construct the trajectories, we consider five states based on civil status: ""single, "partnered"", "divorced/separated", "re-partnered", and "widow". The second aim is to investigate whether certain types of trajectories are associated with the two selected indicators, using linear regression models. In this case, we separate models by sex to account for gender differences. Preliminary results present five groups of marital trajectories, named: "1-Early continuous partnership"; "2-First union dissolution and re-partnership"; "3-Late continuous partnership"; "4-Union dissolution" and "5-Never partnered". The presence of men and women is equally distributed in clusters 2 and 5, while women prevail in clusters 1 and 4, and cluster 3 is male-dominated. As expected, there were no significant differences between those in a continuous partnership (clusters 1 and 4) for either of the two studied outcomes. Regarding the association between trajectories and the CASP index for men, cluster 2 "Re-partnership" and 5 "Never partnered" show a lower level of quality of life compared to the reference group of early and continuous partnership. Regarding subjective wellbeing, cluster 2 "Re-partnership" presents a significantly lower level of life satisfaction, again compared to the reference category. Concerning women's results, those who belong to clusters 4 "Union dissolution" and 5 "Never partnered" scored lower on the CASP index, while only women belonging to cluster 4 "Union dissolution" had a lower level of life satisfaction. In other words, lower life satisfaction and quality of life among Finns aged 60+ was found among single and re-partnered men, and among single and divorced women. We discuss these results in the light of gender differences in relationship- satisfaction among re-partnered respondents.

Title	**The evolution of networks and homophily**
Authors	**Stephen M Nei (University of Exeter)*; Matthew Jackson (Stanford University); Erik Snowberg (University of British Columbia); Leeat Yariv (Princeton University)**
Abstract	We examine friendships and study partnerships among university students over several years using a panel survey of nearly all students at a US university. The nature of our data allows us to document how the networks of college students evolve throughout their time at university. The density of connections, as well as the strong ethnic and gender homophily we observe, increase over time. This homophily exhibits partial persistence over time, with an individual who is homophilious in one survey wave likely to be homophilious in later waves. We also consider homophily over homophily by comparing the empirical network to a random draw from a modified configuration model, finding assortativity in homophily compared to the set of networks that respect the number and gender or ethnicity of each individual's friends. Using a large set of incentivized behavioral elicitations, we find weaker but still significant homophily over malleable traits---over risk preferences, altruism, sleep, video game playing, GPA, etc.---that emerges with a delay and with limited evidence of assimilation of behaviors. We also document the impact of network connections on changes in GPA. GPA gains are most pronounced across connected students who are both female or of different ethnicities.

S13_3 15:30-17:00	**Political Networks** *Organisers: Dimitris Christopoulos, Manuel Fischer, Christina Prell, James Hollway, Petr Ocelik*

Title	**The National Network of U.S. State Legislators on Twitter**
Authors	**Ishita Gopal (Pennsylvania State University); Taegyoon Kim (Pennsylvania State University); Nitheesha Nakka (Pennsylvania State University); Bruce A Desmarais (Pennsylvania State University)***
Abstract	Networks among legislators have been found to shape politics and policymaking within legislative institutions. In past work, the ties between legislators have been defined on those who serve in the same legislature or chamber. Online information networks, which have been found to play important roles in legislative communication at the national

	level, are not bounded by individual legislative bodies. Indeed, networks of online interaction are unique in that we can observe ties across legislatures. We collect original data for over four thousand U.S. state legislators and study patterns of connection among them on Twitter. The results help us to better understand what motivates online tie formation, and how these patterns differ for within and across-state ties. We look at three types of Twitter networks---follower, retweets and mentions. We describe these networks, and estimate the relationships between ties and six classes of variables---party affiliation, state, chamber, gender, race, and legislative professionalism. We find that networks are organized largely along geographic and partisan lines; and that legislators are more likely to tie to other legislators of the same gender and race. In each network, we find that cross-state ties are wired differently than within-state ties.

Title	**"They will not replace us": conspiratorial othering in nativist networks**
Authors	**Hugo Leal (University of Cambridge)***
Abstract	This paper introduces the concept of "conspiratorial othering" and demonstrates its role in the diffusion of what I call "nativist networks". I used conspiratorial narratives about migrants, in particular the idea that "the West" is endangered by an ongoing process of Islamisation (Great Replacement Theory), to trace the evolution and interactive dynamics of nativist networks that, it is argued, have been encroaching and internationalising through a process of conspiratorial othering. The conviction that the West faces an existential threat from "others", racialised others, is at the centre of a wave of nativist, far-right politics. As the often-viral narratives go, the "other" is presented as one singular entity with unity of purpose and action. The conspiratorial claim being "they", the racialised religious, social and ethnic minorities, have a plan to replace "us", the native, white majority. Although othering and even conspiratorial framing have been identified as nativist traits, the way these two operative mechanisms influence each other and contribute to the diffusion of broader nativist ideologies is seldom studied, particularly outside the scope of North American geography and politics. The paper departs from the analysis of two original cross-national surveys (9 countries) focusing on popular beliefs in migrant-related conspiracy theories and online news consumption to establish the existence of an observed "real-world" association between political affiliation and migrant-related conspiracy theories, namely the "Great Replacement". We analyse the offline-online relationship by hypothesising that (H1) online behaviours might mediate the relationship between beliefs (e.g. believing in the Great Replacement Theory) and belongings (e.g. being affiliated with nativist networks). To further explore this relationship, I set out to test whether there is an instrumental relation between conspiratorial othering and nativism detectable in their online network dynamics, positions and roles (H2). This was performed through an analysis of the online manifestation of conspiratorial othering across three quasi-monopolistic social media platforms, Facebook, Twitter and YouTube, between 1 November 2014 and 30 November 2016. Methodologically, by looking at how the researched viral narrative plays out in different online networking spaces, I also intend to promote the practice of cross-platform methods and studies (Rogers, 2017) and avoid a well-documented over-reliance on "easy data" (Burgess & Bruns, 2015). I conclude that "conspiratorial Othering" is a central shared element in the repertoire of action of growingly internationalised, multilingual and multinational, nativist networks.

Title	**Structural balance in international relations: Evidence from a new statistical model**
Authors	**Marius Mehrl (LMU Munich)*; Cornelius Fritz (LMU Munich)**
Abstract	Albeit introduced more than 60 years ago, structural balance theory remains of substantive interest to scholars of international relations. The discussion on whether cooperative and conflictuous relations between countries are balanced continues, stoked by two factors. First, anecdotal evidence suggests that when one interstate dyad becomes hostile, other states quickly adjust their relations to the newly warring countries. Most recently, this has been visible in European countries' reactions to the Russian invasion of Ukraine, with numerous previously pro-Russian states aiding Ukraine while sanctioning Russia. But second, prominent studies on the topic have produced inconsistent findings, with some concluding that interstate relations are regularly imbalanced. We argue that these contradictory results are partially due to a methodological weakness in these previous studies: they seek to test a network theory, but assume dyadic conditional independence to do so. This is inappropriate for at least two reasons. First, existing studies that focus on either positive relations between states (alliances) or negative ones (militarized interstate disputes) recognize that observations are interdependent, that this interdependence is substantively interesting, and that it needs to be accounted for. Logically, the same holds when we conceptualize international relations as a signed network with the goal to jointly study positive and negative relations. Second, assuming dyadic conditional independence means that the expectations of structural balance theory, e.g. "the enemy of my enemy is my friend", must be operationalized as exogenous variables. In particular, previous studies combine observations of triangles at t and t−1 to capture structural (im-)balance at t, which can produce erroneous results, detecting imbalance when triangles at t and t−1 differ but are both balanced. We take this as motivation to study structural balance in international relations by employing the recently developed Signed Exponential Random Graph Model (SERGM) as well as more than 100 years of data capturing alliances and conflict in the international state system. The SERGM allows modeling dynamic signed networks and is thus well-

	suited for the task at hand. At the same time, we extend the SERGM to address several unique challenges posed by these data. We incorporate an offset term to capture changes in the composition of the countries present in the network, allow covariate effects to smoothly vary over time as the state system shifted from multi- to bi- and then unipolarity over the course of the 20th century, and alter the estimation method to apply the model to larger and more networks.

S06_4 15:30-17:00	**Modeling Network Dynamics** *Organisers: Nynke Niezink, Robert W Krause*

Title	**A matter of time: Simulating network interventions in relational event networks**
Authors	**Rumana Lakdawala (Tilburg University)*; Joris Mulder (Tilburg University); Roger Leenders (Tilburg University)**
Abstract	Interaction Interventions involve the use of social network data to bring about a behavioural change or to influence social dynamics in a network towards desirable outcomes. Knowledge about the mechanisms that drive social interactions in a network can inform intervention strategies and influence the success of intervention attempts. To predict the effects of interventions on network dynamics, temporal information must be taken into consideration. For instance, how quickly (or slowly) do networks evolve when an intervention is carried out? How long should the intervention be carried out for? Do the effects of the intervention persist or diminish with time? Does targeting certain actors in a network lead to faster results? We believe these questions can be effectively addressed through simulations of interventions. We introduce two simulation frameworks based on the tie-oriented Relational Event Model (REM) and the actor-oriented Dynamic Network Actor Model (DyNAM) that can be used to simulate interventions in continuous time. The simulation frameworks are highly flexible and can incorporate various network effects such as reciprocity, transitivity and homophily and also account for the way in which the influence of past interactions decays over time (e.g., half-life, step-wise etc.) We propose three types of interventions: 1) actor level, 2) network level and 3) composition. We describe each type in detail and specify how the simulations can relate to practise. To demonstrate the broad potential of the simulation frameworks for network interventions we simulate interventions on a corporate email network. The interventions we assess intend to increase the inter-department collaboration across employees in the organization. The number of inter-department emails is used as a proxy for the collaboration across departments. In the first simulation study we evaluate interventions of varying duration and strengths to answer questions about the persistence of their effects after the intervention. In the second simulation study we evaluate intervention strategies that target specific subsets of actors in the network (based on various endogenous or exogenous criteria). In a third simulation study, we hypothesise about the network conditions that are required for successful interventions.

Title	**Role switching and generalized exchange in a financial market**
Authors	**Alessandro Lomi (Università della Svizzera italiana); Federica Bianchi (Università della Svizzera italiana)***
Abstract	Role switching in economic exchange happens when parties take turns at occupying buyer and seller positions. Role switching is common in financial markets where buyer and seller roles are contingent on – rather than preceding individual transactions. The fluidity of their role structure makes financial markets sensitive to sudden change in the level of uncertainty that permeates exchange conditions. In this study, we focus on restricted and generalized reciprocity as relational resource allocation mechanisms stabilizing flows of resources in financial markets. The objective of the study is to document how the stabilizing effects of these generic relational mechanisms flow during the life course of a financial market. We focus on these specific relational micro-mechanisms because they represent the main empirical signature of role switching in market exchange. Change over time in the effects of restricted and well as generalized reciprocity on transactions provides direct evidence of change in the fluidity of the role structure of the market, and its capacity to absorb uncertainty created by major exogenous shocks. The empirical value of this claim is evaluated using data that we have collected over the complete history of a major European on-line market for interbank deposit. We specify and estimate a relational event model to examine patterns of turn taking and role switching throughout the entire life history of the market, which includes approximately two million transaction events recorded from January 1999 – when the on-line trading platform opened – to December 2019 – when the on-line trading platform closed. We report clear evidence that uncertainty weakens the tendency toward role switching which is replaced by hierarchical ordering as a basic organizing principle of market transaction. We document that the speed at which the main micro-relational mechanisms operate to affect transactions changes considerably during the market life course. The results of the study clarify the distinctive empirical value of specifying an operational connection between social mechanisms and social structure that can incorporate time-dependent change as a core theoretical element.

Title	**An extended family of measures for directed networks**
Authors	**Martin G Everett (University of Manchester)*; David Schoch (University of Manchester)**
Abstract	Centrality indices such as beta-centrality, Katz status, and Hubbell's index are commonly generalized to directed

	networks by relating the in-centrality of nodes to the in-centrality of their in-neighbors and equivalently so for out-centrality. This paper proposes an extension of Bonacich's beta-centrality and related measures for directed networks where the in-centrality of a node depends on the out-centrality of their in-neighbors and their out-centrality on the in-centrality of their out-neighbors. These indices extend hubs and authorities in the same way as beta-centrality generalizes eigenvector centrality. Several technical results are presented including the extension of the range of permissible parameters to negative values, similar to traditional beta-centrality.

Document Changelog

2.0 [Added] All abstracts and list of poster presentations. Abstracts appear following the detailed sessions programme order (the full document is searchable).
[Added] Information on all social events, maps, wifi, and other useful information.
[Added] Early coffee break before the first morning sessions.
[Updated] Evening social event on Thursday moved to Devenport House Courtyard, a free social event added on Wednesday, all social event times extended.
[Removed] Withdrawn presentations in blocks S04_S13_3, S13_2, S14_3, S19_1, S20_2, S21_2.

1.6 [Added] Included Keynotes and other meetings and social events details.
[Removed] Withdrawn presentations in blocks S02_3, S04_1, S05_2, S06_2, S13_1, S21_1.

1.5 [Removed] Withdrawn presentations in blocks S06_1, S06_2, S13_1, S15_1.
[Updated] Added Rooming for workshop *Moving Beyond Descriptives: Basic Hypothesis Testing with R/Statnet* (Lorien Jasny).

1.4 [Removed] Withdrawn presentation in block S04_3.
[Removed] Cancelled Workshop *Using Patent Data for Collaboration Network Analysis. An Application with USTPO Data in PatentsView.*
[Updated] Merged sessions S08_2 and S08_1.
[Updated] Fixed typos in the presentation times for blocks S04_1 and S23_2.
[Updated] Moved presentation *An extended family of measures for directed networks (*Martin Everett; David Schoch) from block S05_3 to S06_4.
[Updated] Title change for presentation *Stochastic Actor-oriented Models for Different Group Sizes* (Tom A.B. Snijders).
[Updated] Authors' name for presentation *Population dynamics in Dudelange from 1800 to 1950* (Laura Silva; Franco Bonomi Bezzo; Sonia Schifano; Antoine Paccoud).
[Updated] Authors' name for presentation *Exploring inter-organisational collaboration networks in tourism disaster management: A case study of rural and nature-based destinations in New Zealand* (Lucia Danzi; Caroline Orchiston; James Higham; Rodolfo Baggio).
[Updated] Authors' name for presentation

1.3 [Removed] Withdrawn presentations in blocks S22_1, S13_2.

1.2 [Removed] Cancelled Workshop *Using 'igraph' for SNA: Advanced Topics.*
[Removed] Withdrawn presentations in blocks S22_1, S08_1.
[Updated] Cancelled Workshop *Moving Beyond Descriptives: Basic Hypothesis Testing with R/Statnet* moved to Monday afternoon.

1.1 [Added] Room details for social events and posters award session.
[Removed] Withdrawn presentations in blocks S06_4, S04_1.
[Updated] Room allocation for Friday's full-time workshops.
[Updated] Sessions organisers' names for S17 Social Influence.
[Updated] Authors' name for presentation *The consequences of social influence for the secondary transfer effect of intergroup contact* (Tibor Zingora; Olivia Spiegler; Tobias Stark; Chloe Bracegirdle; Miles Hewstone).
[Updated] Presentation *Intergenerational contact and SARS-CoV-2 diffusion in a Covid-19 epicenter: an agent-based model of the population-wide network based on sampled personal networks* (Federico Bianchi; Raffaele Vacca) moved to the S19_1 block.

1.0 Initial Release.