



SN Zurich 2019

Conference Booklet:

General Information
Session Chair Overview
Program Parallel Sessions
Abstracts

4th European Conference
on Social Networks

9-12 September 2019

ETH zürich



Universität
Zürich ^{UZH}

eawag
aquatic research ^{ooo}

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Centre for Business
Network Analysis

^b
UNIVERSITÄT
BERN

The electronic version of this booklet can be found at:
www.eusn.org/2019/

The open L^AT_EX template, `AMCOS_booklet`, used to generate this booklet is available at
https://github.com/maximelucas/AMCOS_booklet

General Information EUSN 2019

9-12 Sep 2019



Venues

ETH Zurich Centre Campus (ETH)

Rämistrasse 101, 8092 Zurich
+41 44 633 11 11

University of Zurich City Campus (UZH)

Rämistrasse 71, 8006 Zurich
+41 44 634 11 11

Keynotes

Opening Keynote: 9 Sep, 14:00, at ETH:
Marijtte Van Duijn, University of Groningen
Keynote: 10 Sep, 17:30, at UZH:
David Lazer, Northeastern University

How to get there

The central campus areas of ETH Zurich and University of Zurich are located in the center of [Zurich](#) and can be reached by public transport from the Zurich Airport by train no S16 / S2 and by tram no 10. Tickets are available at ticket machines as well as [online](#). They can be bought for [zones](#) or the entire network. To travel from Zurich Airport (ZRH) to the city, buy a ticket for three zones (110 & 121); the city zone 110 always counts as two zones.

Public Transport

SBB Swiss Railway
[online timetable/ticket order](#)
ZVV Zurich Transport Network
[online timetable/ticket order](#)

Taxi 444

Pone: +41 44 444 44 44
Online booking: <https://www.taxi444.ch/>

Internet

WiFi Guest Account:
Login: eusn2019 / Password: Zuerich_2019

Contact Conference Coordinator

Denise Weber
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Conference App

For iPhones on Apple Store, for Android Devices on Google Play Store.



Communication

Website: [EUSN 2019](#)
Twitter: [@EUSNconference](#)

Conference Dinner

10 Sep, 18:30 – 20:00
University of Zurich, Foyer L West

Hospitality Suite

9-11 Sep, 20:30 – 23:30
Kanzlei Club
Kanzleistrasse 56, 8004 Zurich
tram stop Helvetiaplatz

Restaurant recommendations close to ETH & UZH

[No 15 HOT PASTA](#) - The Pasteria Italiana
[Zum Alten Löwen](#) – Tavolata = seasonal swiss meals to share
[Didis Frieden](#) – fine cuisine
[Restaurant Brasserie Johanniter](#) – rustic Swiss cuisine
[01Bar & Restaurant](#) – easy snacks/meals, cocktails
[La Pasta](#) – italian cuisine
[Zeughauskeller](#) – traditional Swiss cuisine

Restaurant recommendations close to Hospitality Suite

[BANK](#) – burgers, salads, bar
[YUMA Restaurant & Bar](#) – street food and international specialities
[VOLKSHAUS](#) – traditional Swiss cuisine
[NENI 25hours Hotel Langstrasse](#) – east mediterranean cuisine
[Restaurant Cinque](#) – Italian cuisine

About

EUSN 2019

The 4th European Conference on Social Networks (EUSN 2019) will be held in Zurich, 9-12 September 2019. Continuing the traditions of previous conferences in Barcelona (2014), Paris (2016), and Mainz (2017), and the legacies of predecessors Applications of Social Network Analysis (ASNA) and UK Social Network Analysis (UKSNA), the conference will bring 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 network science.

Conference Coordinator

Denise Weber (ETH Zurich)

Organizing committee

Ulrik Brandes (ETH Zurich)
Thomas Friemel (University of Zurich)
Christoph Stadtfeld (ETH Zurich)

Manuel Fischer (EAWAG)
Karin Ingold (University of Bern)

Program Chairs

Guido Conaldi (University of Greenwich)

Francesca Pallotti (University of Greenwich)

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Session Overview

Monday - Wednesday (9 - 11 Sep)



Session title Chairs	A	B	C	D	E	F	G
	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
Monday 14:00-15:00	Keynote Marijtje van Duijn, Audimax, Floor F						
1 Monday 15:30-17:00	Methods David Schoch	-	Movie Networks Pete Jones Termeh Shafie	Inference and Generalisability in Modelling Samples of Networks and Multi-Level Network Data Pavel Krivitsky Marijtje van Duijn	Studying intertwined social-ecological systems as networks: Methodological and conceptual advances, and new substantive insights Örjan Bodin Manuel Fischer Karin Ingold	Social Capital Marie-Pierre Bes	Migration, Transnationalism and Social Networks Marian-Gabriel Hancean Miranda Jessica Lubbers Jose Luis Molina
2 Tuesday 09:00 - 10:30	Communication Networks Tobias Frey Thomas Friemel	Collaboration networks. Methods and Applications Giuseppe Giordano Giancarlo Ragozini Maria Prosperina Vitale	Political Networks Dimitris Christopoulos Mario Diani James Hollway Florence Metz	Modeling Network Dynamics James Hollway Nynke Niezink Tom Snijders Christoph Stadtfeld Christian Steglich	Network Ecology: Tie Formation in Context(s) Malte Doehne Daniel McFarland James Moody	Personal Networks and the Life Course Laura Bernardi Marlène Sapin Eric D. Widmer	Migration, Transnationalism and Social Networks Marian-Gabriel Hancean Miranda Jessica Lubbers Jose Luis Molina
3 Tuesday 11:00 - 12:30							
4 Tuesday 13:30 - 15:00	Criminal network analysis Paolo Campana Nynke Niezink				Qualitative Perspectives in Social Network Analysis Stefan Bernhard Andreas Herz Luisa Peters Inga Truschkat		Mobility flows in education system Giancarlo Ragozini Maria Prosperina Vitale
5 Tuesday 15:30 - 17:00						Gender and social networks Elisa Bellotti	-
Tuesday 17:30-18:30	Keynote David Lazer, University of Zurich, KOH-B-10						
6 Wednesday 09:00 - 10:30	Agent-based models: Linking complex social phenomena to social network dynamics Federico Bianchi Andreas Flache Károly Takács	Organizational Networks Spyros Angelopoulos Emmanuel Lazega Francesca Pallotti Paola Zappa	Polarization in Social and Political Networks Laurence Brandenberger Philip Leifeld	Modelling Sevag Kevork	Networks and the Study of the Human Past Tom Brughmans Martin Stark Ivo Veiga Bernd Wurpts David Zbiral	Gender and social networks Elisa Bellotti	Networks for Learning Katerina Bohle Carbonell Dominik E. Froehlich
7 Wednesday 11:00 - 12:30				Social Influence James Hollway Nynke Niezink Tom Snijders Christian Steglich Andras Vörös		Health Behaviour Networks Thomas Friemel Sarah Geber	
8 Wednesday 13:30 - 15:00				Complex Social Networks Kai Fischbach Haiko Lietz Marcos Oliveira Martin Stark		Intergroup Relations in Social Networks David Kretschmer Hanno Kruse Lars Leszczensky Sebastian Pink Tobias Stark	
9 Wednesday 15:30 - 17:00			Challenges and opportunities for studying evolving stakeholder networks Örjan Bodin Manuel Fischer Lorien Jasny Christina Prell Christian Steglich	Ego and Personal Networks Michal Bojanowski			

Parallel Sessions 1 - Monday 9 Sep, 15:30 - 17:00



14:00-15:00							
Keynote Marijtje van Duijn, Foyer Audimax, Floor F							
	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
15:30-17:00	Session A1: Methods	Session B1	Session C1: Movie Networks	Session D1: Inference and Generalisability in Modelling Samples of Networks and Multi-Level Network Data	Session E1: Studying intertwined social ecological systems as networks: Methodological and conceptual advances, and new substantive insights	Session F1: Social Capital	Session G1: Migration, Transnationalism and Social Networks (1/3)
15:30-15:50	Ulrik Brandes and Stephen Borgatti <i>Are You Really Interested in This Relation?</i>	-	Pete Jones and Johan Koskinen <i>Measuring Centrality in Character Networks</i>	Pavel N. Krivitsky, Pietro Coletti and Niel Hens <i>Representativeness and Generalisability of Inference for Exponential-Family Random Graph Models from Samples of Networks</i>	Martin Huber, Mario Angst and Manuel Fischer <i>A Network Approach to Analyze Social-Ecological Fit in Swiss Wetlands Governance</i>	Yingjie Yuan <i>Selecting Top Performer' Ideas for Team Creativity? Team Learning Goal and Top Performer's Advice Centrality</i>	Renáta Hosnedlová, Ignacio Fradejas-García, Miranda J Lubbers and José Luis Molina <i>Networked (Im)Mobility Patterns in a Transnational Social Field</i>
15:53-16:13	Julian Müller and Ulrik Brandes <i>Role Formation in Networks</i>	-	Termeh Shafie and Pete Jones <i>Gender Dependent Structures of Dialogue Networks in Films</i>	Mahdi Shafiee Kamalabad, Rick Aalbers, Roger Th.A.J. Leenders and Joris Mulder <i>A Relational Event Model for Real-Time Analysis of Email Interactions in a Large Dynamic Network of Consultants</i>	Daniel Grinnell <i>You Are What You Eat: Grouping Users Together Using Their Common Interests, a Case Study on Disinformation Propagators</i>	Pablo De la Vega Suarez, Juan Gabriel Rodriguez Hernandez and Juan Prieto Rodriguez <i>Choosing a Job: Who Influences You the Most, Parents or Friends?</i>	Marian Gabriel Hancean, Miranda Jessica Lubbers and Jose Luis Molina <i>Measuring Transnational Social Fields Through Binational Link-Tracing Sampling</i>
16:16-16:36	Aleš Žiberna <i>Comparing Different Methods for One-Mode Homogeneity Blockmodeling According to Structural Equivalence on Binary Networks</i>	-	Dima Kagan, Thomas Chesney and Michael Fire <i>Using Data Science to Understand the Film Industry's Gender Gap</i>	Alexander Brand <i>Structuring and Negotiation Mechanisms in Longitudinal Educational Networks - an Analysis of the PISA Multi-Level Network Using an Agent Based Simulation Study</i>	Örjan Bodin <i>A Network-Based Research Paradigm to Enhance the Research on Social-Ecological Systems</i>	Marie-Pierre Bes <i>Relation Chains for Getting an Internship</i>	Luca Verginer <i>Scientists on the Move: the Global Brain Circulation-Network</i>
16:39-16:59	David Schoch <i>Leveling Ties in Two-Mode Networks</i>	-	Katharina Burgdorf and Henning Hillmann <i>The Emergence of New Hollywood: Identity Formation from Symbolic Networks</i>	-	-	-	-
17:15-18:30	Business Meeting, Room HG F 26.3						
20:30-23:30	Hospitality Suite at Kanzlei Club						

Parallel Sessions 2 - Tuesday 10 Sep, 09:00 - 10:30



	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
09:00-10:30	Session A2: Communication Networks (1/2)	Session B2: Collaboration networks. Methods and Applications (1/4)	Session C2: Political Networks (1/4)	Session D2: Modeling Network Dynamics (1/4)	Session E2: Network Ecology: Tie Formation in Context(s) (1/2)	Session F2: Personal Networks and the Life Course (1/3)	Session G2: Migration, Transnationalism and Social Networks (2/3)
09:00-09:20	Sara Colella , David Schoch, Andreas Jungherr and Ulrik Brandes <i>Information Sharing on Social Media</i>	Giuseppe Giordano , Domenico De Stefano and Susanna Zaccarin <i>Network Effect on Individual Scientific Performance: Evidence on the Italian Scientific Community</i>	Maira Faul and Jordan Tchilingirian <i>How Network Analysis Can Help to Demystify Multistakeholder Global Governance</i>	-	András Vörös , Kieran Mephram and Christoph Stadtfeld <i>Informal Group Perceptions in Multidimensional Social Networks</i>	Anna-Majja Castren <i>Shared Intimacies? A Longitudinal Analysis of Two Partners' Networks of Emotional Closeness</i>	Samin Aref , Emilio Zagheni and Jevin West <i>Analyzing International Mobility of Researchers Through Affiliation Addresses in Web of Science Publications</i>
09:23-09:43	Tetiana Kostiuhenko <i>Social Capital of Ukrainian Students: Study Achievements, Values, and Resistance to Disinformation</i>	Daria Maltseva and Vladimir Batagelj <i>Social Network Analysis: Evolution of the Field</i>	Dimitris Christopoulos , Mario Diani, James Hollway and David Knoke <i>Multimodal Political Analysis: Detecting Evidence of Agency</i>	Viviana Amati and Tom A. B. Snijders <i>Identifying Model Misspecification in Stochastic-Actor Oriented Models</i>	Francesca Pallotti , Sharon M Weldon and Alessandro Lomi <i>Coordination as Continuous Social Interaction: a Case Study on Surgery Teams</i>	Vida Cesnuiyte <i>Personal Networks in the Life Course of Military Families</i>	Brigitta Németh and Laszlo Lorincz <i>Network Effects in Internal Migration</i>
09:46-10:06	Abhishek Samantray and Paolo Pin <i>Polarization of Beliefs Due to Homophily in Communication and Credibility of Fake News</i>	Stanislav Moiseev and Daria Maltseva <i>Mixed Field of Mixed Methods: Bibliographic Analysis</i>	Patrick Doreian and Andrej Mrvar <i>The Network of the Koch Brother's anti-Democratic Political Social Movement</i>	Tom A.B. Snijders and Felix Schoenenberger <i>Networks in Social Contexts: Specification Issues for the Settings Model</i>	Hanno Kruse and Clemens Kroneberg <i>Contextualizing Oppositional Cultures: a Multilevel Network Analysis of the Emergence of Status Orders Across School Contexts</i>	Claire Bidart <i>Changes in Personal Networks in Times of Conjugal Transitions</i>	Stefan Bernhard <i>Reciprocity and Self-Identifications in Refugees' Social Support Ties</i>
10:09-10:29	Kübra Tanınmış , Necati Aras and Altinel Kuban <i>Minimizing the Misinformation Spread in Social Networks</i>	Nataliya Matveeva , Ivan Sterligov and Maria Yudkevich <i>Collaboration Patterns of Russian Universities Before and After Government Intervention: Analysis of Co-Authorship Networks</i>	Reini Schrama <i>Change or Stability in Network Governance</i>	Robert Krause , Tom Snijders, Mark Huisman, Anna Iashina and Alberto Caimo <i>Advances in Missing Data Treatment for Network Analysis - Actor Attributes, Multiplexity, and Bayesian</i>	Philip Roth and Katharina Scheidgen <i>Local Cultures of Tie Formation: the Impact of Context-Specific Institutions on Advice Tie Formation</i>	Marlene Sapin and Stephanie Baggio <i>Patterns of Resources and Strains in Family Networks and Mental Health: Empirical Evidence from a General Population Sample</i>	Verónica de Miguel-Luken <i>Partners' Independence in Core Discussion Networks. Native Endogamous, Foreign-Born Endogamous and Mixed Couples in Spain</i>
10:30 - 11:00	Coffee Break, Foyer F Floor						

Parallel Sessions 3 - Tuesday 10 Sep, 11:00 - 12:30



	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
11:00-12:30	Session A3: Communication Networks (2/2)	Session B3: Collaboration networks. Methods and Applications (2/4)	Session C3: Political Networks (2/4)	Session D3: Modeling Network Dynamics (2/4)	Session E3: Network Ecology: Tie Formation in Context(s) (2/2)	Session F3: Personal Networks and the Life Course (2/3)	Session G3: Migration, Transnationalism and Social Networks (3/3)
11:00-11:20	Artem Antonyuk <i>Between the Civil Society and the Corporation: Construction of the Meaning of Freedom of Speech in Internet Governance</i>	Daria Maltseva and Ilia Inshakov <i>Variability of Biopolitical Journals: an Attempt to Bring Together the Field Using SNA</i>	Guido Conaldi, David Monciardini and Valentina Baiamonte <i>Topic Modelling and Networks of Policy Preferences in the Regulation of Mandatory Corporate Sustainability</i>	Alejandro Espinosa-Rada <i>Micro-Explanations for Multilevel Scientific Networks: a Stochastic Actor-Oriented Model in a Scientific Discipline</i>	Kerstin Sailer <i>Action Networks - Exploring Dynamic Organizational Routines in Outpatient Clinics</i>	Pablo Nicaise, François Wyngaerden, Hélène Garin, Sébastien d'Oreye de Lantremange, Sébastien Combéfis and Vincent Lorant <i>Does the Structure of the Personal Networks of Patients with Severe Mental Illness Differ from the Common Types Found in the General Population?</i>	Iulian Oana, Marian-Gabriel Hancean and Adelina Alexandra Stoica <i>Flows of Economic Remittances Within Social Transnational Fields</i>
11:23-11:43	Emilie Vrain and Charlie Wilson <i>Ever Talked About Smart Homes, Car Sharing or Digital Farmers Markets?</i>	Judith Hartstein <i>Admitting Uncertainty: a Weighted Socio-Epistemic Network Approach to Cognitive Distance Between Authors</i>	Sebastian Haunss, Nico Blokker, Sebastian Pado, Jonas Kuhn, Andre Blessing, Gabriella Lapesa and Erenay Dayanik <i>Supporting Discourse Network Analysis Through Machine Learning for Claim Detection and Classification</i>	Marion Hoffman and Per Block <i>A Partition Model for Dynamic Membership of Non-Overlapping Groups</i>	Mark Wittek <i>Status Systems as Dynamic Network Ecologies of Perception - a Theoretical Framework and Empirical Test in the School Context</i>	Eric Widmer, Ella Schwartz and Adam Roth <i>Later-Life Transitions and Overlap of Spouse Networks, a Longitudinal Study of Couple Networks in Switzerland</i>	Bianca Mihaila and Marian-Gabriel Hancean <i>Exploring the Impact of Homophily on Finding a Job</i>
11:46-12:06	Theodoros Katerinakis and Zisis Kiriakakis <i>Breaking Eggs and Baking Ties: Connecting Cultures in "E-Vasilopita and E-Avgomachia" Networks</i>	Bruce Haupt <i>Operationalizing a Mixed Methods Study of the Spread of Higher Education Innovations Through an Inter-Organizational Network in the United States</i>	Cornelius Fritz, Paul Thurner and Göran Kauermann <i>A Separable Counting Processes-Based Model for the Analysis of the International Arms Trade Network from 1950 to 2018</i>	Federica Bianchi and Alessandro Lomi <i>A Time to Give and a Time to Take: the Effect of Market Uncertainty on Exchange Sequences</i>	Markus Lang <i>When Do International Technology Transfers Become Reciprocal? Empirical Evidence from German Network Data</i>	Vera de Bel, Marijtte van Duijn and Tom Snijders <i>Collecting Multi-Actor Family Network Data Among Divorced and Non-Divorced Families</i>	Agnes Lukacs J. and Beata David <i>Types of Embeddedness and Successful College Transition in the Case of Roma Undergraduates</i>
12:09-12:29	Moses Boudourides and Giannis Tsakonas <i>Open-Access Assortativity of Coauthorship Networks</i>	Daniela D'Ambrosio, Marco Serino and Giancarlo Ragozini <i>In Search of New Ways to Join Factorial Methods and Blockmodeling for Analysing Affiliation Networks</i>	Oliver Wieczorek <i>Which Universities and Scholars Have Access to the Field of Power in the United States? Mapping Pathways to Gain Access to and to Influence Science Policy in the United States.</i>	Joris Mulder and Peter Hoff <i>A Latent Variable Approach for Modeling Relational Events with Multiple Receivers</i>	Malte Doehne and Daniel McFarland <i>Network Ecology: Tie Formation in Context(s)</i>	Sabine Bakker <i>The Bigger, the Better? - Personal Network Development and the Mobilization of Intra-Organizational Social Capital.</i>	-
12:30-13:30	Lunch Break, Foyer E & D South						

Parallel Sessions 4 - Tuesday 10 Sep, 13:30 - 15:00



	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
13:30-15:00	Session A4: Criminal network analysis (1/2)	Session B4: Collaboration networks. Methods and Applications (3/4)	Session C4: Political Networks (3/4)	Session D4: Modeling Network Dynamics (3/4)	Session E4: Qualitative Perspectives in Social Network Analysis (1/2)	Session F4: Personal Networks and the Life Course (3/3)	Session G4: Mobility flows in education system
13:30-13:50	-	Sándor Juhász, Gergő Tóth and Balázs Lengyel <i>Brokering the Core with Periphery - Collaboration Networks and Individual Success in the Hungarian Film Industry</i>	Monika Verbalyte, Jan Delhey, Emanuel Deutschmann and Auke Apłowski <i>Network Europe: How Europe Grows Together Through Transnational Interactions</i>	-	Simon Pápcke and Ulrik Brandes <i>Character Networks in a Collection of 19th Century German Novellas</i>	-	-
13:53-14:13	Nynke Niezink and Paolo Campana <i>When Things Turn Sour: a Network Event Study of Violence Among Organized Crime Members</i>	Bruce Cronin and Sergey Sosnovskikh <i>Networks Among the Tenants of the Special Economic Zones and Industrial Parks in Russia</i>	Sören Petermann <i>Social Resources as Incentives for Local Political Protest</i>	Marilyne Mejerink, Mitja Back, Katharina Geukes, Steffen Nestler, Joris Mulder and Roger Leenders <i>Time-Varying Effects of Personality and Friendship on Real-Life Interactions in a Freshmen Student Network</i>	Anastasia Pupynina <i>Communicative Practices of Transnational Memory - Social Network Analysis of a Historical Online Forum</i>	Marina Hennig <i>Dynamics and Stability in Ego-Centered Network Data</i>	Giancarlo Ragozini, Giuseppe Giordano and Maria Prosperina Vitale <i>The Analysis of Student Mobility Flows in Higher Education. a Multimode Network Perspective</i>
14:16-14:36	Casper van Nassau, Tomas Diviak, Christianne de Poot and Frank van Tubergen <i>Explaining Tie Formation in Salafi-Jihadi Networks Operating in Western Contexts</i>	Beata Łopaciuk-Goncaryk <i>Interdisciplinary Collaboration Within Economics - Emerging Patterns</i>	Kieran Mephram, Christoph Stadtfeld and András Vörös <i>The Dynamics of Social Networks and Political Opinions: a Bipartite Network Approach</i>	Sebastian Haunss and James Hollway <i>Modeling Discourse Dynamics with DynAMS</i>	Brigitte Gasser <i>Shared Reading</i>	Beate Volker <i>Open Mind - Open Network? The Interrelation Between Cognitive Patterns and Social Networks</i>	Maria Prosperina Vitale, Silvia Columbu, Mariano Porcu, Isabella Sulis and Ilaria Primerano <i>Network Measures and Attractiveness Indexes for the Analysis of the Italian Student Mobility Flows in Higher Education</i>
14:39-14:59	Tomáš Diviák, Casper S. van Nassau, Jan Kornelis Dijkstra and Tom A. B. Snijders <i>Dynamics and Disruption: Structural and Individual Effects of Police Interventions on Two Dutch Jihadi Networks</i>	Rodrigo Liscovsky Barrera <i>The Diffusion of Zebrafish in Latin American Biomedical Research. a Study Based on Bibliometric Dynamic Network Data</i>	Laurence Brandenberger, Giona Casiraghi, Simon Schweighofer and Frank Schweitzer <i>Predicting Offline Political Support with Online Social Behavior</i>	Diana Karimova, Roger Leenders and Joris Mulder <i>A Bayesian Multinomial Choice Model for Relational Event Data</i>	Roman Gibel <i>Qualitative Insights in Organizational Membership-Networks</i>	Feng Zhang <i>Application of Guanxi and Ego-Centric Network to China's Outward Foreign Direct Investment in the UK</i>	Marialuisa Restaino, Ilaria Primerano and Maria Prosperina Vitale <i>A Multilayer Approach to Analyze Mobility and Collaboration Networks in European Countries</i>
15:00-15:30	Coffee Break, Foyer Floor F						



Parallel Sessions 5 - Tuesday 10 Sep, 15:30 - 17:00

	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
15:30-17:00	Session A5: Criminal network analysis (2/2)	Session B5: Collaboration networks. Methods and Applications (4/4)	Session C5: Political Networks (4/4)	Session D5: Modeling Network Dynamics (4/4)	Session E5: Qualitative Perspectives in Social Network Analysis (2/2)	Session F5: Gender and social networks (1/2)	Session G5:
15:30-15:50	Jan Kornelis Dijkstra , Gerard Wolters and Matthijs Oosterhuis <i>The Rules of Sustainability. Online Networks of the Polish Extreme Right.</i>	Anna Piazza <i>"Who Benefits from Whom": Resource Complementarity and Organizational Performance</i>	Myriam Truffert , Florence Metz and Manuel Fischer <i>Identifying Levers and Multipliers in the SDG Interaction Network</i>	Viviana Amati , Alessandro Lomi and Tom Snijders <i>Goodness of Fit Concepts for Relational Event Models</i>	Doreen Reifegerste and Christine Linke <i>Support Repertoires of Adolescents and Young Adult Cancer Patients: a Qualitative Ego-Centered Network Analysis</i>	Jing Liu , Marijtte van Duijn and Tom Snijders <i>Humans May Prefer Balanced Structures but This Can Differ from Females to Males: Linking Triadic relations Model to Theories</i>	-
15:53-16:13	Cindarella Petz and Jürgen Pfeffer <i>Political Judiciary in the Provincial Courts of Vienna 1935</i>	Paola Zappa <i>Team Performance and Repeated Collaboration in R&D Projects</i>	Rea Pärli , Manuel Fischer and Eva Lieberherr <i>Structure Matters - a Social Network Analysis on Swiss Stakeholders' Information Exchange About SDG 6</i>	Alvaro Uzaheta , Viviana Amati and Christoph Stadtfeld <i>Modeling Heterogeneous Preferences in Dynamic Network Actor Models</i>	Tom Toepfer and Laura Behrmann <i>Symbolic Interactionism as Analytical Framework for Qualitative Network Research</i>	Elisa Bellotti , Dominika Czerniawska-Szejda and Luigi Guadalupi <i>Women in Science. Research Collaboration in Italian Academia from a Gender Perspective.</i>	-
16:16-16:36	Johannes Wachs , Taha Yasseri, Balazs Lengyel and Janos Kertesz <i>Community Social Structure and Corruption</i>	Evangelia Petridou and Jorgen Sparf <i>Resilience and Social Networks in Sweden</i>	Paula Castro and Marlene Kammerer <i>Inside and Outside the Climate Negotiations: Contrasting Networks of Conference Diplomacy Reporting and Media Perception</i>	Giuseppe Arena , Joris Mulder and Roger T. A. J. Leenders <i>Modeling Memory Decay in Dynamic Networks: a Semiparametric Bayesian Method for Fine-Grained Longitudinal Data Analysis</i>	Victor Blanco , Tobias Luthé and Adrienne Grêt-Regamey <i>Assessing Collaboration Networks to Support Systemic Innovation in Mountain Areas</i>	Júlia Galántai and Flóra Samu <i>Dyadic Analysis of Partnership Quality and Satisfaction Based on Household Labor Division and Gender Equality Measures</i>	-
16:39-16:59	-	-	Florence Metz , Aline Schmucki, Eva Lieberherr and Robert Hubert <i>Finding Consensus for Greening in Agriculture</i>	-	Tobias Luthé , Victor Blanco and Adrienne Grêt-Regamey <i>Assessing Community Innovativeness by Metrics, Contextual Resilience Adaptive Waves Phases and "Reality"</i>	-	-
17:30-18:30	Keynote David Lazer at University of Zurich, Auditorium KOH-B-10						
18:30-20:00	Conference Dinner at University of Zurich, Foyer L West						
20:30-23:30	Hospitality Suite at Kanzlei Club						

Parallel Sessions 6 - Wednesday 11 Sep, 09:00 - 10:30



	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
09:00-10:30	Session A6: Agent-based models: Linking complex social phenomena to social network dynamics (1/2)	Session B6: Organizational Networks (1/4)	Session C6: Polarization in Social and Political Networks (1/3)	Session D6: Modelling	Session E6: Networks and the Study of the Human Past (1/4)	Session F6: Gender and social networks (2/2)	Session G6: Networks for Learning (1/2)
09:00-09:20	Marcos Oliveira and Fariba Karimi <i>Homophily and Minority Dynamics in Face-to-Face Interactions</i>	Nevena Ivanovic , Thom de Vries, Gerben van der Vegt and Dirk Pieter van Donk <i>Matching Collaboration to Disruptions: Relational Event Modeling of Inter-Team Collaboration During Organizational Disruptions</i>	-	-	Bernd Wurpts <i>Brokering Across Markets Not Persons: Network Organizations, Trade Specialization and Reciprocal Exchange in the Development of the Modern Economy</i>	Matthew Smith , Heather McGregor, Yasaman Sarabi and Dimitris Christopoulos <i>The Formation of Female Directorship Ties Amongst the FTSE 350 - a Network Analysis</i>	Cigdem Baskici , Suat Atan and Yavuz Ercil <i>Studies in Social Networks Journal 2000-2019: the Intellectual Structure of Social Network Perspective</i>
09:23-09:43	Karoly Takacs and Dorottya Kisfalusi <i>Social Network Dynamics and Grading Discrimination: an Agent-Based Model</i>	Olaf Rank , Georg Wolff and Michael Wältermann <i>Professional Advice Networks Among Organizations: Does Personality Matter?</i>	Zachary Neal and Samin Aref <i>Analyzing Political Polarization and Legislative Effectiveness Through Partitioning Networks of U.S. Congress Legislators</i>	Carter Butts <i>Prediction of Equilibrium Dynamics Using Exponential Family Random Graph Models</i>	Gabriel Geisler Mesevage and Rui Esteves <i>Private Benefits, Public Vices Railways and Logrolling in the 19th Century British Parliament</i>	Jan Fuhse <i>Gender as a Relational Institution in Interpersonal Ties</i>	Elisa Operti and Amit Kumar <i>This Cloud Has a Silver Lining - Economic Crisis and Technological Exploration</i>
09:46-10:06	Ibrahim Emirahmetoglu <i>An Empirical Model of Network Formation on Coauthorship</i>	Claudia Walther <i>Organizing for Complex Product Innovation: How the Case of Smart Materials Inspires Towards an Explicit Network Conceptualization of Innovation Ecologies</i>	Juergen Lerner and Alessandro Lomi <i>The Price of Polarization in Open Peer-Production</i>	Benjamin Sischka and Göran Kauermann <i>Bayesian and Spline Based Approaches for (EM Based) Graphon Estimation</i>	Henning Hillmann <i>Corsairs and Careers in Economic Networks: Evidence from Ancien Régime Saint-Malo</i>	Sanjana Singh and Eva Jaspers <i>Gender Diversity Outcomes: an Organisational Network Perspective</i>	Eleonora Marucci , Davide Barrera, Beau Oldenburg, Rene' Venstra and Marloes Hendrickx <i>The Role of Teacher Attunement in Shaping the Classroom Normative Context: the Emergence of Status Norms for Bullying and Prosociality</i>
10:09-10:29	Manuel Sebastian Mariani , Yanina Gimenez, Jorge Brea, Francesco De Colibus, Martin Minnoni and Claudio Juan Tessone <i>Searching for Individuals Whose Early Adoptions Signal Future Success in a Nationwide Socio-Economic System</i>	Emmanuel Lazega , Peng Wang and Chrystelle Richard <i>Uncertainty, Risk Allocation and the Structuration of Multilevel Networks: the Case of French Public-Private Partnerships</i>	Philip Leifeld and Dana R. Fisher <i>Smoothed Bipolarization of Policy Debates: Are Coalitions in Discourse Networks Stable over Time or Punctuated?</i>	Sevag Kevoork and Göran Kauermann <i>Iterative Estimation for Exponential Random Graph Models with Nodal Random Effects</i>	Elise Dermineur <i>Peer-to-Peer Credit Networks in Pre-Industrial Finland</i>	Gerrit Rooks <i>Gender Differences in Learning Hierarchical and Nonhierarchical Networks</i>	Debbie Vermond , Esther de Groot, Valerie Sills, Greg Rubin, Fiona Walter and Niek de Wit <i>Using a Mixed-Method Approach to Social Network Analysis in Exploring the International Collaborations in Primary Care Cancer Research: a CanTest Collaborative Study</i>
10:30-11:00	Coffee Break, Foyers E & D South						

Parallel Sessions 7 - Wednesday 11 Sep, 11:00 - 12:30



	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
11:00-12:30	Session A7: Agent-based models: Linking complex social phenomena to social network dynamics (2/2)	Session B7: Organizational Networks (2/4)	Session C7: Polarization in Social and Political Networks (2/3)	Session D7: Social Influence (1/2)	Session E7: Networks and the Study of the Human Past (2/4)	Session F7: Health Behaviour Networks (1/3)	Session G7: Networks for Learning (1/2)
11:00-11:20	Roberto Rondinelli , Martin Atzmüller and Giancarlo Ragozini <i>Looking for Best Descriptors to Map Networks via Subgroup Discovery. First Results from a Simulation Study</i>	Felix Sommer , François Lambotte and Philippe Dumont de Chassart <i>Identifying and Comparing User Roles Across Companies in Organizational Social Networks</i>	Petr Ocelík <i>Incumbents' Strategies in Media Coverage of Climate Change: a Case of the Czech Republic</i>	Johan Koskinen , Michael Schweinberger and Tom A.B. Snijders <i>Modelling Individual Differences in Network Evolution</i>	Thomas Weitin <i>Rivals of the Goethezeit. Network Models in Literary History</i>	Emanuele Del Fava , Irene Adema, Moses Kiti, Piero Poletti, David James Nokes, Stefano Merler, Piero Manfredi and Alessia Melegaro <i>Evaluating Social Contact Patterns of Children for Infectious Disease Transmission in Rural and Urban Kenya Using a Personal Network Approach</i>	Eszter Vít <i>Peer Effects on Educational and Academic Aspirations in Hungarian Schools</i>
11:23-11:43	Marjan Cugmas , Aleš Žiberna and Anuška Ferligoj <i>On the Local Network Mechanisms and the Global Network Structures</i>	Katharina Scheidgen <i>How New Ventures Form Organizational Ties: the Varying Impact of Personal Ties in Berlin and Silicon Valley</i>	Pilar Elizalde <i>The ABC of Human Rights like-Minded Networks in International Institutions</i>	Per Block and Stephanie Burnett Heyes <i>Is Depression Actually, Really Contagious? a Confident Answer to a Related Question</i>	Ivo Veiga and João Mascarenhas-Mateus <i>"Building Cultures of Steel and Concrete. The Networks of Engineers in Portugal (1850-1900)"</i>	Jay Chiehen Liao , Yi-Fang Yu and Carol Strong <i>The Influence of the Venue-Based Network to the Anogenital Human Papillomavirus Infection in Men Who Have Sex with Men: an Application of Temporal Network Autocorrelation Model</i>	Swaran Sandhu <i>Teaching Applied Social Network Analysis with R/igraph for Undergraduate Students</i>
11:46-12:06	Katarzyna Growiec , Jakub Growiec and Bogumił Kamiński <i>Social Network Dynamics: Individual-Level Mechanisms and Aggregate Outcomes</i>	Mara Sintejudeanu , Geraldine Robbins and Katerina Bohle-Carbonell <i>Boundary Spanning in Mandated Hospital Networks</i>	Gunes Ertan and Ali Carkoglu <i>A Network Approach to Measuring Polarization in Survey Studies</i>	Isabel Raabe and Heiko Rauhut <i>Cooperation and School Success: Network Dynamics and Micro-Macro Links</i>	Tomáš Hampejs and David Zbrl <i>Assessing the Validity of Social Networks Constructed from Name Co-Occurrence: the Example of Medieval Inquisitorial Records</i>	Helge Giese , Hansjörg Neth and Wolfgang Gaissmaier <i>Alcohol Consumption in University: Social Influence and Its Perception</i>	Lorena Ortega , Zsófia Boda, Ernesto Treviño, Verónica Arriagada and Denisse Gelber <i>The Inclusion of Immigrant Students Within Chilean Classrooms: Analysing Teacher-Student Interaction Networks</i>
12:09-12:29	Yavuz Ercil and Cigdem Baskici <i>Proposing Boundary Roles as a New Indicator for Network Analysis</i>	Bruce Cronin <i>Financial Performance Effects of UK Director Interlocks: a Panel Study</i>	-	-	Oxana Mikhailova <i>Discourse Network Analysis of the Satanism Representations in the Russian Legal Practice</i>	Srebrenka Letina , Balázs Lengyel, Anikó Bíró, Gergő Tóth and Károly Takács <i>Social Network and Mental Health: the Relationship Between an Online Social Ego-Network Structure and Antidepressant Use in Hungarian Small Settlements</i>	Per Engzell <i>Diversity and Differentiation: Curricular Tracking, Friendship Selection, and Achievement Stratification</i>
12:30-13:30	Lunch Break at Foyer E & D South						

Parallel Sessions 8 - Wednesday 11 Sep, 13:30 - 15:00



	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
13:30-15:00	Session A8: Complex Social Networks (1/2)	Session B8: Organizational Networks (3/4)	Session C8: Polarization in Social and Political Networks (3/3)	Session D8: Social Influence (2/2)	Session E8: Networks and the Study of the Human Past (3/4)	Session F8: Health Behaviour Networks (2/3)	Session G8: Intergroup Relations in Social Networks (1/2)
13:30-13:50	-	Alejandro Hermida Carrillo and Marco Tonellato <i>Ownership and Retaliation in Self-Managing Organizations: Learnings from Wikipedia</i>	-	-	Émeline Brylinski <i>Using Formal Network Analysis to Reveal Political Stakes and Power Dynamics Shaping International Recommendations in Education (1934-1958)</i>	-	Christian Steglich , Lysann Zander, Thorsten Henke and Jürgen Baumert <i>Holding Micro-Level Network Mechanisms Accountable for Observed Macro-Level Group Segregation. The Case of Language-Delineated Student Groups in Bilingual Education.</i>
13:53-14:13	Luka Naglifá and Lovro Šubelj <i>War Pact Network Model: a Generative Model of Networks That Shrink</i>	Marco Tonellato , Alessandro Lomi and Jürgen Lerner <i>Building the Team: an Empirical Analysis of Team Assembly Mechanisms and Network Embeddedness in Robot-Assisted Surgery</i>	Jordan Tchilingirian <i>Policy Intellectuals in a Time of Crisis a Social Network Analysis of British Think-Tanks and the Field of Policy-Knowledge Production 2005 - 2017</i>	Timon Elmer and Guirong Fu <i>Mental Health in Friendship Networks: Symptom-Specific Selection and Influence</i>	Julia Perczel and Balazs Vedres <i>Social Sequence Analysis on Historical Big Data - a Case Study</i>	Tobias Frey and Thomas Friemel <i>Investigating Social Structures Beyond Friendship. the Role of Social Referents and Social Networking Sites Regarding Health Behavior Among Adolescents</i>	David Kretschmer , Lars Leszczensky and Swetlana Nowoshenowa <i>Gender Differences in Religious Segregation of Adolescents' Friendship Networks</i>
14:16-14:36	Christian Zingg , Giona Casiraghi, Giacomo Vaccario and Frank Schweitzer <i>A Network Approach to Calculate the Entropy of Social Organisations</i>	Lászlo Lőrincz , Rikard Eriksson, Guilherme Chihaya, Dávid Takács, Balázs Lengyel and Aniko Hannak <i>The Structure and Geography of Internal and External Co-Worker Ties</i>	Jan-Erik Refle , Manuel Fischer and Martino Maggetti <i>Policy Networks and Swiss-EU Interactions in the Energy Sector</i>	Flora Samu and Ákos Bocskor <i>The Dynamic of Gossip: an Empirical Study How Interpersonal Communication About Others Changes Opinion-Based Support</i>	Delio Lucena , Olivier Accominotti and Stefano Ugolini <i>Measuring Systemicness in the International Financial Network During the First Globalization</i>	Daniel Maier <i>Vaccinating Everybody? Simulating Transmission Processes of the Human Papillomavirus in Sexual Contact Networks and the Impact of Prevention Programs</i>	Dorottya Kisfalusi , Lilla Dorina Habsz, Márta Radó, Károly Takács and Béla Janky <i>Are High Performing Roma Pupils Considered as "Acting White" in Hungarian Schools?</i>
14:39-14:59	Michael Heaney and Philip Leifeld <i>The Multiplexity of Lobbying Coalitions</i>	Slobodan Kacanski <i>Social Selection Mechanism in Corporate Governance Network</i>	Tamara Shcheglova <i>Identification of the Structure of Behavioral Patterns in Socio-Political Groups in Online Social Networks</i>	Srinidhi Vasudevan <i>Board Processes, Director Selection and Risk-Taking Behaviour of Firms</i>	John Mowbray , Neil Rollings and Mark Tranmer <i>Using the Relational Event Model with Diary Data: an Illustrative Example Based on Margaret Thatcher</i>	Emily Long <i>Mental Health in Adolescent Social Context: Using Social Network Analysis to Examine Patterns in Mental Wellbeing</i>	-
10:30-11:00	Coffee Break at Foyers E & D South						

Parallel Sessions 9 - Wednesday 11 Sep, 15:30 - 17:00



	Room E33.1	Room E33.3	Room E33.5	Room E7	Room E21	Room E22	Room E23
15:30-17:00	Session A9: Complex Social Networks (2/2)	Session B9: Organizational Networks (4/4)	Session C9: Challenges and opportunities for studying evolving stakeholder networks	Session D9: Ego and Personal Networks	Session E9: Networks and the Study of the Human Past (4/4)	Session F9: Health Behaviour Networks (3/3)	Session G9: Intergroup Relations in Social Networks (2/2)
15:30-15:50	Balazs Lengyel , Gergő Tóth, Johannes Wachs, Ákos Jakobi, Riccardo Di Clemente, Bence Sagvari and Janos Kertesz <i>Urban Segregation Conditions Network Effects on Income Inequality</i>	Evgenia Dolgova and Pursey Heugens <i>Dynamics of the Academic Hiring Networks Among European Business Schools</i>	Sebastian Stevens and Arunangsu Chatterjee <i>Social Capital Theory as a Framework for Stakeholder Connectivity Within an eHealth Innovation Ecosystem: a Case Study of the EPIC Project</i>	Béatrice Milard and Yoann Pitarch <i>How Personal Networks Shape Scientific Communities?</i>	Carla Galluccio , Paolo Cimadomo and Giancarlo Ragozini <i>Reconstructing the Ties Between Jewish Settlements in Galilee via Multiplex Network: First Results</i>	Claudia Zucca and Mark McCann <i>Explaining the Normalization of a New Theory in the Complex Network of Organizations That Deal with Public Health in Scotland</i>	Florian Beng and Teresa Isigkeit <i>Making Visible the Consolidation of Scientific Fields Using Inter- and Intragroup Relations</i>
15:53-16:13	Haiko Lietz , Marcos Oliveira and Florian Lemmerich <i>Emergence of Order in Scientific Conferences</i>	Marco Castellani <i>Hybrid Semantic Networks as Grounds of Cognitive Maps</i>	Tymofii Brik , Natalia Shapoval and Mylovanov Tymofiy <i>To What Extent New Auction Systems and Political Ties Increase Competition in Public Procurement? New Evidence from Emerging Markets in Ukraine</i>	Martin Everett <i>Unpacking Burt's Constraint Measure</i>	Tom Brughmans <i>Exploring Visual Signalling Networks of Medieval Strongholds in Garhwal Himalaya, India</i>	Gilles Merminod , Imane Semlali, Ana Terrier, Orest Weber and Pascal Singy <i>Chronic Pain Communication in Elders' Social Networks</i>	Diego Palacios Farias , Paula Luengo Kanacri, Christian Berger, René Veenstra and Jan Kornelis Dijkstra <i>Promoting Social Cohesion in Classrooms: Examining the Effects of an Intervention on Prosocial Behavior and Civic Engagement on Friendship and Liking Networks</i>
16:16-16:36	Christoph Martin and Peter Niemeyer <i>The Relationship Between Global Network Measures and the Robustness of Centrality Measures</i>	José A Rodríguez , John Mohr, José Luis Condom Bosch, Alberto Martín Pérez and Aitor Domínguez <i>A Social Network Approach to the the Happiness Industry Social Field</i>	Christina Prell , Michael Paolisso, Elizabeth Van Dolah, Christine D. Miller Hesed, Jose Daniel Teodoro and Katherine Johnson <i>Messing with the Boundaries: the Challenges of Defining and Studying a Participatory Stakeholder Network</i>	Balint Dioszegi , Anne Ter Wal and Valentina Tartari <i>Making Haste Slowly: Interaction Pacing and Group Dynamics During Entrepreneurial Networking Events</i>	Maria Carmela Schisani , Giancarlo Ragozini and Daniela D'Ambrosio <i>From Core to Periphery: Marine Insurances in the Naples Business Network over the 19th Century (1820-1900)</i>	Sarah Geber <i>The Structure of Normative Perceptions: How Young Drivers' Egocentric Friend Networks Form Normative Perceptions About Drinking and Driving</i>	Gerald Mollenhorst <i>Geography and Intergenerational Network Contacts</i>
16:39-16:59	Przemyslaw Siemaszko <i>Global Games on Social Networks</i>	Yasaman Sarabi , Heather McGregor, Matthew Smith and Dimitris Christopoulos <i>Market Dominance - Do Network Ties Matter? an Analysis of Interlocking Directorates of the UK FTSE350</i>	-	Michal Bojanowski <i>Local Brokerage and Access to Unique Information</i>	Ramona Roller and Frank Schweitzer <i>The Letter Correspondence Network of 16th Century Reformers: Examining Possible Driving Factors of Communication</i>	Isidro Maya-Jariego , Daniel Holgado and Deniza Alieva <i>The Network of Local Coordinators in the Implementation of a Community Program to Prevent Drug Abuse</i>	-
17:30-19:00	Poster Session & Farewell Reception at Foyers E & D South						
20:30-23:30	Hospitality Suite at Kanzlei Club						

EUSN 2019 - Poster Submissions

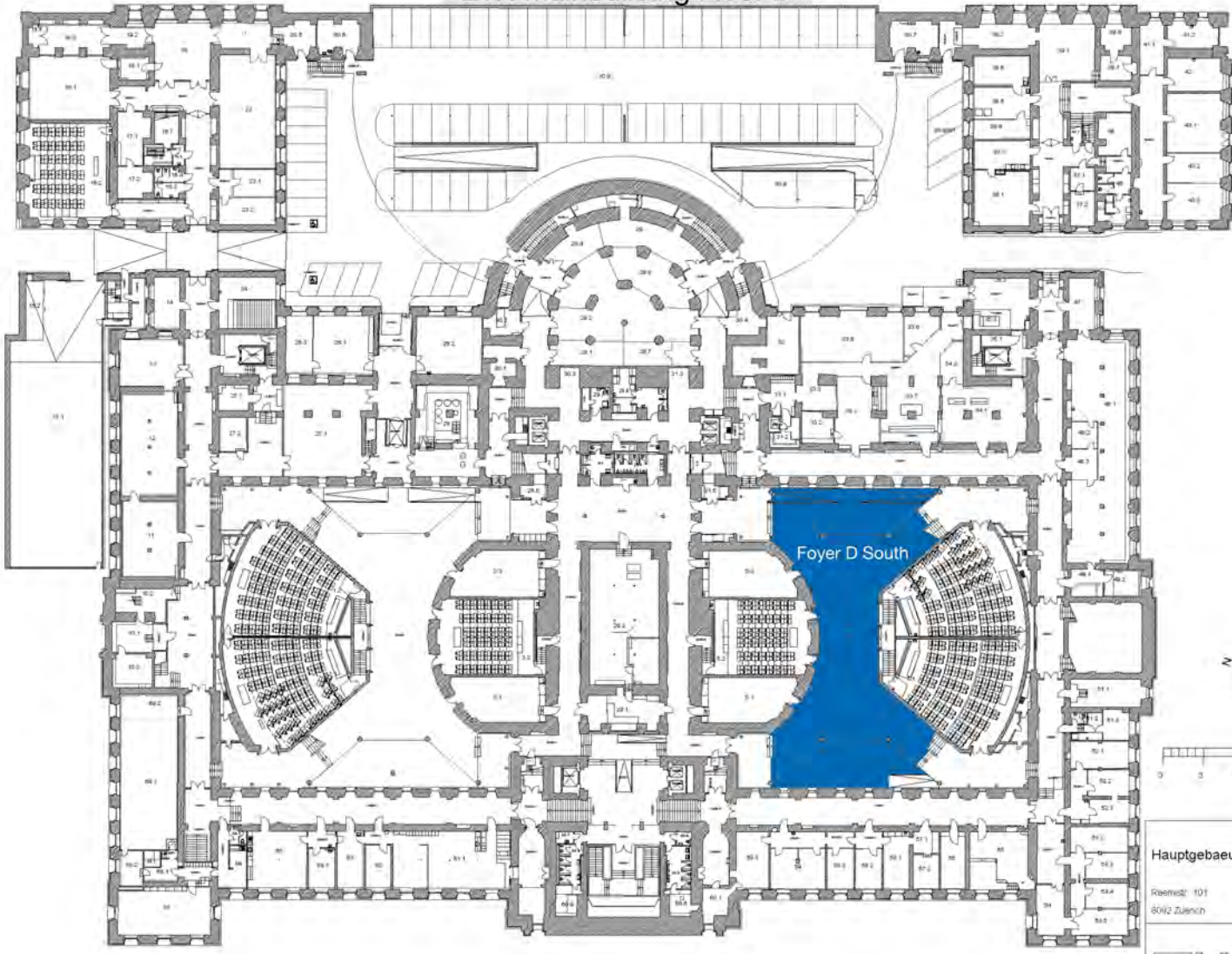
Poster Session: 11 Sep 2019

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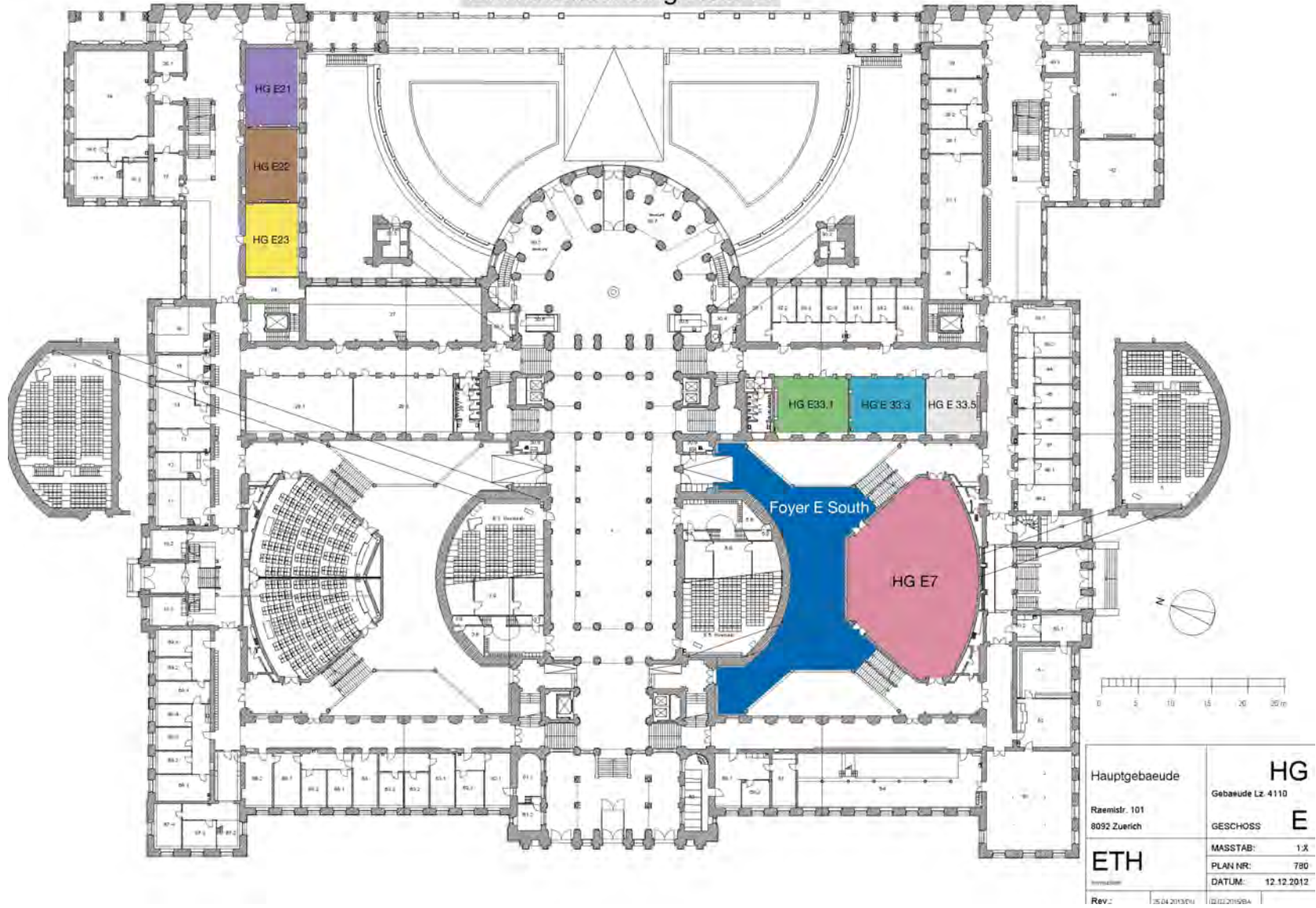
Wednesday 11 Sep	
Zoltán Kmetty, Anna Vancsó and Dániel Váry	Acquiring Personal Facebook Data – Is it still possible?
Cinderella Komolafe, Agnes Lukacs J. and Beata David	The Role of Special Colleges in the Process of Structural Mobility
Melissa Twemlow, Maria Tims and Svetlana Khapova	Structuring for Proactivity in Agile Teams: Towards a Network Perspective on Team Member Proactivity and Team Performance
Meltem Alemdar, Christopher Cappelli and Jessica Gale	Early Career Teachers' Personal Support and its Impact on Retention and Persistence in Schools
Onintsoa Ravaka Andriamihaja	Operationalization of the Telecoupling Concept with Social Network Analysis: Case of North-Eastern Madagascar.
Theodoros Katerinakis and Yiorgos Alexopoulos	Greekcovering in Progress: Cooperative Banks of Chania and Karditsa Crafting an Innovative Foundation of Resilience and Spatial Development Using Network Tools
Jörg Hartmann and Jan-Philip Steinmann	Do Their (traditional) Partners Hold Them Back? Mechanisms of New Refugee Women's Social Integration in Germany
Thomas Goll	Political Education from the Beginning? – Interruptions Instead of Lifelong Learning
Caterina Bembich and Sorzio Paolo	Social Network Analysis in the Study of Early School Leaving
Igor Francetic and Fabrizio Tediosi	A Social Network Analysis of Referral and Advice-Seeking Flows in Two Rural District Health Systems in Tanzania
Yi-Fang Yu, Te-Tien Ting, Jay Chiehen Liao and Carol Strong	The Dynamics of Adolescents' Pubertal Development, Depression and Friendship Networks
Jose Teixeira	An Empirical Case Study of Collaboration Among Competitors in the Open-Source Arena
Yvonne Hegele	The Effects of Ministerial Portfolios on the Policy Coordination Network
Hannah Muelder, András Vörös, Kieran Mepham and Christoph Stadtfeld	Aggregating Individual Group Perceptions in Social Networks
Thomas Grund, Elisa Bellotti and Martin Everett	Toward a Gendered Theory of Networks
Thomas Grund	Bringing Social Context Back in: Reciprocity, Triadic Closure and Homophily Across School Classes
Ashwin Rambaran, Gianluca Gini and Tiziana Pozzoli	Peer Influences on Defending Self-Efficacy in Early and Middle Adolescence
Bernie Hogan, Joshua Melville, Patrick Janulis, Gregory Phillips II and Michelle Birkett	Network Canvas: Articulating Key Considerations for the Collection of Roster and Ego-Network Data
Jose Teodoro, Christina Prell, Laixiang Sun and Melissa Kenney	The Ties that Bind Climate Science and Practice in Coastal Adaptive Comanagement
Danila Sidorenko and Alexander Pavlov	Social Network Analysis of Heroes Cooperation in Dota 2 Professional Scene
Christiane Kellner	Network Research: a Means to Evaluating Project Success?
Zsolt Ember, Eva Huszti and Bea David	Composition of Social Network and its Effects to Health Behaviour and Mental Health Among Roma People
Anna Abalkina	Plagiarism and Academic Fraud in Dissertations
Helga Dizdari and Roland Seiler	The Influence of Players' Attachment Styles on Intra-Team Relationship Dynamics. An Inferential Social Network Analyses Perspective on Sport Teams

ETH Mainbuilding Floor D

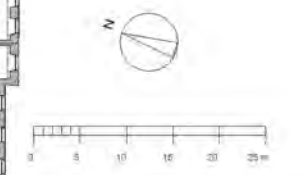
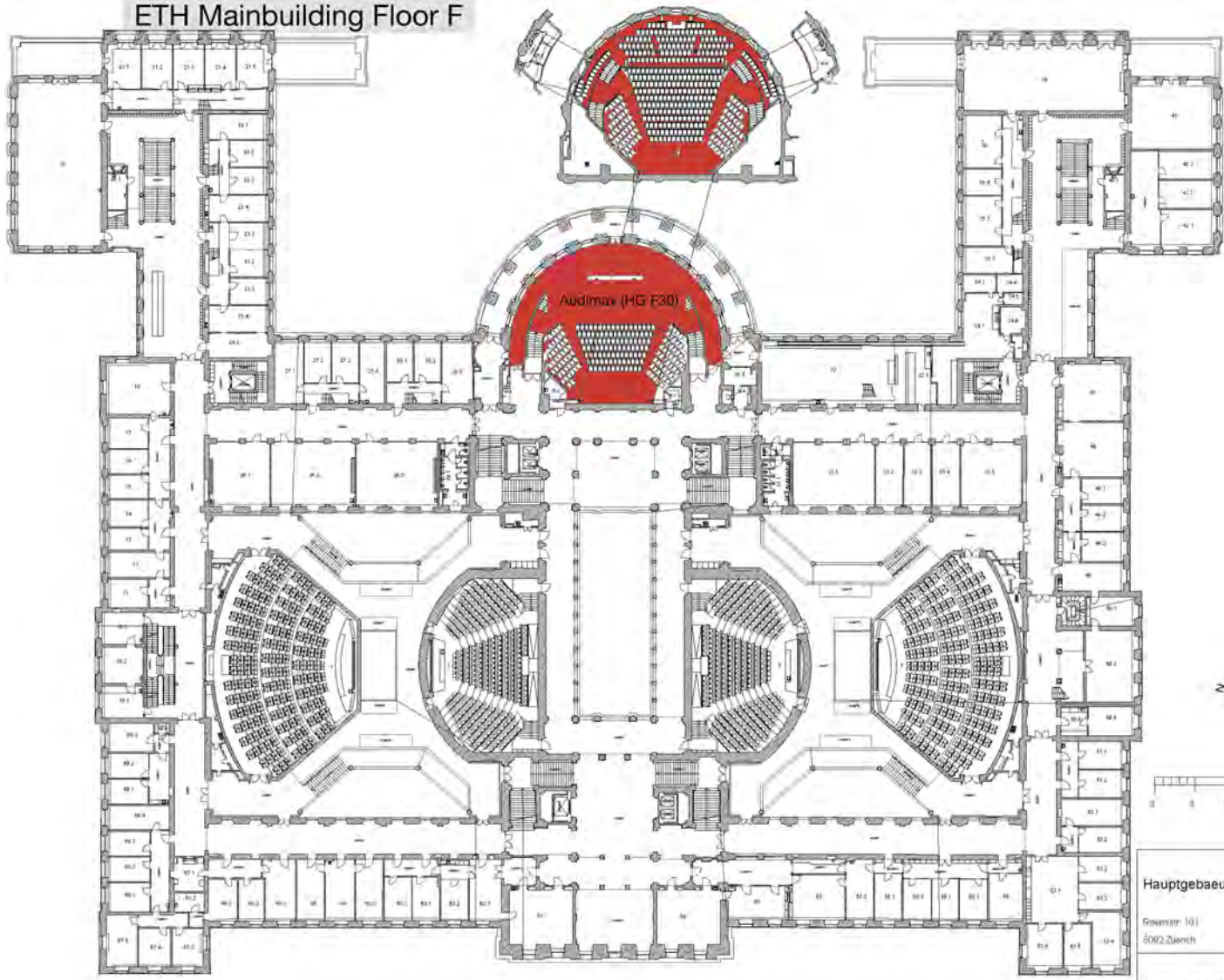


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Rev:	14.10.2018A	21.12.2018B
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ETH Mainbuilding Floor E



ETH Mainbuilding Floor F



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		PLAN NR. 782	
		DATUM 12.12.2012	
Rev:	07.04.2014/SL	24.02.2016/BA	27.02.2016/BA



List of Abstracts

Keynotes

Chair: Christoph Stadtfeld

Applied Statistics in Social Network Analysis

Marijtje van Dujn

University of Groningen, Netherlands

With the advance of statistical modeling techniques for the analysis of complex social network data, the complexity of the analysis and – especially – the interpretation of its results has increased as well. This development requires an effort from social network researchers, builders of new models and software and applied researchers alike. Taking the perspective of the statistical consultant/collaborator, I investigate – good and perhaps bad – practices in applying statistical models in social network analysis. The aim of the investigation is to gain more understanding of the process, not per se to find a “best” practice. One set of theoretical guiding principles can be found in statistical pragmatism as coined by Robert Kass, which focuses on the “big picture of statistical inference”. The big picture connects data and scientific and statistical models to be able to arrive at conclusions about research questions. This approach goes beyond the usual inferential approach based on samples from populations, which is difficult to apply in social network analysis. Another set of practical guiding principles can be found in the well-known setup of research papers, defining a research question leading to testable hypotheses, data collection method and description, statistical hypothesis testing and results, with –ideally – a discussion on the validity and generalizability of the research. The intersection of both principles revolves around the “results”, perhaps –statistically- significant, and their interpretation in relation to the research question. In tune with many other researchers, I would like to argue that this provides a too narrow view, especially in social network analysis. Taking a broader perspective, and building on both older and more recent research, the value of visualization becomes clear immediately. Second, a good understanding of the statistical models used is important as well. In view of the rapid developments in the last two decades, this requires a larger effort, both for the applied researcher and for the statistical “expert”. Simulation studies may be an important tool for this purpose. Moreover, the collaboration within a research team deserves some further attention as well, with respect to division of tasks and responsibilities. The talk will be illustrated with “real” applications and experiences.

Chair: Lars-Erik Cederman

Truth, Democracy, and the Social Network

David Lazer

Northeastern University, United States

Democracy, in part, depends on the premise that people make choices based on a collectively reasoned understanding of the world. Our understanding of the world, in turn, is mediated through our connections— to people, to institutions, and to sources of information. The logic of our connections - to people, and to various truth-constructing institutions - have been undergoing a remarkably fast evolution the last generation. This presentation will reflect on some of the emerging logics of the information ecosystem of the 21st century, and their implications for democracy.

Methods (Session A1)

Chair: David Schoch

Are You Really Interested in This Relation?

Ulrik Brandes¹, Stephen Borgatti²

¹ ETH Zurich, Switzerland

² University of Kentucky, United States

While indices such as degree centrality are based directly on the ties in a network, most indices in network analysis implicitly evaluate another relation derived from the given one. Examples include geodesic distance in closeness centrality, Freeman dependency in betweenness centrality, and redundancy in Burt's constraint. We argue that it is beneficial to factor out the derivation of a relation of interest from the construction of indices for three reasons: (i) many new indices are obtained from the use of other derived relations than the ones initially incorporated in an index, (ii) it becomes possible to test the assumptions implicit in the use of a derived relation independent from an index, and (iii) more general statements about indices can be made by using assumptions that hold for multiple relations.

Role Formation in Networks

Julian Müller, Ulrik Brandes

ETH Zurich, Switzerland

Role equivalence of actors in social networks is generally formalized via a self-referential definition of the equivalence of neighborhoods. A drawback of this approach is that, empirically, non-trivial role equivalences are rare. We therefore propose to break up the self-reference in the formalizations. Comparing the relationships of actors for some given equivalence then yields a new equivalence. Iterated applications of such comparison operations lead to a deterministic process of role evolution on the network. For specific definitions of this process, well-known role equivalences such as structural, regular, or exact equivalence are obtained as fixed points to which the process converges. However, we are not limited to the study of fixed points but find the evolution of role structures and cycles in the process of independent interest. Finally, our generalization allows for the exploration of other, more complex kinds of roles through incorporation of additional actor and tie variables in the comparison of neighborhoods.

Comparing Different Methods for One-Mode Homogeneity Blockmodeling According to Structural Equivalence on Binary Networks

Aleš Žiberna

University of Ljubljana, Slovenia

One-mode homogeneity blockmodeling is an idea to clustering networks that searches for partitions of units in the network, that the resulting blocks, that is parts of the network that contain (possible) ties from units of one group to units of another group (or ties within group) are as homogeneous as possible (some measure of variability on them is as low as possible). Typically, sum of squared deviations from the mean is taken as the measure of variability.

In this presentation, the results of a simulations study will be presented where several methods for this problem are applied to binary networks generated according to structural equivalence. Several versions of homogeneity generalized blockmodeling (using relocation algorithm) and a k-means based algorithm will be compared. Since all compared methods try to optimize the same criterion function, this will be the main criteria for comparison. All methods will be given the same amount of time to find the best possible solution.

The networks on which the methods will be tested will be sparse binary networks. The number of units will vary from 200 to 800, the number of clusters from 2 to 16. The “null” or empty blocks will have the density of 0.05, while the density of the “complete” or non-empty blocks will vary from 0.06 to 0.16. The image matrix (the matrix defining, which blocks will be “null” and which “complete”) will be such that each groups will have on average 1.5 ties to other groups.

Leveling Ties in Two-Mode Networks

David Schoch

The University of Manchester, England

Networks can be made of various kinds of ties, but (often implicit) assumptions embodied in network-analytic tools do not necessarily apply to all of them. Centrality indices, for instance, build on the assumption that it is always beneficial to add more ties. Consequentially, networks that include ties with a negative sentiment require different concepts of centrality. We here highlight a third general type of tie, the leveling tie, which is neither positive nor negative but an indication of commonality. We argue that these ties occur particularly often in one-mode projections of two-mode networks which therefore restricts the applicability and interpretability of standard network analytic tools. We introduce a set of alternative methods to analyse networks with leveling ties, guided by their formal connection with the class of interval graphs. The practical and theoretical considerations are illustrated with two-mode networks from different contexts. These include the derivation of ideological alignments of legislators in U.S. congress based on co-voting patterns, socio-economic status based on occupations of married couples and political alignments of subreddits based on commenting patterns.

(Session B1)

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Movie Networks (Session C1)

Chairs: Pete Jones, Termeh Shafie

Measuring Centrality in Character Networks

Jones Pete¹, Johan Koskinen²

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In recent years, a number of studies have emerged in which network analysis has been used to study fictional narrative texts. This approach is usually referred to as the study of “character networks” – networks in which the nodes are characters from a fictional text. Most often, these papers have been focused on literary texts (such as plays and novels), though a smaller number of papers have applied a similar approach to film texts. One of the assumptions behind pursuing this kind of approach is that network tools may help us to build further understand of and insights into the texts. Indeed, several papers have noted that network centrality measures are a good example of tools which can be used to explore the character networks. In practice, existing studies have pursued this by computing measures such as degree, betweenness and closeness for nodes in the network, and using this to make claims about those characters’ importance in the narrative. However, this approach is very limited in its ability to tell us anything meaningful about the narrative as it is always based on a static, aggregated network representation. This is an inappropriate representation of narratives as networks, as temporality and sequence are fundamental concepts in the definition of narrative. Narratives are defined in large part by the order in which events are organised, and our ways of making sense of stories are intimately bound up in questions of temporal sequence. Static network representations cannot therefore offer satisfactory models of narrative texts as the crucial temporal dimension of sequence is lost through aggregation, even if frequency of interaction is retained as tie weights. As narratologist Gérard Genette points out, this elimination of time from the narrative “is not only not sticking to the text, but is quite simply killing it”. To put the problem another way, calculating centrality measures on static network representations gives us a static marker of a character’s importance, but it does not make sense to characterise a character’s importance as a fixed property because character importance evolves dynamically over the course of a narrative. Characters can occupy different positions within the narrative through time, and the dynamics of this should be of key interest in any network-based study of narrative texts concerned with questions about characters’ positions within the narrative. Instead, we propose some principles for measuring narrative centrality in ways that are more in line with key ideas from narratology. We describe a method for constructing character interaction networks from films based on observed vocal interactions between characters, and offer a simple illustration of what this dynamic approach can offer using examples from recent blockbuster cinema. We hope that this discussion can help move the character networks approach forward and provide an example of where the approach might become a tool for more serious study of narrative texts.

Gender Dependent Structures of Dialogue Networks in Films

Termeh Shafie, Pete Jones

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We present a novel approach to empirically analyse gender representation in films by using entropy tools. Multivariate entropy analysis is a general statistical method for analysing and testing complicated dependence structures in data consisting of repeated observations of variables with a common domain and discrete finite range spaces. Only nominal scale is required for each variable, thus making it very suitable for extracting semantic information from dialogues and scripts. Variables on ordinal or numerical scales can also be used, but they should be aggregated so that their ranges match the number of available repeated observations. Using a corpus of movie dialogue networks, we illustrate how these tools can enhance the analysis of gender representations in films by identifying factors associated with certain tropes of gendered conversation. The observed dialogue networks are transformed into a multidimensional data set comprising multiple node and edge attributes, where the latter is coded according to conversational content between pairs of same sex characters. Under the assumptions that associations between conversational content are shared by members of the same gender group, dialogues are used to reflect a meaning structure that characterise this group (stereotypical and non-stereotypical gender portrayals). Furthermore, we use the output of the entropy analyses to specify different structural models to be tested against null distributions according to stochastic blockmodels and random multigraph models. This application yields a deeper insight into the gendered nature of dialogue in film, an area in which little systematic empirical research exists. Moreover, the multivariate entropy analysis allows for the relationships between textual attributes, production-level attributes and endogenous network attributes to be explored together. This provides a novel opportunity to situate the character networks within their industrial context in a way that provides a new layer to the development of network tools for analysing fictional narrative texts.

Using Data Science to Understand the Film Industry's Gender Gap

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Data science can offer answers to a wide range of social science questions. Here we turn attention to the portrayal of women in movies, an industry that has a significant influence on society, impacting such aspects of life as self-esteem and career choice. To this end, we fused data from the online movie database IMDb with a dataset of movie dialogue subtitles to create the largest available corpus of movie social networks (15,540 networks). Analyzing this data, we investigated gender bias in on-screen female characters over the past century. We find a trend of improvement in all aspects of women's roles in movies, including a constant rise in the centrality of female characters. There has also been an increase in the number of movies that pass the well-known Bechdel test, a popular—albeit flawed—measure of women in fiction. Here we propose a new and better alternative to this test for evaluating female roles in movies. Our study introduces fresh data, an open-code framework, and novel techniques that present new opportunities in the research and analysis of movies.

The Emergence of New Hollywood: Identity Formation from Symbolic Networks

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The 1960s saw a shift from Classical Hollywood Cinema to New Hollywood. This shift included changes with respect to visual and narrative style and mode of production. It was driven by a community of young filmmakers that shared an artistic understanding of auteur filmmaking and challenged the predominant commercial understanding of Classical Hollywood Cinema. We ask how New Hollywood filmmakers formed their collective identity and drew boundaries from the old Hollywood studio system. Sociologists have studied identity formation from different perspectives. One stream in the identity literature highlights the significance of social networks for the formation and recognition of collective identities. A different stream highlights the significance of symbolic boundaries for identity formation. Historical studies of New Hollywood reveal evidence for both mechanisms. On the one hand, the collaborative nature of filmmaking entails the emergence of social networks. On the other hand, filmmakers can express symbolic boundaries through symbolic references, such as dialogue sequences that one film borrows from another. The use of symbolic references entails the emergence of a symbolic reference network. To resolve this tension, we analyze collaboration and symbolic reference networks of New Hollywood filmmakers. We use data from the Internet Movie Database (IMDb) and analyze collaboration and symbolic reference networks of 23,516 American filmmakers and 40,361 feature films between 1930 and 1985. The two-mode collaboration network consists of filmmakers (directors, writers, cinematographers) that are connected to films in which they participated. The symbolic reference network consists of films that are connected to films of which they included a symbolic reference. We analyze both networks with respect to patterns that indicate boundaries including the number of sub-components and modularity. At the time of New Hollywood (1960s/1970s), first results show clearer boundaries for the symbolic reference network than for the collaboration network. These findings indicate that identity formation of New Hollywood filmmakers operated through symbolic reference networks rather than collaboration networks. These findings also resonate with the idea of auteur filmmaking. Auteur filmmaking highlights the role of the individual director as decisive for the filmmaking process which rather prohibits the emergence of collaborative social networks. We argue that New Hollywood filmmakers used symbolic references to signal to each other their auteur identity and to draw symbolic boundaries between them and the old Hollywood system while producing within the walls of the old Hollywood studio system.

Inference and Generalisability in Modelling Samples of Networks and Multi-Level Network Data (Session D1)

Chairs: Pavel Krivitsky, Marijtje van Duijn

Representativeness and Generalisability of Inference for Exponential-Family Random Graph Models from Samples of Networks

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Joint modelling of large samples of networks collected from similar settings—classrooms, households, etc.—has a long history, with a variety of methods available to pool information in model estimation and inference. In the exponential-family random graph modelling framework, these methods range from post-hoc two-stage meta-analyses to sophisticated multilevel approaches. However, relatively little attention has been devoted to the generalisability of this inference, especially when the sample of networks is effectively a convenience sample, and when the population of networks is heterogeneous in size and composition. We consider two samples of within-household contact networks in Flanders, Belgium, which used very similar survey instruments but very different sampling designs: 1) a sample of 318 households, selected based on having children 12 years of age and under, for which the dyad census has been observed, and 2) a generally representative sample of 1265 households from the region for which only contacts incident on one respondent were observed. By applying the principles of model-based survey sampling inference, we propose to combine the strengths of the two datasets, while making explicit the assumptions previously left implicit in this type of analysis. Our approach allows us to borrow concepts and diagnostic tools from generalised linear modelling to produce parameter estimates that are meaningful and generalisable to the entire population of networks, while allowing complex within-network dependence to be represented.

A Relational Event Model for Real-Time Analysis of Email Interactions in a Large Dynamic Network of Consultants

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There has been an increasing interest in understanding how social networks evolve over time. The study of network dynamics is often based on modeling the transition of a (small) number of snapshots of the network observations. The approach however is not suitable for analyzing networks of event streams where edges are constantly changing in frequency, strength, sentiment, or type in real time. We present a relational event approach for directly modeling interaction rates as a function of endogenous which depend on the passed event history and exogenous variables. As the effects of these variables are likely to be dynamic, a moving window approach is utilized to investigate how the effects change in real time. Depending on the chosen window length either short-term or long-term effects can be investigated. We show how Bayes factors and posterior model probabilities can be used to quantify the statistical evidence in the data for the existence, direction, and relative strength of the network drivers, over time. The method is used for analyzing streams of email messages about innovation activities between approximately 2500 employees in a consultancy firm. As the number of directional edges that are at risk is huge (approximately 6,2 million), computational feasibility is a serious issue that will be addressed. It will be shown how the method can be used to uncover the dynamic effects of hierarchical, geographic and divisional differences over a year and to get new insights about the dynamic integration process of new employees in an organization.

Structuring and Negotiation Mechanisms in Longitudinal Educational Networks - an Analysis of the PISA Multi-Level Network Using an Agent Based Simulation Study

Alexander Brand

University of Bamberg, Germany

Differentiation practices in the field of education are a fundamental factor for the emergence and reproduction of social inequality. In addition to the individual characteristics of actors at the micro level, macro-structural conditions such as educational policy and the way knowledge resources are recorded have an impact on the structuring of opportunities within society. These social facts are not simply given but represent the result of recursive conflicts between different motivations. This study aims to develop an agent-based model of the cooperation network of the institutions involved in the PISA study in order to obtain a more precise overview of the negotiation process of such decisions and to examine to what extent the different types of actors could dynamically structure educational policy decision-making processes by attempting to assert their interests. For this purpose, the Habitus Field Theory according to Bourdieu will be applied to derive rules of action for the actors in the field of power. The procedure used here offers the advantage of being able to respond very precisely to the different motivations of the actors for acquiring transferable capital or gaining power of disposal over the rules of transferability. In order to obtain a suitable theoretical overall concept for the modelling, more recent theoretical connections between Bourdieu and network theory are used, which allows an explicit reference to social capital and complex actions of the actors in and between fields. Based on the data of the PISA multi-level cooperation network, which nodes and edges were collected between April 2016 and July 2017, a simulation study will be carried out in order to examine how connections between actors in and between fields can develop. The multiplex network constructed for this purpose consists of 1796 nodes, a total of 4114 edges and includes agents from the academic field, economic field, professional field, bureaucratic field, political field, field of philanthropy, field of consulting, cultural field, field of education, and field of military. The first layer consists of officially announced cooperation at institutional level between the OECD and other agents. The second layer includes relationships based on co-affiliations and Interlocking directorates and the third layer includes co-author network structures derived from PISA-related documents like official reports. Subsequently, Temporal Exponential Random Graph Models are calculated for the actors in order to test which emergent effect can be determined at the level of the overall network. Since an agent-based study usually reveals a large influence of the input parameters for the actions, sensitivity analyses (Fourier amplitude sensitivity testing - FAST) are carried out in order to consider the influence of the model formation.

Studying intertwined social-ecological systems as networks: Methodological and conceptual advances, and new substantive insights (Session E1)

Chairs: Örjan Bodin, Manuel Fischer, Karin Ingold

A Network Approach to Analyze Social-Ecological Fit in Swiss Wetlands Governance

Mario Angst, Martin Huber, Manuel Fischer

EAWAG Aquatic Research, Switzerland

Despite efforts to improve the governance of ecosystems, their degradation is an ongoing problem. The social-ecological system (SES) framework enables researchers from diverse disciplinary backgrounds to address problems in the governance of ecosystems. The SES framework allows to frame social units (e.g. governance systems and actors) and ecological units (e.g. resource systems and resource units) in analytical categories. Those analytical categories can be assessed using a social-ecological networks (SEN) approach as a theoretical concept as well as a methodological approach to research interactions within the SES. The SEN approach conceptualizes the ecological units and their interactions as a first network, the social units and their interactions as a second network, and – crucially – the relations between social units and ecological units as a third network. The approach then combines these three networks to assess the occurrence and arrangement of specific network configurations, the fit between social and the ecological networks, and to evaluate the influence of network structures on governance outcomes. In contrast to relatively well established procedures to assess social network structures within an SEN, the conceptualization and operationalization of management-relevant ecological networks within SEN models is still in its infancy. We propose a novel approach to conceptualize relevant ecological relations within an SEN based on the open standards (OS) framework. The OS framework was developed to structure the governance of ecosystems into management activities and impact factors related to ecosystem governance goals and has a long history of use in practice. Our presentation will focus on a SEN in the context of wetland ecosystem governance in Switzerland. Wetlands are among the most resource- and species-rich ecosystems in central Europe. However, since most wetlands in Switzerland are located in highly populated areas, there exists a high level of conflict between use and conservation targets within these areas. This makes wetlands an interesting case to see to what degree political variables influence the collaborative governance of ecosystems. For this talk, we will focus on wetlands in the Swiss Reusstal region. The case combines actor-related (e.g. political variables like actor's interests and power) and institutional factors (e.g. institutional borders and multi-level governance structures) influencing the social-ecological fit in an SEN.

You Are What You Eat: Grouping Users Together Using Their Common Interests, a Case Study on Disinformation Propagators

Daniel Grinnell

Cardiff University, United Kingdom

This paper introduces a novel method for relating social media users together by leveraging commonalities in users' own social networks. By identifying common nodes in each pair of user's immediate social networks rather than direct connectivity, a much richer and more granular relationship between users can be calculated, including a commonality ratio. The novelty of this approach is that this does not require direct linking or interaction between a pair of users, nor content analysis in order to aggregate and classify users. This network-based method significantly advances the ability to define clusters of social media users with similar interests in a language agnostic manner. This paper then goes on to demonstrate the application of this methodology to understand a set of users who act as sources for disinformation propagators. It demonstrates the ability of this methodology when coupled with cluster analysis to rapidly define communities of interest to these disinformation propagators. These derived clusters are then qualitatively and quantitatively analysed as a unit in terms of their content, in order to identify trends and commonalities in the account portrayal, nature, and content. Finally, this paper will consider the calculated network's characteristics which are present, and what inferences can be made from these.

A Network-Based Research Paradigm to Enhance the Research on Social-Ecological Systems

Örjan Bodin

Stockholm University, Sweden

A big question confronting social network research is: how do different social networks produce different outcomes? This question is particularly eminent for Social Ecological Network Analysis (SENA) because an important aim of this research is to help in the development of effective policies and interventions enhancing system level outcomes such as sustainable use of natural resources. This presentation presents theoretical and methodological challenges facing SENA in moving beyond single case studies heavily laden with local context. It is based on the work of a collaborative group of 19 scholars from different scientific disciplines and locations. From this work, key advantages and important constraining factors in applying network-based research to social-ecological systems will be presented. For us, a social-ecological system can favorably be represented as a multilevel network comprising distinct social and ecosystem levels, with interdependencies within and between the social and ecological systems – a social ecological network. Current network methodologies such as ERGMs and SAOMs can be applied to such networks to produce novel results about the prevalence of certain social-ecological structures and processes. But effective, sustainable environmental governance requires a good understanding of the causes and consequences of these patterns of social-ecological interdependencies, and needs to relate such social-ecological patterns to global outcomes. We argue two key advances are needed to build the new but currently rather scattered field of SENA into a coherent research paradigm: (i) a typology of causal assumptions explicating the causal aims of any given study of a social-ecological system; (ii) unifying research design considerations about how to conceptualize exactly what is interdependent, through what types of relationships, and in relation to what kinds of environmental problems. The former also involves elaborating what research methods and analytical approaches are suitable for what causal aims. The latter encompasses a set of considerations on how to best describe the study object as a network of nodes and links, and an analytical perspective that builds from a realization that there are certain core aspects of environmental problems that re-occur across multiple contexts and scales. We draw from previous studies to demonstrate how these advances combine into a comparative heuristic that facilitates leveraging case-specific findings of social-ecological interdependencies to generalizable, yet context-sensitive, theories based on explicit assumptions of causal relationships.

Social Capital (Session F1)

Chair: Marie-Pierre Bes

Selecting Top Performer' Ideas for Team Creativity? Team Learning Goal and Top Performer's Advice Centrality

Yingjie Yuan

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The role of top performers – the most creative individuals within work teams – is an intuitive yet elusive question in both creativity research and practice (Aguinis & O'Boyle, 2014; Groysberg, Lee, & Nanda, 2008). Successful team creativity relies on the selection of high-quality ideas for creative products and services (Girotra, Terwiesch, & Ulrich, 2010; Rietzschel, Nijstad, & Stroebe, 2019). Thus, it is vital to understand when and how top performers' ideas get selected by work teams, and in turn shape team creativity. The present study integrates the motivational perspective and social network perspective to address this question. I first propose that team learning goal is more positively related to the selection of top performers' ideas when top performers are highly creative. Because learning-oriented teams that strive to master challenges are more likely to pursue their creative ideas when top performers present highly unconventional and groundbreaking ideas (i.e., highly creative). Drawing insights from the literature on advice networks, I suggest that the advice centrality of top performers translate this joint impact of team learning goal and top performers' individual creativity on team idea selection. The rationale is that, in learning-oriented teams, top performers that are highly creative are more likely to be sought for advice for the comprehension and dissemination of their creative ideas, which in turn facilitates teams to select their ideas. To further investigate its performance implication, I examine how this interplay between team learning goal and top performers' individual creativity affects team idea selection to promote team creative performance. Hypotheses were tested and supported on a multi-sourced dataset of 49 teams across various organizations. In response to recent calls for motivational views of how teams pursue highly creative ideas (Alexander & van Knippenberg, 2014) and network readings of team creativity (Yuan, 2019), this study advances team creativity literature by examining how top performers shape team idea selection and creative performance (via advice centrality), and how team motivation (i.e., learning goals) catalyzes this positive effect.

Choosing a Job: Who Influences You the Most, Parents or Friends?

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In this paper we study who influences you most when deciding between a public and a private sector job: parents (vertical channel) or friends (horizontal channel). After constructing a novel database and developing a network analysis, we measure the influence of peers' tastes on the willingness to work for the public or private sectors. Then, we compare the peer effect with the impact that parental occupation has on individuals' preferences for a public or private sector job. For the private sector, our findings show that the influence (marginal effect) of friends is larger than the influence of parents. The opposite is found for the public sector. However, in the latter case the overall effect of the horizontal channel may overcome the vertical one because individuals may have several friends but just two parents. By gender, parents and friends influence more women than men.

Relation Chains for Getting an Internship

Marie-Pierre Bes

LISST, France

The communication will be based on a recent study conducted among students (N=277) in Engineering and Business Schools about how they found, precisely, how they searched an internship. Our goal is to obtain enough information (number of people, socio-demographic variables, nature of tie, and rationale of the choice) about relational chains used in this kind. At first, the method is, in the spirit of Granovetter's thesis (1973, 1983), to know which channels (market, institution or networks) have been used to search a firm, which accepted to take the student and which personal contacts the used. However, our method differs from the current in considering, not only the one which success, but all the alternatives. For that, we conduct direct interviews and asked the students to tell us all the "stories of searching", including failure stories, focused on the type of contacts and nature of social ties, step by step. Here, a step is an interaction between student and firm. The method is so based on the quantitative narrative method (Grossetti & alii, 2011). The results underline, for the "winner", in comparison with the others, the short length of chains (mean = 2), strong ties with the first intermediate in half cases and use of strong ties for the students belonging to the upper social class. These results reject in part the theory of weak ties since we consider the whole chain and not only personal and direct networks but confirm Bian's (1997) results. Additionally, the study underlines direct contacts in face-to-face, which represent half of cases, despite in a world where media social and phone exchange seem to be prevalent. We suggest in conclusion some analysis of the relation between high social status, strong ties and short chains, related to Lin' capital social studies.

Migration, Transnationalism and Social Networks (Sessions G1, G2, G3)

Chairs: Marian-Gabriel Hancean, Miranda Jessica Lubbers, Jose Luis Molina

Networked (Im)Mobility Patterns in a Transnational Social Field

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A growing body of research into the networked character of migration and mobility has stressed that most migrants tend to know people in the country of destination even before they arrive, and that these network members give them important support upon arrival. However, most of this research samples “on the dependent variable”, namely migrants in a given destination country, artificially separating them from the people who never migrated and those who decided to return. We argue that we can obtain a deeper understanding of the role of social networks in transnational migration and (im)mobility by examining these groups jointly. In this proposal, we therefore analyze the role of social networks for the migration and mobility of individuals in a transnational social field connecting a community of origin (Dâmbovița in Romania) with a community of destination (Castellón de la Plana in Spain). Specifically, we ask the following question: In what ways are the current and past migration experience of network members related to individuals’ own trajectories within the transnational social field that spans these two locations? Furthermore, we analyze whether the type of relationship with network members mediates their role for mobility. Traditionally, SNA research into migration has strongly focused on family ties, but there is still a lack of clarity with respect to the role of friendship ties. We use data from the ongoing research project “The Role of Social Transnational Fields in the Emergence, Maintenance and Decay of Ethnic and Demographic Enclaves” (ORBITS) (MINECO-FEDER-CSO2015-68687-P). This project adopted an original mixed-methods, multi-sited fieldwork methodology, in which both migrants in Castellón de la Plana and non-migrants and returnees in Dâmbovița were sampled through an RDS-like binational link-tracing design. In total, 304 interviews were held. In the interviews, respondents were asked about their own migration trajectories and their personal networks were elicited (with an average size of 18 members). Also, they were asked to give referrals to other potential survey participants in both places. For our analysis, we first conceptualized and developed an indicator of respondents’ mobility on the basis of their migration status (migrant, returnee, or non-migrants), the frequency of transnational visits, and intention / failed attempts to move. Second, we developed a typology of personal network composition based on the interplay of four alter characteristics (country of residence, current and/previous migration experience; frequency of communication with ego; relationship role). Third, we analyze the relation between personal network composition and mobility using regression analysis, controlling for ego’s sociodemographic variables and for the dependency structure in the sample. Our results show that the complexity of mobility patterns can be better understood when

taking into account all three groups of actors (migrants, non-migrants and returnees). Moreover, this study contributes to an assessment of the importance of family versus friendship ties for different mobility patterns.

Measuring Transnational Social Fields Through Binational Link-Tracing Sampling

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We advance an innovative data collection methodology for sampling from transnational social fields - transnational networks embedding migrants and non-migrants. This methodology, built by adjusting an existing bi-national link-tracing sampling design, was used to collect information about one of the largest migrant populations in Europe (the Romanian diaspora). Network and attribute data were collected about people living in a Romanian sending migration community (Dâmbovița, the place of origin) and in a Spanish receiving migration place (Castellón, the destination area). After one year of ethnographic fieldwork, 304 face-to-face pen-and-paper semi-structured interviews were conducted simultaneously in both sites (150, in Spain, and 154, in Romania). We employed a link-tracing sampling method, starting from a set of nine purposively selected seeds (Romanian migrants established in Castellón). From these seeds, we continued in a chain-referral way, until we reached the sample size target of at least 150 interviews in both sites. Name generators were applied to the study participants (egos) to elicit their social contacts - alters (family, friends and acquaintances) living in Spain, Romania and other countries. Also, participants were asked to provide data on the relationships among the alters. Inter-connecting the egos' personal networks, we built a multi-layered complex network structure embedding more than 5,000 nodes. The link-tracing network (one of the layers) consists of 1,068 people and 1,185 ties. Using spatial autoregressive models, we examined whether the created network structure affects the migration intentions of the embedded participants. Homophily on observed attributes (sex and place of residence) was detected in the nomination patterns of the respondents. Also, our data suggest that participants' migration intentions are positively affected by direct contacts within the network, which might be indicative either of peer influence or social selection effects. Moreover, in the origin place, migration intentions are positively affected by the ability of using a foreign language and negatively, by age. Chances of remigration are increasing in the destination area as age increases. Our research contributes to the emerging efforts of applying social network analysis to the study of international migration. In this line, we suggest future ways of investigating the impact of transnational social fields upon attitudes such as intentions to change the country of residence. Also, we provide methodological suggestions for improving link-tracing sampling from transnational networks of migration.

Scientists on the Move: the Global Brain Circulation-Network

Luca Verginer

ETH Zurich, Switzerland

Global mobility of scientists is an important modern phenomenon with economic, societal and political implications. Attitudes towards international migration have soured in recent years, with economic migrants being the most talked about issues in both media and public discourse. However, also mobility of high skill labour has come under fire. To inform the debate on this issue, we offer a high level overview of mobility and brain circulation patterns at global scale. The analysis of global mobility patterns remains challenging, due to difficulties in obtaining individual level mobility data. In this work we reconstruct the international mobility network of about 3.7 million scientists moving between 9,745 cities across the globe and augment this network with scientific output measures to estimate various aspects of brain circulation phenomena and its impact on scientific production. We highlight that international scientific mobility is marked by national borders and language affinity, and show that international exchange can contribute to the scientific output growth of selected global hubs. We do also observe that the mobility network is dominated by a handful of "global cities" which attract scientists from a wide range of locations, but outward mobility is predominantly between these "global cities". Moreover, we find evidence to suggest that these global cities attract highly productive scientist early on in their careers, suggesting a superior ability to identify talent. We reconstruct the network using MEDLINE, a large public literature repository maintained by the National Library of Medicine. Due to its nature the repository covers mostly bio-medical literature but other fields such as Physics or Economics also well represented.

Analyzing International Mobility of Researchers Through Affiliation Addresses in Web of Science Publications

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In the new global economy, high-skilled migration has become a central issue for research and policy. This is reflected in numerous studies investigating mobility of professionals between countries. In this study, we focus on the movements of researchers, as a subcategory of migration processes among the highly skilled people, which have far-reaching consequences for the exchange of knowledge and development of new ideas as well as shaping the competitive advantage of countries involved in the resulted circulation of knowledge and expertise. Studying migration of the highly skilled (and researchers in particular) at the global level is difficult with classic demographic methods, in part because a world migration survey does not exist. Here, we use bibliometric data as a complementary approach to study international mobility of researchers. This makes a direct focus on movements of scholars possible through the equivalent of a “census” of publications. The feasibility of this method has already been tested in some earlier studies in the literature which use bibliometric data to estimate migration flows. Existing numerical results on this topic are descriptive and more comprehensive discussions have remained speculative with studies based on collections of publications that are too small to be representative of the scholars’ international mobility. While there are some methodological challenges in studying mobility using bibliometric data, this novel approach is shown to be worthwhile provided that results are combined with supplementary insight into methodological limitations and therefore interpreted with care. While similar methodologies have been deployed in the past, there is still uncertainty involving researchers’ international mobility in different disciplines which this study aims to shed some lights on. A key advantage of using bibliometric data for studying mobility of researchers is the availability of millions of publications in bibliometric databases such as Web of Science, Scopus, and Dimensions. Each publication serves as a data point that maps authors to places on a certain publication date. These data points not only refer to researchers, but also provide information about their fields of research and the disciplines of the publication venue. This study is a two-step endeavor which involves constructing a longitudinal dataset on mobility of researchers to obtain geographical trajectories as career paths of scholars. The trajectories would then be used to generate migration estimates. In addition, by leveraging the network structure of the data, we hope to be able to test and advance network theories of international migration. We track international movements of researchers through the changes in the affiliation addresses of over 30 million publications indexed in the Web of Science database since 1990. By that, we establish a longitudinal dataset on mobility of researchers which involves over 70 million authorships across a large number of research topics in different

disciplines. Observing that most researchers do not show any evidence of international mobility, we provide detailed results on the small fraction of scholars whose affiliation track represent international moves. Using the data for mobile scholars, circular and return migration estimates can be provided for different disciplines and subject categories.

Network Effects in Internal Migration

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We focus on the role of social networks in Hungarian internal migration. We analyze two levels of the migration decision: the decision to leave the current residence and the relocation decision made between alternatives by their place utility. When analyzing migration rates of, and the migration rates between the pairs of them, we identify two types of network effects: the effect of previous migration and the effect of connections on an online social network. One of the most apparent function of social networks about migration is decreasing the information costs and risks. Accordingly, previous migration experience in the community increases out-migration rate, and previous movements between a source and destination area have a positive impact on subsequent migration. Presence of family and friendship networks increases the attractiveness of specific destinations for several reasons. They may help the migrants finding jobs or housing, provide emotional aid and companionship. Previous migrants maintain some of their relationships after moving, so they create new relationships between their place of origin and their new place of residence. Therefore a self-enhancing chain migration can occur. In the recent decade much of the communication activity occurs on social media platforms. Accordingly, it was found that friendship-maintenance on social media is positively related to bridging social capital. Social media supports maintaining existing ties, the creation of new ones, and also to reactivate latent (lost) ties. Our analysis is based on the combination of three databases. We use the Hungarian Central Statistical Office's (CSO) domestic migration database, which includes the source and target municipalities of each migration within Hungary, its date, and information on migrants' demographics. We aggregated this to municipality (N=3154) and municipality-municipality levels (N=470,939) for the analysis. The characteristics of the municipalities are covered by the T-STAR database of the (CSO). We used principal component analysis to create six factors describing the characteristics, and available services at the municipalities. The online social network data are based on the archive of the iWiW social network site. This includes 3,762,529 individuals, which represented approximately two-third of the Hungarian internet users in the early 2010s. We analyze the number of connections within and outside the community per user for each municipality when modelling out-migration; and the share of the destination municipality within all external connections in the location choice model. Results indicate that more connections on the online social network outside the municipality is associated with increased out-migration, but more internal connections impede out-migration. This effect is apparent in regression models controlling for demographic composition and characteristics of the municipality, but also after controlling for out-migration rate of the past year, and after controlling for out-migration rates for the last 5 years. Results about location choice show that network connections between two municipalities increase

migration in a regression model with source municipality fixed-effects. This effect is stable after adding previous migration rate, or migration rates for the previous 5 years, or migration rates for the previous 5 years together with fixed effects for the destination municipalities.

Reciprocity and Self-Identifications in Refugees' Social Support Ties

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Transnational migration burdens personal networks in many ways, for example, when contacts to people in the country of origin weaken or when context specific social capital depreciates abroad. War refugees face additional strains since their families are often dispersed across different countries. What is more, in the German case refugees are – at least in the beginning – systematically segregated from the rest of society and find themselves in a situation of multiple deprivation (financial, housing, health, etc.). This raises the question how refugees manage to rebuild personal social support networks in an extraordinarily challenging biographical phase. The presentation addresses this question by looking at social support networks of refugees from Syria, who migrated to Germany in 2015 and 2016. The focus lies on a particular type of relation: close, supportive bridging ties to people established in the host country (e.g. Germans or second-generation migrants). Such 'meaningful bridging ties' typically provide support in different forms, for instance instrumental support for job searches, social companionship, or emotional support. Refugees frame these relations with intimate labels such as "my German mother", "sister" or "soul mate", which indicates that they are not (any more) predominantly about giving support. I show in particular how refugees negotiate social support in meaningful bridging ties. Empirically, such negotiations involve mutual alignments of expectations with regard to reciprocity (giving, receiving, and reciprocating support). Moreover, they touch upon refugees' self-identifications since meaningful bridging ties are protected domains in which respondents are able to escape the stigma of being a 'refugee'. This indicates that dealing with resource scarcity via personal support networks is linked to dealing with marginalised social positions and stigmatised discursive categories. The presentation combines qualitative interviews with standardized and unstandardized network methods. A total of 43 refugees were a) invited to narrate their lives in the host country, b) asked about their support networks (9 items on instrumental and emotional support, social companionship and obligations) and c) prompted to visualise and elaborate on their support network.

Partners' Independence in Core Discussion Networks. Native Endogamous, Foreign-Born Endogamous and Mixed Couples in Spain

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The study of immigrants' personal networks is gaining increasing attention in recent years, mostly in relation to the social support provided and received in different moments of ego's migratory experience and various geographical contexts. On the other hand, in last decades literature has widely analysed core discussion networks, where homophily based on ethnic origin has been proved to be of enormous relevance. However, there are still some gaps in the knowledge about the precise position of spouses and intimate partners in these core networks when the ethnic component is taken into account and, to our knowledge, there is hardly any research that has considered together both partners' perspectives. In this research, we use a nationally representative sample for Spain that contains information about both members of the couple's core discussion networks. This allows us to focus simultaneously on these networks for both members of the cohabitant couples. Specifically, we compare three types of couples: native endogamous, mixed (Spaniard – non Spaniard) and foreign-born endogamous, in order to answer the following research questions: a) Does the partner's role differ according to type of couple? (partner being elicited or not, and the extent to which ego can discuss important matters with him/her) b) What degree of independence exists between the partners in terms of non-shared alters? Is it affected by partners' national origins? c) How is network density related to couple types? How can it influence partners' independence? In order to answer question a) we use multilevel modelling (alters nested within egos, who are nested within couples) and, for question b), we build a variable about alters overlap that refers to the couple as a unit of analysis, so conventional multivariate regression models are applied. Preliminary results show that the role of the partner varies according to type of couple. As native endogamous, mixed and foreign endogamous couples are compared, the role of the partner as someone with whom ego can discuss about every important matter is less obvious for the foreign endogamous couples. However, it is in mixed couples where a higher proportion of independent alters (alters that do not belong to both members' core networks) is found. Findings suggest different scenarios in case of couple breakup implications. (Funded by the Spanish Ministry of Economy, Industry and Competitiveness (Project reference: CSO2017-86349-P))

Flows of Economic Remittances Within Social Transnational Fields

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University of Buchares, Romania

Given that one of the main motives for migration is the betterment of the economic situations of families, research into transnationalism on the flow of people is tied to the research of money and goods. Surprisingly, the study of remittances has been mostly performed from an individual point of view, which tends to see migrants as isolated from the networks in which they are embedded. Recently, the incorporation of social network analysis into the study of transnationalism argues that individuals do not act in isolation. There is already accumulating evidence suggesting the benefits of emphasizing the backbone of migration flows, i.e. tie configurations embedding persons, countries, cultures etc. The network framework suggests that ties between social actors could be viewed both as channels for the transmission of money and goods, but also norms, values or institutional expectations. Still very few research projects capture relational data intended to map the structure of migration networks connecting people in the destination, origin and other worldwide places. We build on the data collected through the ORBITS project (MINECO-FEDER-CSO2015-68687-P). A personal network research design is employed to analyze the flows of economic remittances (money and goods) within transnational social fields (interconnected personal networks transcending borders). We investigate the personal networks of 304 Romanians migrants in Spain (Castellón) as well as of their social contacts in the origin country (Romania, Dâmbovița). Employing statistical models, we explore the association between structural and compositional network features and the circulation of money and goods (e.g. geographical dispersion of families, frequency of communication, emotional closeness etc.). The results of our analysis uncover what node attributes and network positions facilitate the flow of economic remittances controlling for the particularities and the micro-economic characteristics of our transnational social field (Castellón – Dâmbovița). These findings contribute to the body of literature into social network effects that explores the mechanisms of diffusion and transmission through networks – e.g., smoking and other health related behaviors, musical preferences or viruses. At the same time, we contribute to the recent efforts of bringing network analysis in the study of migration.

Exploring the Impact of Homophily on Finding a Job

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Nowadays, the different ways migrants have tried to find a job have intensified with the development of technology and tend to rely more and more on it. Still, the question that arises is linked to the past. How did migrants manage to find a job despite of not being part (yet) of the country of destination? Various answers come from the literature on migrant networks, viewed as social mechanisms through which people have access to economical and labour opportunities. Research on job opportunities for migrants is multi-faceted. Some studies show that networks provide network capital, a form of social capital that links people interpersonally to job opportunities. Social ties (e.g. relatives, friends or acquaintances) help individuals take the decision to migrate and provide information about the destination area, such as finding jobs or accommodation. Also, they provide important information about jobs that usually cannot be found through formal application. Scholars are stressing that access to information about jobs is strongly influenced by being part of the social structure. Other studies introduce social homophily. Working people are more inclined to be friends to similar others in terms of working status. There is a large probability that individuals with a certain type of job in the country of origin to seek for jobs information and interact with social ties from the country of destination who are working on similar positions. Hence, network members working in the same industry are more inclined to offer information about similar occupation. In this oral communication, we look at how the transnational social field (structural and relational components of the interconnected personal networks) influences the ways migrants are finding certain types of jobs before they arrive at destination. There are few studies in which data about the process of finding job opportunities for migrants are captured and analyzed with the specific tools of personal network analysis, especially in the area of transnational social fields. We explored data collected through the ORBITS project (MINECO-FEDER-CSO2015-68687-P), which describe the flow of social contacts of Romanians in a Spanish demographic enclave (Castelló) and their place of origin in Romania (Dâmbovița). We investigate the personal networks of 304 Romanian migrants in Spain (Castellón) as well as of their social contacts in the origin country (Romania, Dâmbovița). We employed a mixed methods research. Using regression models, we investigated if compositional attributes (e.g. multidimensional homophily) are associated with finding certain types of occupations. Hence, we explore how migrants are influenced in their job search by the demographic characteristics of their personal networks. We add qualitative insights from ethnographic fieldwork in order to understand the causal mechanisms underlying the statistical results. Our research contributes to the systematic literature on applying social network analysis to the study of employment opportunities for migrants. These results add to the knowledge on how personal networks influence the

probability of finding a certain type of jobs for migrants across transnational social fields, and more particularly, across ethnic and demographic enclaves.

Types of Embeddedness and Successful College Transition in the Case of Roma Undergraduates

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College transition for Roma undergraduates can be viewed as a structural mobility, since students' origin is an ethnically homogeneous, low-educated group, while the host environment is composed of non-Roma intellectuals. To model this special college transition, we adapted Brandes and his colleagues' social network model, originally with migrants' integration processes in focus. Based on the proportion of origin, fellow and host alters we identified three relevant egocentric network types by cluster analysis. Then we examined which type of embeddedness (closed, balancing, embedded) is the most successful from the aspects of social capital, sense of belonging, and subjective well-being. We examined the students of Christian Roma Collegium Network in Hungary between 2012 and 2016. We mapped their egocentric network structure with contact diary (one-week long) and analysed with EgoNet software, and applied questionnaires on their value system and mental health. One hundred and twenty-four Roma college students were included in the analysis. Those Roma students who had extended, open, brokerage network with both fellow and host alters reported better on subjective well-being, and the sense of belonging level was significantly higher, since this type of network provides the most ties to the university. College students, whose closure network is dominated by the fellow group, had reported better subjective well-being as well; however, the sense of belonging level was significantly lower. Being close to the special college community could weaken the ties related to the university. Results also highlighted that students, whose network is overrepresented by the origin group, try to equilibrate between fellow and host groups, run the risk of breaking their networks to separated components. These college students reported worse on subjective well-being. In accordance with research studies on low-status minority students our results suggest that extended, open, and heterogeneous networks simultaneously can provide both bonding and bridging resources that eventually induce positive coping strategies. However, when one has to adjust to the three groups simultaneously and face the demands of different norms that cannot be done without serious mental costs. Results also highlighted that through the strong, supportive ties, college community can provide substantial stability for students balancing between the origin and host milieu.

Communication Networks (Sessions A2, A3)

Chairs: Tobias Frey, Thomas Friemel

Information Sharing on Social Media

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In social media, the diffusion of a topic is governed by user decisions to share or re-distribute content. We add to the growing body of literature by considering interdependencies between spreading topics. The diffusion of a topic might indeed affect the spread of another by stealing or boosting audience attention. According to attention economics and triggered in part by availability bias, we posit that this mutual influence will be particularly visible for thematically related topic items. To study mutual influence we construct a network on a clearly delineated subject: Twitter messages sent in the wake of a celebrity's death. These events are quite common, have a wide diffusion due to their high level of human interest and are characterized by a well-defined timing. From an initial analysis of data we collected in 2018, we conclude that topic salience displays strong regularities with the occasional notable deviation possibly due to mutual influence. To analyse this phenomenon, we build a network of recently deceased celebrities who are related by the overlap of their audiences on Twitter. We test whether celebrities more central in this weighted network have a stronger influence on the attention devoted to the death of other celebrities. As a methodological contribution we devise a suitable notion of positional dominance to capture centrality in the weighted network.

Social Capital of Ukrainian Students: Study Achievements, Values, and Resistance to Disinformation

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In social media, the diffusion of a topic is governed by user decisions to share or re-distribute content. We add to the growing body of literature by considering interdependencies between spreading topics. The diffusion of a topic might indeed affect the spread of another by stealing or boosting audience attention. According to attention economics and triggered in part by availability bias, we posit that this mutual influence will be particularly visible for thematically related topic items. To study mutual influence we construct a network on a clearly delineated subject: Twitter messages sent in the wake of a celebrity's death. These events are quite common, have a wide diffusion due to their high level of human interest and are characterized by a well-defined timing. From an initial analysis of data we collected in 2018, we conclude that topic salience displays strong regularities with the occasional notable deviation possibly due to mutual influence. To analyse this phenomenon, we build a network of recently deceased celebrities who are related by the overlap of their audiences on Twitter. We test whether celebrities more central in this weighted network have a stronger influence on the attention devoted to the death of other celebrities. As a methodological contribution we devise a suitable notion of positional dominance to capture centrality in the weighted network.

Polarization of Beliefs Due to Homophily in Communication and Credibility of Fake News

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We investigate how people's beliefs can be polarized due to the spread of fake information in social networks. In particular, we model how the emergence of polarization can occur due to (i) the precision or credibility of misinformation during its inception into the society (conceived as a large social network), and (ii) homophily in communication among people with differing beliefs. Homophily in communication creates groups of people with bounded beliefs about reality, and hence can polarize a society. Credibility of fake news circulating in the social network can lead to acceptance of the (fake) news depending on agents' susceptibility to it, thereby changing beliefs and creating polarization. We show that fake news can not polarize the society unless it has a minimal level of credibility, irrespective of the level of homophily in communication patterns. We conduct an empirical investigation of the effect of homophily in communication patterns on the level of polarization. For this, we use evidence from Twitter conversations on the climate change topic. There are two important findings. (i) Homophily and polarization are entangled in a long run equilibrium, i.e., they are cointegrated, and they both mean-revert to deviations away from equilibrium. (ii) Homophily negatively affects polarization (Granger-causality sense), and the effect holds only in the long run. Therefore we infer that anti-climate tweets do not carry enough credibility to polarize the society. Hence, in general, although detecting fake news is important, detection and prevention of "credible fake news" is more helpful for the society at large.

Minimizing the Misinformation Spread in Social Networks

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Boğaziçi University, Turkey

Influence Maximization Problem has been widely studied in recent years due to rich application areas including marketing. It involves finding k nodes to trigger a spread such that the expected number of influenced nodes is maximized. The problem we address in this study is a competitive extension of the reverse influence maximization problem, i.e., Misinformation Spread Minimization Problem (MSMP) where two players make decisions sequentially in the form of a Stackelberg game. The first player (leader) aims to minimize the spread of misinformation whereas the second player (follower) aims its maximization. To this end, the leader protects h nodes in advance taking the response of the follower into consideration. Then, the second player selects k unprotected nodes to start the influence propagation and the diffusion process unfolds until no more nodes can be activated, according to the widely used Linear Threshold model. In this model, a node becomes active if the total weight of the arcs coming from its active neighbors exceeds a threshold. Due to the uncertainties in the node thresholds, the MSMP is a stochastic optimization problem and it is modelled as a discrete stochastic bilevel programming formulation using the live-arc technique to define the scenarios. Two algorithms, one greedy heuristic and one matheuristic, are proposed for the first player's problem. In the greedy algorithm, the set of nodes to protect is decided in a constructive fashion based on the marginal contributions of the nodes to the reduction of spread. In the latter, the solution space of the leader is searched via a Tabu Search based method while the follower response is estimated for each leader solution visited. In both algorithms, the second player's problem is approximated by Sample Average Approximation, a well-known two-stage stochastic programming solution method which is based on taking samples from the scenario space repeatedly and solving an approximation problem for each sample. This method is augmented with a state-of-the-art algorithm developed for the influence maximization problem to improve the time efficiency of the proposed algorithms. The numerical study shows that the performances of the algorithms are similar in terms of both solution quality and running time for networks with less than one hundred nodes. As the network size increases, the greedy algorithm is outperformed.

Between the Civil Society and the Corporation: Construction of the Meaning of Freedom of Speech in Internet Governance

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Freedom of speech on the internet is the topic of heated debates and controversies, with discussions including governments, private companies, and civil society as major stakeholders. In particular, multiple perspectives on freedom of speech are expressed within the internet governance domain where actors engage in discussions of key issues that influence how internet is run and developed. However, there is little knowledge about how the meaning of freedom of speech is constituted by different stakeholders involved in internet governance. In this paper we study how the notion of freedom of speech is constituted at the Internet Governance Forum, a multistakeholder UN-mandated event for public policy debates on internet-related issues. The data consists of transcripts of discussions at dynamic coalitions of the Forum that took place from 2010 to 2018. Drawing on the structural conception of meaning, we apply semantic network analysis to the corpus of texts to map collocations between words and extract connections between concepts related to the topic of freedom of speech as they were articulated by different stakeholders. Analysis of resulting semantic networks uncovers how connections between concepts provide a particular framing for the notion of freedom of speech. We find out that the notion of freedom of speech is constituted primarily within human rights and technical frames. Moreover, analysis of changes in semantic networks reveals that around 2013 a human rights framing of freedom of speech became less salient, while a technological framing became more salient. These findings are discussed in the context of recent scholarship and interviews with experts.

Ever Talked About Smart Homes, Car Sharing or Digital Farmers Markets?

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The spread of ideas, trends and products, can heavily be influenced by our social networks. When it comes to innovations which help reduce our carbon emissions, understanding how social influence can be utilised to increase adoption is a crucial step towards a sustainable future. A wide-variety of consumer-facing low carbon innovations which offer novel attributes already exist within our daily lives and have the potential to disrupt incumbent firms - from the way we travel, what we eat, how we interact with our homes and where we get our energy. However, these innovations only exist in small market niches and their impact has been limited thus far. To help mitigate climate change they need to be diffused rapidly and adopted extensively. Interpersonal communication among social networks exchanges functional information on an innovation's attributes and social information on group identity, status and social difference. Such communication can help reduce perceived uncertainties and risks and demonstrate an innovation's value to end users. Crucially, however, previous studies have focussed on sustaining rather than disruptive low carbon innovations (DLCIs). Social influences on diffusion are very different for disruptive innovations as, by definition, they do not offer incremental improvements on the attributes identified in the literature as influencing adoption rates. Rather they offer wholly new attributes to end users. Using the Diffusion of Innovations theory this research investigates the role of social influence in the spread of DLCIs, discovering how and by whom the attributes are valued, and the extent to which this is communicated socially by early adopters to non-adopters. A national online survey conducted in the UK with over 1000 participants collected data on the attributes valued by early adopters of 16 DLCIs and the perceptions of those attributes by non-adopters. This information has been critical for analysing the gap between disruptive innovation niches and the mass market, as well as providing a population-level reference point. A second online survey was administered to early adopter and non-adopter groups for three case study innovations i.e. smart home technologies, car sharing schemes and digital farmers markets. This survey examines whether or not interpersonal communication channels help narrow the gap between the niche and mass market. Data was collected on participant's ego networks and communication behaviour (whom they communicate with and what innovation attributes they discuss). Using social network analysis techniques, results provide a comprehensive account of interpersonal communication by early adopters and the relative importance of social network structure and adopter heterogeneity for the flow of information regarding the DLCIs. The results of this research not only provide insights into the characteristics of early adopters and their social networks, they also help identify marketing strategies and policy actions for using social influence to accelerate a low carbon transition.

Breaking Eggs and Baking Ties: Connecting Cultures in “E-Vasilopita and E-Avgomachia” Networks

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Easter and Christmas are milestones in the Christian calendar and shape the social life of major populations. Easter is an ascetic process towards resurrection and Christmas season finds its own peak point in New Year’s Eve, covering significant populations of Russian Federation, Greece, Serbia, Romania, Bulgaria, Georgia, Cyprus, Poland, Albania, Czech Republic, Slovakia, Modenegro among others as well as their diasporas. Countries are identified with the birth and re-birth concepts connecting families and social groups together. Understanding networks means identifying the most important actors, ties, and relations. Furthermore, customs, as communal identifiers of “applied culture” are key indicators of social cohesion especially when spirituality is based on philanthropy; i.e. on the loving of the other under the bond of agape. In cases like Greece and Cyprus and their diasporas centrality in communicating customs is defined as the relationship between structure and influence within small groups. In the current paper a real-life network, incorporating egg-breaking and cake-sharing, is showcased using the analytics of on-line participation and network metrics. Competing with eggs (“avgomachia”) symbolizes conflict of good with evil, in a contest that leads to friendly conflict resolution. The focal signifier of intra/inter family networks in all those communities is the preparation for dyeing eggs and waiting for the Easter day to break, as well as the baking and sharing of the traditional St. Basil’s cake called “vasilopita”. Eggs encapsulate life and substances of life, where as Christmas cake incorporate the act of sharing. The modus operandi of e-avgomachia and e-vasilopita is founded around the virtues of peace, agape, equality, hospitality, respect, justice, and unity as values of social capital; values that make people assemble around eggs and cake expressing preference, desire, motivation and homophily. Social Network Analysis supports the argument for behaviors and behavioral outcomes “your friends who live miles away have just as big an impact on you as your next door friends”. Field data from followers -as friends of the vasilopita and avgomachia-related customs, and network representations support the premise that keeping customs in religiously homogenous communities is a demanding task. In the current paper, the bottom-up approach of the physical egg-crashing and vasilopita cake customs are scaling-up via the on-line network that stimulates the original application of these customs. E-avgomachia and e-vasilopita are on-line networks that increase the “productivity of culture” in a Habermasian lifeworld of interconnected members; although low betweenness may be manifested, nodes are holding tight in periodic seasonal occurrences to practice their customs on-line; participation increases, exercise and execution of customs flows, and network actors feel more inclusive in a secular way, when they are co-present to

break eggs and bake cakes beyond religious connotations. The innovative “e-avgomachia and e-vasilopita” networks are enhanced by relevant "commodities" (traditional products and brands that promote locality). The act of shared participation in the virtual world of e-eggs and e-cakes redefines the sense of belonging and generates homopolar ties of enculturation. E-avgomachia and e-vasilopita realize innovative ways for diffusion of customs and connect cultures, especially in times of crises.

Open-Access Assortativity of Coauthorship Networks

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Typically, indexing services of scientific publications provide a variety of relational and attribute datasets and as such they are often subjected to a variety of social network analyses. Here, we are focusing on the time-dependent bipartite graph of authors and sources (journals etc.), where the former publish their contributions. Moreover, we are interested in the Open-Access (OA) type of sources (at the time of publication). A first step in the analysis of such a dataset often is to aggregate over time (typically over year(s) during which the OA type of a source might remains the same) deriving thus a number of weighted graphs of authors vs. sources for each time period. Subsequently, one may project the bipartite graph over the mode of authors in order to obtain the known co-authorship graphs among individual authors (according to common sources to which a pair of authors publish) or over the mode of sources getting the so-called intersection graphs among publications (according to authors publishing to a pair of sources). The latter intersection graph will be referred here as co-publication graph (having nodes sources linked according to authors publishing in them). As for the OA type of publications, apparently, it is a categorical attribute in the co-publications graph, while it can generate a continuous (scalar) attribute in the co-authorship graph in the following way. First, to each of the OA types, one might assign a real number (called OA score) in the interval -1 to $+1$ so that the paywalled type corresponds to -1 and the gold open access to $+1$. Subsequently, to each author, there corresponds a cumulative OA score as the sum of all the OA scores of this author's publication. Thus, the cumulative OA score becomes the continuous (scalar) attribute of nodes (authors) of the co-authorship graph. Finally, to measure the assortativity (or mixing) of either the co-authorship or the co-publications graph, one might use Mark Newman's assortativity coefficient either for the OA type as a categorical attribute of publications or for the cumulative OA score as a scalar attribute of authors. Here, we are going to exhibit the results of such assortativity computations in the context of four datasets extracted from the Web of Sciences: (1) publications on "Open Science," (2) publications on "Computational Social Science," (3) publications on "Digital Humanities" and (4) publications on "Feminism." Our aim is to compare the levels of OA assortativity among these three important fields of current research and scholarship.

Collaboration networks. Methods and Applications (Sessions B2, B3, B4, B5)

Chairs: Giuseppe Giordano, Giancarlo Ragozini, Maria Prosperina Vitale

Network Effect on Individual Scientific Performance: Evidence on the Italian Scientific Community

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Several studies have shown that scientific productivity depends, among other factors, on scientists' attitudes towards collaboration in research. In their collaborative interactions, scientists can benefit by both methodological and technological complementarities and synergy, improving the quality and quantity of their research output. In this stream of research, Social Network Analysis (SNA) has become the privileged theoretical and statistical approach to study the typical collaboration patterns within disciplines. As it is well known, collaboration among scientists can be represented as a network, in which the actors are scholars and ties may be represented by various forms of scientific collaboration among them. The most frequent way of specifying such networks is to consider only formal research activities, especially co-authorship (i.e., co-production of scientific publications). One of the most debated questions in collaboration network analysis is the impact of collaboration on scientific performance, that is the effect of actors' embeddedness in co-authorship networks and their individual research outputs. Recent literature showed that specific centrality measures (e.g., closeness, betweenness) are in general correlated with indicators of scientific performance (e.g. h-index), even if this impact is affected by heterogeneity depending on the discipline and the data source used to construct the networks. In the light of these findings, our contribution intends to add new empirical evidence on the topic of the impact of collaboration on scientific performance, exploring the influence of actors' embeddedness in co-authorship networks. We will model scientific performance (and its measurement) as a particular mechanism of 'social influence' over time. To this end we will use performance and co-authorship data on Italian statisticians in convenient time periods before and after the two Italian research evaluation exercises (VQR1 and VQR2 respectively on products published in 2004-2010 and 2011-2014). More specifically, we will treat performance as a behavioral variable in a Stochastic Actor-Oriented modeling approach to disentangle how co-authorship linkages affect authors' performance ('behavior') and viceversa.

Social Network Analysis: Evolution of the Field

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The presentation is a part of analysis of bibliographic data about the field of SNA. The study is based on the analysis of articles from the Web of Science Clarivate Analytics data base containing the keyword “social network*”, as well as those published in the main journals in the field. The first part of the data set was collected in 2008, and the collection of networks obtained out of it was labeled SN5 and was used as a challenge data for the Sunbelt 2008 Vizards Session (7,000+ papers). The second part consisting of 60,000+ papers published in the last ten years was collected in June 2018. Thus, the updated data set which is being analyzed includes 70,000+ publications with a complete description. From the collected data the citation network and two-mode networks linking articles with authors, keywords and journals were constructed. In the analysis we are following and improving on the already proven scheme used in earlier studies (Kejžar et al., 2010; Batagelj and Cerinšek, 2013, 2014; Batagelj et al., 2014, 2017, etc.). Analyzing the obtained networks, we evaluated the trends in the field’s growth. Using the Search path count approach, we extracted the main path, key-route paths and link islands in the citation network. Our results show that authors from the social sciences, who were most active through the whole history of the field development, experienced the “invasion” of physicists from 2000’s. However, starting from the 2010’s, a new very active group of animal social network analysis has emerged.

Mixed Field of Mixed Methods: Bibliographic Analysis

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Mixed methods research as an intensively emerging methodological field being developed over the past 30 years, which has a broad extension in studies across diverse scientific areas and disciplines. However, there is a little attention given to the research field itself. How the mixed methods research was developed from the beginning until today? Who are the most important pioneers and scientists working in the field? What kind of research interest and themes were addressed in the mixed methods studies? What are the main journals which promote the field development? It is important to answer these questions and to define the characteristics the state-of-the-art of the mixed methods research and methodological development itself. This paper aims to answer these questions by providing a quantitative analysis of the field of mixed methods research that reveals connections between authors, publications and journals from the middle of 20th century to 2018. We collected all available sources from Web of Science (Core Collection) using the keywords “mixed method”, “mixed research”, and their variation. The data consists of 16 347 papers found by this research query, and 488 696 works, which are being cited by these papers in the reference lists. Using the program WoS2Pajek, we transformed these data into a collection of networks: one-mode citation network and different two-mode networks, including works and authors, works and keywords, and works and journals. This permitted us to get the information on the patterns of publications over time, to distinguish the most important publications, journals and authors in the field, look at the authors collaboration practices, and get the idea of the topic structure of the field. By performing a “main path” analysis, we traced the most important stages in the evolution of the field, and identified the most relevant body of knowledge that it developed over time, which could be viewed as the main corpus of knowledge for any newcomer in the field. The obtained findings can be used as guidelines for implementing mixed methods research in the future, contribute to a common methodological language, and will be helpful for different users such as researchers, funders and reviewers. The complexity of the mixed methods research and its novelty versus the traditional quantitative and qualitative approaches indicates that the structuring of the field development deserve a special attention among the many other mixed methods open issues.

Collaboration Patterns of Russian Universities Before and After Government Intervention: Analysis of Co-Authorship Networks

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We investigate how co-authorship network of Russian universities change before, during and after implementation of the Russian Government University Excellence Initiative (Project 5-100). We argue that this project has become an additional stimulus for changing the strategies of participating universities. For example, the project forced universities to change their publication strategies in favor of increasing the number of publications (Selivanova et al. 2017). Based on co-authorship network analysis we investigate collaboration patterns of Russian universities. Analysis of co-authorship networks allows to investigate the principles of knowledge distribution between network participants (Newman 2004) and specificity and trends of collaboration in various scientific disciplines (Fafchamps et al. 2010; Matveeva & Poldin 2016). Co-authorship network can be analyzed both at individual (where nodes represent researchers) and macro levels (with nodes representing organizations). 30 Russian universities were chosen for analysis. They were divided into two groups: participants of the Project 5-100 and the others. We've used bibliometric data about publications of these universities downloaded from the Web of Science and published in 2010 to 2016. Based on analysis of affiliations the co-authorship networks were constructed for each year. Nodes in these networks are universities, links are publications. In addition, the co-authorship networks of publications in journals of the first (Q1) and last (Q4) impact factor quartiles (e.g. highly cited vs rarely cited journals) were constructed. The dynamics of following parameters were analyzed: number of nodes, number of links, diameter, average distance, density, degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality. In addition, the positions of individual universities were considered, the most and the least central universities were identified. During observed period 30 Russian universities increased publication activity and collaborations with other organization: the co-authorship networks increased from 1947 nodes and 22714 links in year 2010 up to 2223 nodes and 45151 links in 2016. The number of links has increased more than the number of nodes, which suggests that universities have also increased collaboration with each other. The average degree increases from 23,322 in 2010 to 40,622 in 2016. For participating universities significant growth of betweenness centrality is observed in years 2012-2015. The growth of eigenvector centrality is observed in both groups of universities since 2013, although in participating universities the growth is higher. Thus, participation in the Project forces universities to intensify publication and collaboration activities and, on average, inclusion of participating universities in academic community has increased. However, these results differ for individual universities within the group. References Fafchamps, M., Van der Leij, M. J., & Goyal, S. (2010). Matching and network effects. *Journal of the European Economic Association*, 8(1), 203-231.

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Variability of Biopolitical Journals: an Attempt to Bring Together the Field Using SNA

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In our research, we study the development of the field of biopolitics using the analysis of bibliographic data. The field of biopolitics is relatively new, as the active period of such studies has started only in 1980s. However, it is characterized by a high level of interdisciplinary influence, from biology and geography to philosophy and social sciences. Based on this, we propose that nowadays there is no clear understanding of the roots and the main stages of the development of this field, as well as main areas where such research is being conducted. The reconstruction of the history and contemporary state of affairs in biopolitics studies can be important not only from the epistemological point of view, but also from the practical, as it can help researchers working in the field to construct the common understanding of the field's state-of-the-art and all its variations in different disciplines, which can promote an interdisciplinary cooperation. We decided to concentrate on the analysis of academic journals because of its importance for formation contemporary scientific field and discussions. On the one hand, at this moment, an article in academic journal is a most preferred form of the cooperation of researchers. On the other hand, disciplinary and narrow focus of special journals can make them "invisible" to some scientists who approach the same object from a different discipline. This is especially true for the subfield of biopolitics that contains researches not just from different social sciences but from social, natural, and humanitarian sciences. Our study is based on the quantitative analysis of the articles from the Web of Science Clarivate Analytics (Core Collection) data base containing the keyword "biopolitics". The dataset includes 3282 papers with full description and 101 214 papers included into their reference lists. From the collected data, the citation network and two-mode network linking articles with journals were constructed. We made a basic analysis of these networks to extract the most cited works, as well as journals most commonly used in the field. We used the procedures of network multiplication to obtain derived networks: network of citations (including self-citations), where the links correspond to the number of times one journal cited another journal (including itself) in its works, as well as network of bibliographic coupling between journals, where two journals are considered to be coupled if authors they cite overlap. The analysis allowed us to identify the groups of most collaborating journals and journals that can be considered similar. Using the information on keywords associated with these journals, we make some conclusions about the current development of the field of biopolitics.

Admitting Uncertainty: a Weighted Socio-Epistemic Network Approach to Cognitive Distance Between Authors

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In bibliometric networks, uncertainty about the exact relevance of bibliographic information for network construction is a constant issue, which has to be addressed by modelling decisions. There is a lively debate about the meaningfulness of authorship and citation as well as about fractionalization of network tie strengths to address these issues. The hereby presented paper, will show possibilities to account for uncertainty already during the process of network construction. It is argued, that uncertainty is best expressed in probabilities and a framework is provided to conceptualize cognitive distance accordingly. Furthermore, it is explained, that this is doable with reasonable computational effort. The modelling approach is fitted for “zooming in”-distance measurement, i. e. distance measurement problems meeting the following criteria: distances to be measured are between (a) individual researchers, which are (b) working in the same or closely related research areas. This would mean, that we have (a) small publication portfolios, which are assumed to be (b) closely related. The hereby presented concept is based on the ideas of author-bibliographic coupling (Zhao & Strotmann (2008)), which is often used to compute cognitive distances between individual researchers (e. g. Van den Besselaar & Sandström (2017), Wang & Sandström (2015)). The focal entities in such models are authors, their publications and the corresponding references. In this depiction, it is implicitly assumed, that the ‘whole’ of a publication consists of ‘parts’, each of them stemming from exactly one of the authors, and the probability of each part stemming from a specific author is equally distributed between the authors. Also, it is assumed, that the ‘whole’ of an author’s oeuvre (or her epistemic position) is reflected in her publications, and that the probability of a specific publication reflecting the epistemic position is equally distributed between the publications. The conditional probability of a specific publication reflecting the epistemic position of a specific author is given as a product of the individual probabilities (following the multiplication axiom for independent choices as used in a probability tree diagram). In short, uncertainty is integrated by introducing a specific understanding of tie strength as a probability mass function. From tie strengths, path strengths are constructed by multiplication and summation. Finally, distance is defined as the logarithm of the additively inverse strength of the strongest path, which can be efficiently computed using shortest-path-algorithms. The potential of the hereby presented approach lies in the adjustability of the tie strength function to account for less uncertainty, that means if there occurs prior knowledge about the circumstances of paper production and authorship or the meaningfulness of references, a better fitting tie-strength function may be chosen. The modular depiction of network construction allows for explicit discussion of assumptions in each and every step. This opens the door

to applying bibliometric network analysis more comprehensively to enquiries in science studies with different theoretical angles.

Operationalizing a Mixed Methods Study of the Spread of Higher Education Innovations Through an Inter-Organizational Network in the United States

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While policymakers, researchers, and philanthropic organizations acknowledge the importance of networks in spreading and scaling-up higher education innovations, there is a dearth of research examining postsecondary inter-organizational networks (IONs) from a social network perspective. The Competency-Based Education Network (C-BEN) is an example of an ION intended to support educational change. C-BEN was formed in 2013 as a network of postsecondary institutions to catalyze and support adoption of new competency-based education (CBE) programs and practices in the United States. This paper is linked to an ongoing mixed methods research project on ION collaboration across the C-BEN, including an investigation of how the network structure and pattern of interactions relate to the adoption of CBE program models. Extant ION research has shown that information-sharing and knowledge exchange, network learning, and innovation are crucial functions of IONs. This research project seeks to deepen the understanding of how these processes occur within a higher education context. Research questions are posed on (a) network structure, (b) social influence and inter-organizational-to-organizational learning processes, and (c) the relationship between social network structure and interactions and implemented CBE innovations. A mixed methods evaluation design is employed (with elements of exploratory-sequential, explanatory-sequential, and convergent designs embedded across four research phases). The research design is guided by a conceptual framework that incorporates theory from social network analysis, inter-organizational learning, and complexity leadership theory. Data is obtained from surveys, semi-structured interviews, document review, and publicly available online data on individual and organizational interactions. The focus of this paper is on the operationalization of the mixed methods research design. An overview of the research study will be presented, along with a detailed mapping of the mixed method research design components including procedures and outputs of each of the data collection, data analysis, and integration phases. Recommendations for future ION studies that are addressed in this research include (a) using mixed methods approaches; (b) incorporating multiplex tie relations; (c) analyzing multiple units and levels of analysis; (d) examining network processes, outcomes, and leadership; (e) employing multiple ION theoretical mechanisms; and (f) studying the effect of actor embeddedness in multiple networks. This research also expands on the recommendations by scholars for further research (from a network perspective) on collaboration, social capital, complexity theory, leadership, information diffusion, knowledge exchange, network learning, and innovation. The research project is part of the National Research Collaborative on Competency-Based Education/Learning organized

by the American Institutes for Research, and is the recipient of grant funding from the Lumina Foundation. This research is part of the author's dissertation research.

In Search of New Ways to Join Factorial Methods and Blockmodeling for Analysing Affiliation Networks

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In social network analysis (SNA) literature, some advancements have been proposed to perform a positional analysis of two-mode networks through generalized blockmodeling, Multiple Correspondence Analysis (MCA) and/or Multiple Factor Analysis (MFA). Notably, these methods are performed through a direct approach by which the two-mode matrix is analysed directly by considering both the two modes simultaneously, without transforming the original data structure (and respecting the dual nature of such network). Indeed, there is evidence of the relationships between factorial methods and blockmodeling, in that both methods allow detecting the structural similarity in the network (i.e. subsets with similar patterns of connections) by a given criterion of equivalence among the units. Further, there is a connection between the two distinct principles by which MCA and conventional blockmodeling work, i.e. distributional equivalence and structural equivalence, respectively. Such connection is clear in the case of MCA, where the chi-square distances and the correct Euclidean distances (the latter being usually used to detect structural equivalence) yield similar results. In addition, a joint approach has been proposed that combines factorial methods and blockmodeling. In this approach, the network positions (or clusters) derived from the blockmodeling analysis are added as supplementary variables to the factorial map and then displayed and analysed in such a metric space. Hence, in this paper we explore the possibility of pursuing the same analytical strategy by using another method, namely cluster correspondence analysis (cluster CA), which groups simultaneously and directly individuals and variables for binary matrices. More specifically, our aim is to compare the latter method and blockmodeling for affiliation networks, in one of its possible applications, in order to understand if there are any relevant associations between these two strategies, which partition rows and columns of the original two-mode matrix simultaneously. Therefore, it would be interesting to gauge to what extent these two methods (blockmodeling and cluster CA) preserve the inherent duality of the affiliation network data structure. Further, we also intend to look at the way network positions, as they result from the blockmodeling analysis, can be incorporated in the cluster CA and, then, to verify if the latter method is able to reveal and clearly represent specific network structures (e.g. core-periphery and/or segmentation). Possible advantages of this strategy with respect to the above joint approach are considered accordingly. The proposed application will be shown by analysing an affiliation network resulting from the co-productions that a set of theatre companies located in the Campania Region (Italy) released by participating in joint projects during the 2012/2013 season.

Brokering the Core with Periphery – Collaboration Networks and Individual Success in the Hungarian Film Industry

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In collaboration-based creative industries, such as film production, connections to prestigious central creators can facilitate individual success; while brokering loosely connected communities provide access to diverse pools of ideas and knowledge. However, it is still unknown how brokerage in core/periphery networks influence nodal outcomes. In this paper, we argue that links to peripheral creators provide additional and complementary benefits for core members, such as access to novel creative ideas or free capacities. Consequently, those creators who broker the core of the network with the periphery enjoy both type of benefits and thus are more likely to achieve success. In this paper, the argument is tested on a dynamic network of movie creators constructed from a unique dataset of Hungarian feature films for the 1990-2009 period. We provide evidence that being in the core and at the same time brokering the network jointly induce individual success. Then, we propose a new way to capture brokers' role in core/periphery networks and find that those core creators who are gatekeepers between the core and the periphery have an increased likelihood of award winning.

Networks Among the Tenants of the Special Economic Zones and Industrial Parks in Russia

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In Russia, industrial development has significantly slowed down for the past 20 years, and the federal government strived to seek new methods to attract investments into the regions and stimulate economic growth. The Russian government actively implemented special economic zones (SEZs) and industrial parks (IPs) as the effective tools to develop and diversify exports, increase employment, attract foreign direct investments and launch technology/knowledge sharing (Yankov et al., 2016). In Russia, parks were implemented as subtypes of the zones offering almost similar fiscal benefits for their potential investors (Sandler & Kuznetsov, 2015). However, the zones were established for multinational companies, whereas parks for the small-medium enterprises. Investors were commonly offered various Greenfield and Brownfield projects. Scholars suggest that in order for the SEZs to successfully evolve, the cluster approach should be applied in their implementation (Aggarwal, 2012; Zeng, 2012). Previous research revealed that in most of the zones and parks there was lack of the cooperative activities among the tenants (Sosnovskikh, 2017). So, this study examined two SEZs of the industrial type in two different regions (Alabuga SEZ in the Tatarstan Republic and Togliatti SEZ in the Samara region) and four IPs in the Kaluga region (Grabcevo, Kaluga-Yug, Vorsino, and Rosva), as their managing companies had applied the cluster concept in developing these projects, and intensive cooperative activities had been established by 2018. Data collection was conducted in 2016-18 with the help of questionnaires and interviews. The cooperative networks among the tenants of zones and parks were studied using the social network analysis method and analysed with the help of UCINET software. In particular, the studied collaborations involved the provision of the necessary equipment, components, and raw materials, as the sequence of processes involved in the manufacturing of the final product and distribution of a commodity. The results demonstrated that Alabuga SEZ, Grabcevo and Rosva parks had managed to develop multiple clusters on their territories, which were associated with the better performance of the zone and parks. Whereas the Togliatti SEZ, Kaluga-Yug and Vorsino parks were highly centralised and based around anchor investors, and all other tenants were strongly interconnected with it. These findings are consistent with network theories that would predict greater benefits from the first configuration. As a result, the study discusses the overall business environment around these zones and parks and connections to the regional governments. Hence, it suggests their positive and negative outcomes as well as further potential developments of these interconnections.

Interdisciplinary Collaboration Within Economics – Emerging Patterns

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This paper investigates into the patterns of interdisciplinary collaboration in scientific research. The special attention is paid to different forms it can take and their dynamics. Interdisciplinary collaboration can naturally be classified as a bridging strategy, as it connects different disciplines and therefore may lead to innovative researches. At the same time, passing tacit knowledge and mutual understanding in scientific teams may need strong ties. When scientific collaboration has an interdisciplinary character and involves heterogeneous partners, the sufficient strength of a tie is a requirement for the collaboration to be efficient and a research project to succeed. Therefore it can be expected that interdisciplinary collaboration may not signify weak ties, traditionally assumed to constitute bridges. However, if a bridge becomes a strong tie, there is a probability that it ends to be a bridge due to a triadic closure. Another option is an existence of an interdisciplinary collaboration within a network of strongly interconnected ties because of some supporting institutional arrangements. This is possible by building interdisciplinary teams (for example in response to an incentive created by a funding program) or establishing interdisciplinary institutes joining scientists from different disciplines. The starting point is to inquire if interdisciplinary collaboration should be expected to take form of bridges and if those bridges can be constituted by strong ties in a long run. Different types of brokers are taken into consideration. The most expected types should be a gatekeeper and a representative – as the ones who have ties both within and outside of own discipline and are able to implement new ideas into own domain. Consultant (itinerant broker) and liaison are scientists-outsiders able to help in transferring ideas between colleagues who cannot do it directly or between scholars of diverse disciplines having communication barriers. They can also be scholars with skills that are needed in different disciplines, like statisticians. In case of an undirected co-authorship network, the gatekeeper and representative roles become identical in a static analysis. However, when we take a dynamic approach, we may distinguish between them based on the order of ties being created (if the first tie is created between groups, it is a gatekeeper type, if within one group, it means a representative one). This conceptualization is further developed by introducing different configurations of strong and weak ties. The first step is a descriptive analysis on aggregated data. It is aimed to explore which patterns dominate with regard to interdisciplinary ties. The second step is a stochastic modelling. It is intended to investigate the emergence of interdisciplinary collaboration patterns. Data from IDEAS/REPEC are utilized. As they cover only papers in economics, the “interdisciplinary collaboration” is about ties between scientists representing different sub-disciplines of economic research, assessed by JEL codes. Additionally, data on authors affiliations is included. They are a possible source

of information on the researcher's discipline and, additionally, they enable to consider multilevel structure of data.

The Diffusion of Zebrafish in Latin American Biomedical Research. a Study Based on Bibliometric Dynamic Network Data

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Zebrafish, a tropical freshwater fish from the Ganges region of India and popular in pet shops, has become an attractive experimental animal model in contemporary biomedical research. This study seeks to analyse the international dimension of the diffusion process of this popular model at the micro and meso levels by looking at the interpersonal links forged by researchers for knowledge production. To do so, it takes insights from diffusion of innovations theory and applies novel statistical techniques used in diffusion modelling to measure network dynamic exposures using bibliometric data. The analysis compares network diffusion patterns displayed in the global community of zebrafish adopters with those of the Latin American region. The growth of zebrafish research in this particular region is unprecedented and constitutes an interesting case to answer, from a new angle, long-standing questions on dependency and internationalisation dynamics put forward by scholars of Science and Technology Studies. Results from the analysis of more than 28,000 papers published during a period of 20 years (1996-2016) show that a slow and progressive diffusion process has driven the use of zebrafish where high levels of network exposure (resorting to others with prior experience in the use of the model) seem to play an important role. In the case of Latin America, contrary to studies of internationalisation in the region, expert-based dependency dynamics among early adopters of zebrafish are not predominantly international. Among laggards, exposure to national networks of experts is predominant although exposure to regional expertise has been increasing. The latter is explained by the formation of a regional zebrafish network of researchers with the aim of enabling resource sharing, starting collaborative research and to enhance the training of young researchers from the region. Overall, this study delivers a new way of measuring international dependency in knowledge flows by considering the evolution of individual collaborative networks over time and researchers' exposure to international expertise.

“Who Benefits from Whom”: Resource Complementarity and Organizational Performance

Anna Piazza

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A major line of contemporary organizational research explains interorganizational relations to complementarity in resources among organizational partners. Organizational scholars have broadly accepted the idea that partner selection decisions are driven by considerations about similar and dissimilar potential partners along relevant dimensions, including resources complementarity. While prior research has mainly explored complementarity in resources as the main explanation for the formation of relations among organizations, this paper focuses instead on the effects of complementary relations with partners on organizational performance. Soda and Furlotti (2017) have recently distinguished between depth complementarity which is the overlap of the same types of resources held by organizations, and scope complementarity which is the overlap of different types of resources held by organizations. The paper tests how organizational performance varies as a function of complementarity relations, network-related characteristics and attributional factors. More specifically, the objective of this study is to analyse the extent to which collaboration with complementary partners increases (decreases) the performance of a focal organization at various levels. I use data collected on a regional community of hospitals organizations over four years, capturing collaborative relations through patient transfers and mapping their ego networks. I consider each individual organization (ego) as embedded in networks of interorganizational relations that are actively established with other partners (alters) for joint problem solving activities. Furthermore, detailed information on organizational characteristics allow me to reconstruct with accuracy Ego's organizational attributes and those of its neighbors. To assess organizational performance at various levels, the most common performance indicators are used (i.e. readmission rate, occupancy rate and comparative performance index), capturing different aspects of a hospital's activity. I use depth and scope complementarities, in terms of complementarity resources that partners put at the disposal of a focal organization to measure the ego-network composition. I use the number of all alters included in each ego-network as a measure of network size. To measure the features of network structure, I use network cohesion and range. Finally, I also use information on a number of organizational characteristics to assess their role in affecting performance among hospitals in the sample. Results suggest that organizational performance varies as a function of the average level of complementarity that organization holds with its collaborating partners.

Team Performance and Repeated Collaboration in R&D Projects

Paola Zappa

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This paper examines the dynamics of collaboration in emergent cross-functional R&D teams to assess the motivational effect of performance on team composition and stability. A long tradition of studies point to R&D teams – where members with heterogeneous expertise interact to perform complex tasks and work on innovative projects – as the organizational entities that bridge disconnected knowledge spaces and promote innovativeness and creativity. Research on teams has repeatedly addressed the relationship between team composition and stability as well as the extent to which they jointly affect team performance. Relatively less is known about the opposite relationship. Because individuals typically monitor their progress toward achieving goals and change their behaviors accordingly, team members are likely to adjust their collaboration relationships to the team outcomes, forming new beneficial ties and dissolving unprofitable ones or, more broadly, re-evaluating their collaboration portfolio. Studies on performance and performance feedback refer to self-efficacy as the main factor explaining an individual's willingness to mobilize their network of collaborators. Drawing on extant literature that examines the effects of performance feedback on evolution of social relationships, we argue that positive team performance contributes to an individual's sense of self-efficacy, making them more willing to take the risks involved in entering new teams and working with new partners. By contrast, negative performance leads individuals to evaluate their existing collaboration ties and to focus on close relationships which promote learning and are easier to maintain, while dissolving ties to more "distant" partners so to minimize risks and costs of coordination. We test our hypotheses using longitudinal data that we have collected in a large research-oriented hospital specialized in advanced cancer treatments. Doctors carry out their individual research activity. Yet, most advanced research occurs in cross-functional R&D teams, whose membership is based on voluntary participation and activity organized around projects. By observing the dynamics of team-based collaboration on research projects among 250 physicians over a period of around 15 years, we illuminate the effects of team performance on partner selection and participation in teamwork, which ultimately affect the diversity and innovativeness of the research activities carried out at team and organizational level.

Resilience and Social Networks in Sweden

Evangelia Petridou, Jorgen Sparf

Mid Sweden University, Sweden

Resilience is a concept that has been researched, stretched, and applied by scholars of various disciplines as well as politicians and practitioners alike, but it is not a term that fits snugly in the Swedish context. This is a socio-political context of a social democracy characterized by equality and solidarity and a decentralized, corporatist system of governance with an enhanced role of civil society in policy making coupled with a strong, interventionist state. Though there is general consensus that social networks, to the extent that they embody the concept of community, contribute to societal resilience, it is not clear how and under what conditions. To this end, in this paper we examine two networks in the Swedish city of Malmö in the field of violent extremism and prevention of radicalization among the youth in immigrant communities. We compare the bottom up network of a grassroots NGO and the enforced, top down network of a municipality-led community policing project. We seek to identify the kind and amount of resources exchanged in the respective networks, identify central (and potential entrepreneurial) nodes and assess the efficacy of the respective networks, which we operationalize as resilience. Findings of this research have empirical implications, but theoretically, they have the potential to contribute to a wider network theory of resilience.

Political Networks (Sessions C2, C3, C4, C5)

**Chairs: Dimitris Christopoulos, Mario Diani, James Hollway,
Florence Metz**

How Network Analysis Can Help to Demystify Multistakeholder Global Governance

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The recent expansion from multilateral cooperation among public sector actors to multi-stakeholder arrangements prioritises the inclusion of non-state actors in global governance. Thus, many heterogeneous stakeholders are mobilised into new, multistakeholder, governance 'spaces' between their home fields. Yet this central feature of the multistakeholder phenomenon is mainly overlooked and under-theorised. In this paper we show the utility of network theories and methods in demystifying these multistakeholder spaces.

Multimode Political Analysis: Detecting Evidence of Agency

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There is evidence of political action between entities that can be captured in different modes. For instance, citizens support protest movements, which sponsor protest events, on which citizens participate. Citizens, movements and events are different types of entity. They are tied by different types of ties: support, sponsorship, participation. A focus on only one of these entity modes, say protest events is short-sighted and bias our understanding of politics, which naturally involves relations between (and within) these multiple modes. One aspect of multimodal complexity is that it may lie beyond the cognitive competence of any one actor. Limitations to cognitive social structure and actor's network horizon have been recognized and documented in unimodal networks (Friedkin, 1983; Krackhardt, 1987; Kilduff and Krackhardt, 2008). Given such limitations we consider the theoretical and methodological implication of examining agency on multimodal networks. We compare examples of political action from entities affiliated within and between different modes. We therefore consider evidence of agency in three different case studies. A uni-modal case of EU Competition Policy; a bi-modal one on US labor legislation; and tri-modal one on international fisheries governance. Our approach holds promise in detecting power diffusion across political levels, identifying groups of affiliated actors and in detecting political agency.

The Network of the Koch Brother's anti-Democratic Political Social Movement

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Most social movements are discussed in terms of the under-provided and underrepresented people mobilizing to achieve their rights and voice their concerns. But, arguably, one of the most successful social movements is located at the opposite end of the economic spectrum. The billionaire Koch brothers have formed an alliance of organizations and actors to further their own ends. It is a well-funded political network. Its goals include removing all regulation of their industries, especially regarding the environment and workplace safety, shrinking the size of government to create a government of the very wealthy, run by the very wealthy, for the very wealthy and to destroy democracy. An alarm has been sounded in two books, *Democracy in Chains* and *Dark Money*. Both books list some of the organizations in this very secretive network. Using these names, VOSON, a web search algorithm was used to identify a large network of units. We present results regarding this network in terms of its size, the aims of its major actors, its structure and organization. Visualizations of the network are presented. We note that their goal is to destroy this nation's political institutions and democracy itself. It is a social movement whose success must be feared.

Change or Stability in Network Governance

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Due to increasing interdependencies created by the principles of free movement in the European Union (EU), EU member states collaboratively solve problems through network interactions. SOLVIT is a problem-solving network created in 2002 and is based on interactions between national administrative units (SOLVIT centers) to resolve cases that involve the misapplication of internal market rules. This kind of network is an increasingly popular form of governance in the EU as it encourages member states to engage in cooperation while maintaining their national sovereignty and administrative practices. Ample research is done on the establishment and functioning of such networks, however little is known about how they evolve over time. It is unclear how resilient these networks are with regard to political forces surrounding European integration. On the one hand, networks are assumed to be subject to change and either become more integrated and develop into a centralized structure, or break apart. This is particularly pertinent as one of the key players (United Kingdom) is about to leave the network, representing a sudden shock to the system. On the other hand, if interaction in networks is driven by constant functional interdependencies, such as geographical proximity, trade relations and migration flows, we should expect a more stable interaction pattern. This study proposes a much needed dynamic approach to examine interaction among national administrations in European networks. Based on data collected by a repeated survey in 2011 and 2017, including information on interactions among SOLVIT centers, case handling and SOLVIT center characteristics we use a Stochastic Actor Oriented Model to test how resilient the SOLVIT network is to change. Our results demonstrate that the problem-solving network has remarkable network resilience, which is primarily explained by stable interactions based on functional needs as well as by institutional consolidation by network members by increasing the overall effectiveness of their case handling.

Topic Modelling and Networks of Policy Preferences in the Regulation of Mandatory Corporate Sustainability

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In the past ten years corporate social and environmental disclosure in Europe has moved from a voluntary practice embraced by a few large companies to a legal requirement applied by over six thousand firms. This study follows this socio-political transformation by drawing on a mixed methods network analysis approach and analysing the responses received by the EU Commission in public consultations concerning the construction and adoption of the EU Directive on non-financial reporting. By performing topic modelling on the responses and subsequently reconstructing a network of policy preferences, this study shows how different social constituencies deploy alternative – and often competing – logics and values to evaluate corporate social impact and performance. In particular, this study explores the key role of some actors in proposing alternative frameworks and contesting or legitimizing the emerging standardization of corporate social accountability.

Supporting Discourse Network Analysis Through Machine Learning for Claim Detection and Classification

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Currently two general approaches try to tap into the enormous potential that large text corpora present for the analysis of political processes. On the one hand several methods try to directly extract useful information from raw text by counting word or n-gram frequencies or by attempts to detect latent structures through applying topic models and similar techniques. This approach can easily handle very large text corpora but often has only a limited value for understanding the actual content of political discourse. On the other hand various discourse analytical methods and especially discourse network analysis rely on manually annotated text. While these approaches provide superior insights into the meaning and structure of political discourse, their applicability is limited to relatively small text corpora as the task of manual annotation is very time- and labor-intensive. In my paper I will present first results from a research project (MARDY – Modeling Argumentation Dynamics in Political Discourse) in which we develop annotation tools that use machine learning and artificial intelligence to partially automate and thus significantly speed up the annotation process. Such a tool will offer new possibilities to leveraging the power of discourse network analysis to the analysis of discourse dynamics based on large, long-term data sets.

A Separable Counting Processes-Based Model for the Analysis of the International Arms Trade Network from 1950 to 2018

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We propose a novel tie-oriented model for the dynamic analysis of longitudinal networks. The generating process consists of a multivariate counting process of tie changes, that independently governs the formation and persistence of ties with two distinct intensity functions. The formation of a tie indicates the start of a relation between two actors in the network, whereas the persistence continues it. This characteristic is legitimized by the assumption that covariates have a different effect on the formation than persistence of a tie. Additionally, the complexity and extensive time frame of observed networks often make time-varying effects reasonable. Analogies between varying-coefficient models, time-to-event models, and counting processes facilitate the estimation of the parameters and account for more practical time-varying effects that also include random effects on the nodal level. The proposed method is applied to a network consisting of the number of international aircraft trades between 1950 and 2016. The findings corroborate strongly differing and time-varying effects of endogenous and exogenous covariates on the processes of formation and persistence of aircraft trades. Especially during the end of the cold war period, the time-varying network effects display a fundamental structural change in the arms trade network.

Which Universities and Scholars Have Access to the Field of Power in the United States? Mapping Pathways to Gain Access to and to Influence Science Policy in the United States

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A plethora of research conducted in sociology of science has focused on the impact of science policy, rising bureaucracy and economization on universities and researchers. At the same time, the interlinkage between science and the knowledge-economy was object of study for other scholars in the domain of sociology of science. In the former case, it is argued that a surplus in influence exercised by political bodies, governmental units, the legal framework and corporations has a negative impact on research diversity, research autonomy and the potential for scientific breakthroughs, whereas the latter strand of research concludes the opposite. Either way, the interplay between different ecologies – or social fields – is at the core of the effects measured, but the different results indicate that the interplay between academia, politics and economy is not grasped in its entirety. One central, but neglected aspect in both strands of research is the possibility of universities and scholars located therein to affect science policy in such a way that cumulative advantages are generated only for a subset of actors taking influence (e.g. research areas funded by federal agencies). However, to take influence, access to the relevant government bodies (e.g. PCAST, expert committees in US-Departments, hearings) must be established and secured. The contribution at hand focuses on the prerequisites for gaining access to science policy. To do so, it utilizes an amalgam of Network-Ecology and Habitus-Fieldtheory to investigate the effects located on network level and level of the university responsible for having access to governmental bodies and for setting the direction of science policy debate. A mixed methods approach combining Social Network Analysis, Multiple Correspondence Analysis, Content Analysis and Count-Regression was used to unravel the effects on the different levels of analysis mentioned above. The empirical approach is subdivided into four major steps of investigation. In a first step, strategic papers and mission statements of universities were analyzed qualitatively in order to extract strategies for gaining access to the political field and bureaucratic field. Afterwards, these strategies were quantified using Multiple-Correspondence-Analysis. In a second step, over 9000 biographies of actors relevant for science policy during the Obama Administration and their affiliation to different organizations and network ecologies were collected. In a third step, the biographical data and affiliation data were pooled on the level of universities and matched with additional data provided by the National Science Foundation, US-News and World-Report Rankings and SCOPUS. In a fourth and final step, networks were constructed, a measure of access was developed and the preconditions for gaining access were tested using regression techniques. Findings indicate a predominant effect of the university's ability to span network-ecologies. In addition to these effects,

having the right “strategy” as seen in mission statements and strategic plans, access to think-tanks on campus, large endowments and a well-connected university administration prove to have a significant influence on the access to government bodies.

Network Europe: How Europe Grows Together Through Transnational Interactions

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Following relational sociology (Emirbayer 1997) and transactionalist theory (Deutsch 1953), we suggest to conceptualize the European social space as a multiplex network of people’s transnational mobility and communication. To enhance our understanding of how this social space has evolved over time, we analyse the development of four types of cross-border interaction (migration, international student flows, tourism, phone calls) over periods of more than five decades (1960–2017). In specific, we examine: (1) how the magnitude and density of interaction within the European social space has changed over time, (2) whether the European networks have become more centralized or de-centralized over time, (3) what are the determinants of this network structure; and (4) how the degree of closure of Europe towards the outside world has changed over time. Social network analyses of process-generated dyadic data from a variety of sources (UN, World Bank, World Tourism Organization, International Telecommunication Union) reveal, inter alia, that (a) the density of cross border interactions has consistently increased in Europe, (b) European social space is strongly centralized and this changes only somewhat but not substantially over time, (c) this centralization follows the pattern of social and economic inequalities in Europe, and (d) level and trends in closure are type-dependent. Thus, our findings provide new insights into the changing structure of Europe as a social space and highlight the necessity to take the multiplex nature of human interaction into account when examining processes of transnational integration.

Social Resources as Incentives for Local Political Protest

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The contribution investigates the relationships between social resource and local political protest. In theory, protest is a collective good that is difficult to provide due to the free rider problem. However, selective incentives overcome this problem. It is expected that people participate in political protest activities if they dispose control and power over resources related to the political sphere, e.g. politics-specific competences and agency and the political socialisation of individuals. The literature discusses social incentives as well, e.g. ties to people who are already active protesters are strong social incentives. However, social resources are neglected so far. It is argued that social resources like access to several politics-related resources possessed by members of ego's network are relevant social incentives for protest activities. Several hypotheses were developed and tested with German survey data (conducted in six local areas [cities, towns, counties] in two federal states). Access to social resources are measured by a resource generator. It can be shown that social resources are significant incentives for the participation in local political protest on top of collective goods incentives, moral selective incentives and social selective incentives. Furthermore, differentiating between source of social resources, it can be shown that resources from friends and acquaintances are more relevant than from family and kin.

The Dynamics of Social Networks and Political Opinions: a Bipartite Network Approach

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Opinion polarization is currently a much-discussed topic, claimed in popular media to be a major cause of conflict in modern society. The metaphor of polarization has been conceptualized as the uneven distribution of opinions in a society. Specifically, these popularly include a bimodal distribution on a one-dimensional opinion scale, or the clustering of opinions in a multivariate space, the latter of which bears stronger empirical evidence in mass publics. These definitions, however, do not account for the distribution of ties between individuals holding opinions, despite individuals' ties forming a central point in debates on the causes of polarization. Polarized societies are often characterized by individuals being tied to others sharing some opinion. To understand the emergence of such polarized societies, it is thus crucial to examine both the networks between individuals and the polarized opinion outcomes. We thus define network polarization as a societal state that is characterized by, firstly, opinion clustering, and secondly, by network clustering of individuals with similar opinions. Two key, mutually reinforcing, inter-individual processes can explain the generation of network polarization: social influence and homophilous selection. Empirical studies have tested these mechanisms with unidimensional metrics such as left-right political self-placement in friendship networks. Academics simulating societal processes have argued that mechanisms of selection and influence on multiple attitudinal variables result in opinion clustering. This draws us closer to the empirically observed outcome of opinion clustering, and our conceptualization of network polarization, but lacks empirical evidence. Thus, to understand selection and influence's contributions to network polarization, we must bridge a gap: between the empirically evidenced outcome, and the empirically untested multidimensional view of the mechanisms. In this study, we thus examine empirical data for evidence of the micro-level dyadic interpersonal processes of selection and influence, and structural patterns characterizing network polarization. To do so, we statistically model the coevolution of the social network and individuals' political attitudes over time in two complete networks. We collected 7 waves of complete network data over the course of 16 months, in two cohorts of university students in Western Europe ($N_1 = 261$, $N_2 = 660$). To capture political attitudes, we measured agreement with 22 timely policy statements and represented these as a two-mode network. A name generator captured the friendship network within each cohort. To these networks, we apply an ordered stochastic actor-oriented model. Beyond allowing convincing disentanglement of selection and influence, this framework allows us to estimate attitudinal change tendencies through general structures rather than attitude-specific parameters. Currently, our model accounts for social influence and selection on agreement and disagreement between friends. The latter of these is estimated with a newly developed effect. For validation, we simulate

forward, obtaining goodness-of-fit statistics focusing on new context-relevant structures: frequencies of (dis)agreement between all individuals, and frequencies of (dis)agreement between friends. This work will aid our understanding of interpersonal processes' effects on clustering in both individuals' opinions and their social networks, and raises new questions on the sources of these phenomena.

Predicting Offline Political Support with Online Social Behavior

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With the expansion of political discourse onto online social media platforms comes the question of whether offline political alliances and support are established, strengthened or maintained with online interactions. Do political actors who support each other in real life also cultivate this relationship in their online interactions? In our paper we examine the structure of a cosponsorship network of Swiss members of Parliament (MP) and their online interaction network to ask the question of whether the same endogenous and exogenous factors drive the data-generating process of both networks. We are particularly interested to see if online political networks show similar clustering tendencies, exhibit reciprocity and are guided by party, state and ideological homophily. We overlay two data sets, both containing data on political support among Swiss politicians. The first data set stems from an online Swiss political debate and networking platform called Politnetz. On Politnetz, politicians, as well as citizens can debate political issues and establish support-relations with each other similar to 'friendship'-links on other social media sites. The second dataset captures offline political support via legislative cosponsorship signatures among Swiss members of parliament (MP) between 2007-2015. We present a network inference model, comparable to the Exponential Random Graph Model, but for multi-edge networks and assess whether cosponsorship support is reflected in online political support and which factors explain the structure of both networks. Our preliminary results show that direct online support has no explanatory power in cosponsorship support among MPs. However, when using aggregated similarities in online behavior our model explains 15

Identifying Levers and Multipliers in the SDG Interaction Network

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In 2015, the member states of the United Nations (UN) developed and passed the Agenda 2030 for sustainable development. The Agenda 2030 is an action plan for the next 15 years designated to lead to a sustainable future. It includes 17 Sustainable Development Goals (SDGs) which cover the social, environmental and economic dimension of sustainability and are a guideline for all the UN member states. Developed to be integrated and indivisible by design, the 17 Sustainable Development Goals (SDGs) and their 196 targets have gathered a growing scientific community committed to exploring the systemic interactions inherent to the 2030 Agenda. Better understanding these positive and negative interactions between SDGs is critical to foster its full implementation and to know what policies to prioritize in views of the potential synergies and trade-offs connecting the goals. In that respect, the need for informed decision-making urgently calls for more synthesized knowledge on context-specific SDG interactions. Based on a literature review of 68 global assessments from the UN system and 112 relevant scientific articles extracted by keyword search, negative and positive effects of the action on one goal to the pursuit of another goal were collected. The 196 SDG targets represent the nodes of a network wherein these targets are connected with positive or negative ties of different strengths. This network represents the current body of knowledge on SDG interactions. Based on this unique dataset, our analysis focuses on three different key elements of that network. First, we identify the most central SDGs in terms of both positive and negative interactions with other SDGs. Second, we identify systemic levers and multipliers in the SDG network, based on the centrality and the relation between in- and out-degree centralities of nodes. Third, we analyze cluster of strongly interconnected SDGs. As an example, our analysis reveals that some SDGs are influencing rather than being influenced and hence, have a role of systemic levers across the SDGs, while some other SDGs are systematically impacted or influenced by the action across the goals.

Structure Matters – a Social Network Analysis on Swiss Stakeholders' Information Exchange About SDG 6

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In 2015, the member states of the United Nations (UN) developed and passed the Agenda 2030 for sustainable development. The Agenda 2030 is an action plan for the next 15 years designated to lead to a sustainable future. It includes 17 Sustainable Development Goals (SDGs) which cover the social, environmental and economic dimension of sustainability and are a guideline for all the UN member states. According to the United Nations resolution covering the Agenda 2030, countries should not only implement the Sustainable Development Goals nationally, but also support other countries in their implementation. Our presentation investigates how Switzerland deals with the challenge of implementing the Sustainable Development Goal 6 (Water) in developing countries. Although Switzerland itself performs well regarding this goal, it has a high virtual water footprint, which has a high impact on the water situation in developing countries where quantity and quality of water are problematic. One way of taking responsibility of its high impact in developing countries is to mobilize Swiss expertise to solve water problems in these countries. To ensure evidence-based decision-making in this process, information exchange between stakeholders is key. We use social network analysis and interviews to investigate what influences information exchange between Swiss stakeholders involved in the implementation of the Sustainable Development Goal 6 (Water) in developing countries. The networks are composed of 80 stakeholders from research, public administration, NGOs and others, and of ties of political and technical information exchange. Preliminary results show that stakeholders tend to exchange information with stakeholders that are similar to themselves. Stakeholders can be similar to each other according to many different dimensions. We consider different types of similarities from the size of the organization or the covered topics to having the same background (academia, public administration, civil society and private sector) or visiting the same events and participating in the same policy forums. Furthermore, joint participation in policy forums and events as well as having a common language are further beneficial factors for information exchange.

Inside and Outside the Climate Negotiations: Contrasting Networks of Conference Diplomacy Reporting and Media Perception

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Traditionally, the United Nations Framework Convention on Climate Change (UNFCCC) has been the main forum to debate global agreements on climate change, with state negotiation delegations as its most visible actors. In recent years, partly due to the inability of the multilateral process to reach solutions, and to growing recognition of the complexity of the challenge, climate change has begun to be addressed across multiple channels outside the official negotiations. In addition, the press plays a key role in reporting on climate-related political events and thus portraying them to the broader public, possibly also influencing the political process itself. So far, there is scant research into the potential similarities, differences and interrelationships between climate-related diplomacy and how it is portrayed by the media. This study takes a first systematic step in this direction. We seek to gain a more systematic understanding of the interlinkages between the way countries interact in the UNFCCC negotiations as portrayed by a recognized “inside” observer of the negotiation process, the International Institute of Sustainable Development (IISD), and the way these interactions are portrayed by the “outside” global press. While the inside reporting exclusively focuses on the official negotiation process during the UNFCCC conferences, the outside press also reports on further diplomatic exchanges beyond the UNFCCC, like other bi- or multilateral agreements, exchanging resources, or sharing information. We expect reporting by the press is biased by a focus on key large global players, while the inside reporting also covers small and vulnerable countries. In addition, we expect that interactions inside the negotiation rooms are driven by coalitions of like-minded countries, while such groups are less important in diplomatic interactions as reported by the press. Furthermore, outside cooperation may help to pave the way for more cooperative negotiations. Therefore, we should see that more cooperative UNFCCC meetings tend to follow a period of increased cooperation in the real world, or that groups of countries that cooperate in the real world also increase their cooperation within the negotiations. To explore these patterns, we rely on two novel datasets. The first one records agreements and disagreements between country dyads at the UNFCCC negotiations, hand-coded from summaries of the negotiations published by the IISD between 1995 and 2013 in the Earth Negotiations Bulletin. The second one is based on automated text coding of press releases, and contains information on cooperative and conflictive climate-related diplomatic interactions between country dyads between 1995 and 2015. We use descriptive network statistics to explore and compare the evolution of both networks over time. In a second step we rely on dynamic multilevel social network models to analyze the co-evolution of both networks.

Finding Consensus for Greening in Agriculture

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While policymaking has long been described as a black box where a societal problem 'goes in' and a policy solution 'goes out', the policy network approach offers an analytical tool to uncover the social processes in the 'black box'. Social processes are key to comprehend why policy makers adopt policies or fail to agree. In order to better understand success and failures in policymaking, scholars have employed the network approach to study collaboration, coalition formation, stalemates or compromise-seeking. Although compromises are fundamental to successful policymaking, there remain open questions about how and where, i.e., in which venues, actors reach compromise. In order to study compromise in policymaking, this paper focuses on agricultural policy—a policy field that suffers from gridlocks and paralysis across the globe, even though a move towards greening is urgently needed. We ask: How to achieve compromises across coalitions that lead to greening in agriculture? We hypothesize that greening results from coalition-formation, actors' shared success on shaping policy content and exchanges in policy venues. Our research focuses on a recent agricultural policy reform in Switzerland that surprisingly led to greening and therefore provides an interesting case for such an analysis. We analyze the policy process through which policy change towards the greening of the Swiss agricultural policy was possible. We investigate a) who, or which coalitions, found the compromise; b) how the compromise looked like; and c) in which venues and when in the policy process compromise was reached. To this end, we gathered data on involved actors, their policy preferences and event participation by systematically coding 457 documents. We analyze preference data using cluster analysis and we display two-mode networks of actors and events, in which actors co-participated in the policy process. Results show that a pro-change and a pro-status quo coalition opposed each other. Policy change towards greening nevertheless came about in form of a compromise reached through "loose coalitions". We define loose coalitions as groups of actors who share preferences about policy instruments in a policy process even if they do not share beliefs at the more fundamental level. We observe changing, atypical, loose coalitions, for example between liberal and green actors advocating against domestic support, or between green and conservative actors advocating in favor of supporting small farmers. These loose coalitions led to a policy compromise where every coalition was partially successful on some of their policy priorities, while conceding on others thereby enabling policy change towards greening. What we can learn about policymaking from these results is that successes are not only a result of coalition politics, but also of a bargain. Whether or not actors are willing to bargain may depend on a number of factors, including the political system. In a consensus democracy, like Switzerland, bargaining and finding compromise is institutionally incentivized and therefore easier to achieve than is the case for majoritarian systems.

Majoritarian democracies, such as the US or UK, lack institutionalized consensus-finding mechanisms and tend to run into situations where coalitions oppose each other in hurting stalemates.

Modeling Network Dynamics (Sessions D2, D3, D4, D5)

Chairs: James Hollway, Nynke Niezink, Tom Snijders, Christoph Stadtfeld, Christian Steglich

Identifying Model Misspecification in Stochastic-Actor Oriented Models

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The specification of stochastic-actor oriented models for the analysis of panel network data is guided by substantive theories and hypotheses concerning the micro-mechanisms that led to changes of networks and behaviors over time. An issue in the specification of the model is that some micro-mechanisms are represented mathematically by a variety of effects. Selecting an inadequate effect might result in a misspecified model. Recent work on the generalized method of moments estimation in stochastic actor-oriented models, and its comparison with the regular method of moments and the maximum likelihood estimation, has shown that the estimated coefficients obtained by the three methods might differ when the model is misspecified. Based on this empirical evidence and drawing on the econometric literature, we investigate consequences of misspecification and propose diagnostic tools for detecting model misspecification in stochastic actor-oriented models.

Networks in Social Contexts: Specification Issues for the Settings Model

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The 'Settings Model' is a newly developed stochastic actor-oriented model for network dynamics. The data structure includes, next to the network itself, a representation of the social context in which the network develops. Settings are regarded as meeting opportunities, structuring the creation of new ties. A setting is defined as a graph, usually non-directed, and rules for tie change depend on the setting. The primary setting is defined endogenously as an extended local network neighbourhood. In addition, there are so-called meeting settings, given exogenously (e.g., classrooms, departments, the complete graph). The model defines tie changes in the primary setting as multinomial choices, similar to the standard stochastic actor-oriented model. Choices in the meeting settings are binary choices. The Settings Model is conceptually and computationally more attractive for representing network dynamics in larger networks. Remaining issues for the practical applicability of the Settings Model have to do with the model specification. In the first place, the choice of the offset parameter for the meeting settings, which is needed for the distinction between the multinomial choice in the primary setting and the binary choices in the meeting settings, but which cannot be readily estimated from the data. In the second place, the possibility to include effects that depend on statistics of the primary setting, e.g., on the size of the actor's neighbourhood in this setting. These issues are discussed and illustrated by some examples.

Advances in Missing Data Treatment for Network Analysis - Actor Attributes, Multiplexity, and Bayesian

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Missing data on network ties is a fundamental problem for network analyses. The biases induced by missing edge data, even when missing completely at random (MCAR), are widely acknowledged and problematic for network analyses (Kossinets, 2006; Huisman & Steglich, 2008; Smith, Moody & Morgan, 2017). We expand on earlier work on multiple imputation primarily for longitudinal network analysis using stochastic actor oriented models (SAOMs, Snijders, 2017; Krause, Huisman & Snijders, 2017). As well as cross sectional network data using exponential random graph models (Robins, Pattison & Woolcock, 2004; Koskinen, Robins & Pattison, 2010; Krause, Huisman, Steglich & Snijders, 2017). In a series of studies we introduce imputation procedures for more sophisticated imputation problems. For the SAOM family we show four advances. We introduce an algorithm for multiple imputation of actor attributes. Further, we expand the existing methodology to multiplex and multilevel networks. Lastly, we illustrate how to conduct multiple imputation in a fully Bayesian framework. For the ERGM family we propose an algorithm for imputation of missing ties in multiplex networks.

Micro-Explanations for Multilevel Scientific Networks: a Stochastic Actor-Oriented Model in a Scientific Discipline

Alejandro Espinosa-Rada

The University of Manchester, United Kingdom

The aim of the presentation is to explore the longitudinal multilevel dimension of a scientific network in a national discipline. The contribution of this research is expanding existing research on micro-mechanisms in dynamic scientific networks. Also, it contributes to developing a multilevel approach to understanding the simultaneous effect of different (cross)mechanisms that drive the evolution of the networks and the representation of macro processes when the multilevel structure is considered. Modelling the multilevel dimension of a scientific network offers one of the first empirical examples from a stochastic actor-oriented model in the study of scientific networks.

A Partition Model for Dynamic Membership of Non-Overlapping Groups

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Many social processes are not situated at the level of dyads but occur within groups. Such group processes occur, for example, when discussion groups form during parties, when researchers collaborate on the writing of scientific papers, or when citizens join different political parties. Although many theories acknowledge the importance of groups to explain social outcomes, we currently lack statistical tools to explain their formation and evolution. Current network models rely on dyadic processes that express individual dynamics and can only represent social groups as two-mode ties or node attributes. An important limitation of this approach is that it does not allow the modeling of coordination processes between individuals. For example, joining or leaving a group might not be accurately represented by successive creations or deletions of ties from individuals to this group as they can be the result of joint decisions of these individuals. We propose to address this gap by developing a statistical model tailored for a group representation. The proposed model aims at explaining time-stamped observations of group membership changes. We consider the case of non-overlapping groups (e.g., actors cannot belong to more than a group at a time) and represent groups as subsets of a partition of the actor set. Following the logic of well-established network models, the model builds on a Markov chain process in which transitions are defined as changes in the partition state. Such changes include the formation or dissolution of groups but also more complex events such as the splits or merges of groups. Dependencies between actors and events can then be parametrized in the definition of transition probabilities and inference can be drawn from a maximum likelihood procedure. A mathematical definition of the model is described, and an operationalization of social mechanisms within this new logic is proposed. Finally, we discuss a cross-sectional extension of this model in order to illustrate how such dynamics can result in the formation of stable social groups.

A Time to Give and a Time to Take: the Effect of Market Uncertainty on Exchange Sequences

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Using high-frequency time-stamped data that we collected on a major European interbank market between 2006 and 2015, we investigate how the market uncertainty produced by the recent financial crises has affected the internal time structure of relational micro-mechanisms that bring buyers and sellers of liquidity together on the trading floor. In interbank markets banks exchange liquidity in order to satisfy their short- and long-term liquidity needs. We model the time-ordered sequences of financial transactions as a dynamical relational system. We address two related questions. First, what basic micro-mechanisms work to stabilize interbank relations under conditions of market uncertainty? We address this question by examining change in network micro-mechanisms before and after multiple exogenous shocks. Second, how does uncertainty affect the internal time-structure of those fundamental micro-mechanisms? We address this question by examining the distribution of time elapsing between events that define dyadic and extra-dyadic exchange sequences. We restrict our analytical focus to reciprocity and transitive closure as examples of micro-mechanisms that emerge from sequences of time-ordered financial transactions. Empirical results show that the main micro-mechanisms driving the evolution of the system have short- and long-term components that play out with different intensity across different economic scenarios.

A Latent Variable Approach for Modeling Relational Events with Multiple Receivers

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Social behavior between individuals in a network can often be characterized by short communication actions of one actor towards another actor or several other actors. In an information network of employees in an organization, a directional relational event can be an email message send by an employee to another employee, in a school class a directional relational event can be a teacher hushing a student, or in a military squad a directional relational event can be a soldier giving a command to another soldier. Various methods have been proposed in the literature for modelling such network data. Currently however these methods are not specifically suited when the events have multiple receivers (i.e., multicast events) or when the relational events are triggered by unobserved nodal or dyadic characteristics. These are serious limitations for modelling relational event histories in a realistic manner. First relational events may naturally be sent to multiple actors in the network as an employee may send an email to multiple colleagues, a teacher may hush multiple students, or a squad leader may give an order to multiple squad members. Second, relational event events may be driven by latent characteristics as employees may work on unknown but common topics, children in a class may have unobserved common interests, or soldiers have unobserved common communication styles, which result in an increased tendency for them to communicate with each other. To address these shortcomings, we present a generalized multivariate probit model for capturing multicast events with a multiplicative latent factor structure for modelling unobserved heterogeneity in the relational event data. The methodology is illustrated using an empirical event history of email communication messages between employees in an organization.

Time-Varying Effects of Personality and Friendship on Real-Life Interactions in a Freshmen Student Network

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When adolescents move to early adulthood and start their bachelor studies, they move away from their old friendship networks and are confronted with a new social context. In this new social context, the network of freshmen students moves from zero-acquaintance towards emerging new social relationships through interpersonal interactions. Interpersonal interactions patterns at the start of this process, when the student network is in the process of getting acquainted, can be distinguished from patterns later in the process, when relationships move towards long-term acquaintance. Previous research has shown that the influence of personality traits on interpersonal interactions is different for these distinct phases of the getting acquainted process. However, not much is known yet about how effects of personality on interpersonal interaction evolve in continuous time. The aim of the current study is therefore to investigate (1) how underlying mechanisms of personality and emerging friendship networks drive interpersonal interactions, and (2) how these influences change over time as students move from zero-acquaintance towards established social relationships. For this objective, relational event history data from the CONNECT study is utilized. The CONNECT study follows 126 freshmen psychology students over the course of their bachelor studies. In an event-based assessment, observations of interpersonal interactions are obtained. Furthermore, the CONNECT study longitudinally observed students' developing personality traits and emerging friendship networks. This way, the CONNECT study provides a unique way of assessing how interactions between actors in a new social context dynamically evolve in a real-life context. The present study applies Butts' (2008) relational event framework to model the observed interaction sequence. The moving window approach introduced by Mulder and Leenders (2019) is applied to assess how and when personality traits and friendship effects on interpersonal interactions change over time. By applying the relational event framework in combination with the moving window approach, we are able to perform a fine-grained investigation of how the pace and patterns of interpersonal interactions in a real-life freshmen student social network change dynamically over time. In addition, this approach allows investigation of how underlying mechanisms of personality and friendship drive interpersonal interaction in this new social context and how these effects evolve in continuous time.

Modeling Discourse Dynamics with DyNAMs

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While claims by political actors within public debates may enjoy success because they are supported by “better” arguments, often power, resource, affiliation or conflictual relationships among these actors influence which claims are picked up or ignored, become central or peripheral, or succeed one another as debates move on. We examine and test a range of hypotheses drawn from policy networks that concern the dynamics of policy discursive claims using dynamic network actor models (DyNAMs) on two unrelated political discourses in Germany - the debate on exit from nuclear energy in 2011 and the debate about migration politics in 2015. By examining two networks embedded in the same political structure, we learn more about how issue context and discursive dynamics affect how public debates evolve and whether substantially different debates nevertheless are driven by similar mechanisms.

A Bayesian Multinomial Choice Model for Relational Event Data

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There is a growing body of literature that recognises the importance of relational event data in the field of social networks. This type of data can be analysed by the classic relational event model (REM) or other similar models, that have recently emerged from it. These models share a common concept of an event, a triplet of time, a sender and a receiver. The event history forms the longitudinal event data that is considered as a Markov chain of events, in which each current state depends on the previously realized sequence. In practice, senders and receivers, which can be referred to as the actors, can have a large set of attributes (e.g., actor specific attributes, dyad specific attributes, and various summaries of the passed event history) causing the occurrence of links. Our research proposes a new model for analysing relational event data based on a partial likelihood approach and the Bayesian multinomial choice model. In current relational event models the occurrence of a specific directed link may result in very large risk set. In a network of J actors, the number of such links equals $J(J-1)$, which can become too extensive for large values of J . To address this problem we adopt a partial likelihood approach, which models the receiver of an event as a dependent variable, and the sender and the time of the event as given variables. Furthermore, the occurrence of an event can be caused by many effects, such as actor and/or dyadic specific exogenous effects, event history dependent endogenous effects (e.g., inertia, reciprocity, various participation shifts, etc), and interaction effects. In the case of a large number of predictor variables, standard regression analysis would easily result in overfitting. Regularized regression is an effective way to handle such situations. For this reason, we have incorporated a Bayesian lasso in our model. There are two ways of constructing a multinomial choice model: either by using a probit link or by using a logit link to calculate the probabilities of categories. A probit link leads to normally distributed conditional posteriors of the coefficients, that is more convenient to use in Bayesian sampling algorithm. However, a logit link results in logistic conditional posterior distribution of the coefficients, which has intuitive interpretation in terms of log-odds. The dimension of a resulting distribution is defined by the number of actors in the model. Normal and logistic distributions are shown to be similar in large dimensions. This is due to the fact that the estimated Kullback-Leibler divergence approaches zero for dimensions approximately larger than 150. Preliminary results of using the new model on a simulated dataset show that our sampling algorithm is able to detect true large effects and avoid overfitting.

Goodness of Fit Concepts for Relational Event Models

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A defining feature of network mechanisms is their internal time structure – i.e., the fact that they do not operate instantaneously and synchronously. When social interaction data are extracted from relational event sequences, the internal time structure of network mechanisms may be defined in terms of time-to-next-event distributions. For example, given a directed event connecting a sender and a receiver social entity, reciprocity is recorded when a subsequent event is observed that flows in the opposite direction. The duration of the time spell between these two events is likely to be of variable length. Building on this general intuition, in this paper we develop a simulation-based, auxiliary variable approach to assessing the goodness of fit of relational event models. Our approach posits that a model fits the data well to the extent that its empirical estimates are consistent with the observed internal time distribution of the network mechanisms that generate the observations. Because the time distribution of the network mechanisms is not itself modeled directly, this approach provides a particularly stringent test for the adequacy of relational event models. We use data that we have collected on relational coordination among healthcare organizations to explore the empirical value and limitations of the goodness of fit concepts that we develop. We discuss the general implications of our work for the specification, estimation, and testing of mechanism-oriented models for networks.

Modeling Heterogeneous Preferences in Dynamic Network Actor Models

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The Dynamic Network Actor Models (DyNAMs) allows analyzing relational event data, i.e., interactions between actors occurring over time, such as phone calls, emails, and social media communications. DyNAMs (Stadtfeld & Block, 2017) assume that the observed sequence of relational events is the outcome of a continuous-time Markov process with two sub-steps modeling the changes in the network. The first step describes the time until an actor initiates the next relational event, and is modeled by an exponential distribution depending on the actor activity rate. The second step determines the choice of the receiver of the event, and is modeled by a multinomial probability distribution. In the choice model (step 2), actors' preferences over the set of receivers are defined by a linear combination of parameters and statistics. The statistics express the dependence of events on monadic and dyadic attributes, actor position in the network and previous events. The parameters quantify the attractiveness of the statistics and are assumed to be constant across actors. This homogeneity assumption, albeit statistically and computationally convenient, is hard to justify in some empirical contexts, e.g., in the presence of unobserved attributes or unspecified network statistics which lead to unobserved heterogeneity in actors' preferences. Here, we present an extension of the DyNAMs that allows accounting for unobserved heterogeneity by including random effects parameters in the multinomial model. We illustrate the applicability of the model by analyzing sequences of who follows whom on a social media site.

Modeling Memory Decay in Dynamic Networks: a Semiparametric Bayesian Method for Fine-Grained Longitudinal Data Analysis

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As a result of the increasing automated collection of information, fine-grained longitudinal network data are increasingly available in many disciplines, such as sociology, biology, and engineering. This stimulated scientists to develop network models which suit the inherent dynamic nature of the so-called relational event, that is an interpersonal action generated by a sender and targeted to one or more receivers at a specific time point. In the societal field, the application of these models aims to find insights into social behavior patterns and to shed light on the emergence of a global structure from dynamics occurring at a local level. In the new framework of Relational Event Models, the event rate is modeled as a function of sufficient statistics depending on transpired events and exogenous attributes. So far little attention has been paid to the possibility that recently occurred events have a larger impact on the current event rate than those events happened long ago. This hypothesis lays the foundations for the likely presence of a memory effect that would influence the unfolding of a dynamic network. For instance, for a given endogenous effect, we could formulate a short-term definition (e.g., short-term reciprocity) for recently passed events; and a long-term definition (e.g., long-term reciprocity) for long passed events. Alternatively it has been proposed to model memory decay with an exponential function with a given half-life period. A problem is then that we would not be able to learn about memory decay from the observed data as it is prespecified. The purpose of this work is to provide a semiparametric (Bayesian) method for modeling memory decay in relational event data. The method is semiparametric in the sense that it does not make assumptions about a specific functional form for memory decay of endogenous network effects. Thereby, the method can be used for finding any functional form of memory decay which could be an exponentially decreasing trend, a smoothed step-wise function, or other, possibly more complex, functional trends. In the case of event history data with combinations of positive and negative events, the proposed method will not only allow us to learn how much longer negative events are stored in the actor's memory than positive events but also whether the memory decay of these different sentiments follow different functional shapes. In our method, we start by splitting the elapsed time for an endogenous effect in a fixed number of intervals with boundaries which are modeled as random parameters, as can be done in a Bayesian framework. The Bayesian sampler then results in many realizations of different interval configurations and corresponding network effects in the posterior. Subsequently, by averaging over these configurations we will obtain an approximately smooth functional trend of memory decay of the endogenous effects. The proposed method will be useful for fine-grained analysis of the memory of actors in a network, and it establishes the basis for further developments around the

concept of memory in dynamic social networks.

Network Ecology: Tie Formation in Context(s) (Sessions E2, E3)

Chairs: Malte Doehne, Daniel McFarland, James Moody

Informal Group Perceptions in Multidimensional Social Networks

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Informal groups emerge in social networks and influence individual and collective outcomes. While groups provide important context for individual activities, their structure and effects are not fully understood. In social network analysis, groups are often defined as clusters in a network of positive relations, such as friendships. Such clusters can be empirically identified and analyzed using various community detection techniques. However, informal groups are arguably more than just cohesive subgraphs relatively separated from the rest of the network. As individuals organize into groups, they develop norms and identities, define group boundaries, and become similar in their perceptions and behavior. In order to understand how they form and affect individuals and communities, we need to measure multiple aspects of groups and how people perceive them. While some work has been done in this direction (e.g. social cognitive mapping), we still know little about how informal group perceptions are structured in communities. How are the perceptions of individuals about informal groups related to social networks in communities? Which peers do people perceive to be members of their groups? To investigate these questions, we collected longitudinal social network and group perception data in scope of the Swiss StudentLife Study. Here we analyze the first year of the first cohort of the project, focusing on 226 engineering undergraduate students. In this period, we surveyed social networks and self-perceived membership in informal groups of students six times. We analyze the multidimensional network of social relations and peer perceptions which link individuals to their perceived groups and members of these groups to each other. We find that (1) students do not simply perceive their friends as members of their groups, but predominantly peers with whom they have positive relations. Further, (2) perceived own groups tend to be subsets of larger friendship communities (identified by different community detection techniques), with very high rates of positive relations between group members. (3) Perceived groups also show higher rates of reported interactions than friendship communities or other subsets of the cohort's social network. Finally, (4) members of perceived groups tend to perceive each other positively, attribute social roles to each other and agree on their perceptions about outgroup members more often than members of friendship communities. The results imply that by collecting data on the informal groups people feel members of, we can identify sets of individuals who show high levels of interaction, cohesion and shared norms. These groups are only partially captured by asking people to nominate whom they are friends with. Measuring multiple dimensions of positive social relations brings us closer to identifying the relevant peers. However, these peers may have very different effects on individuals, depending on how they are organized into informal groups and how these groups are defined/operationalized. By investigating multiple group and network measures simultaneously, we can better

understand the effects of informal groups on individuals.

Coordination as Continuous Social Interaction: a Case Study on Surgery Teams

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How is coordination achieved within teams? How do interactions among team members form and evolve over time? What is the nature of these interactions? A current line on research is emerging from the view that these questions are best addressed by collecting high-resolution data on continuous-time interactions within and across teams. This research is gradually changing the way in which we think about social interaction – and about the collection of network data needed to understand its internal structure. With few exceptions, however, empirical work analyzing team coordination in continuous time and in naturalistic settings is still infrequent. In this paper, we contribute to this line of network research by proposing an integrated research design approach to the collection, coding and analysis of continuous-time social interaction processes extracted from video-recordings. We offer an illustration of how to match data collection and analysis of video data to investigate team processes in naturalistic (non-experimental) settings. We show how audio-visual recordings can be used to collect continuous-time data on various types of interactions within teams, and how these data can be coded and analysed as relational event sequences, i.e., interactions initiated by one team member and directed toward one or more alters at any particular point in time. The opportunity to illustrate how visual data can be collected, organized and analysed as sequences of relational events is provided by video recorded data of surgical teams in two operating theatres at a major teaching hospital in London. Coordination among team members (surgeons, nurses, anesthetists, and operating department practitioners) is achieved through various forms of interactions reflecting different types of verbal and non-verbal communication (i.e., speech, gaze, and handling of objects). We show how these various modes of communication can be coded and analysed as relational events connecting team members. Given the crucial role of effective teamwork and communication between healthcare providers for patient safety and hospital costs, the collection and analysis of continuous-time data on interactions within surgical teams may be used to improve work practices within operating theatres, and develop a better understanding of the relation between team coordination and team performance.

Contextualizing Oppositional Cultures: a Multilevel Network Analysis of the Emergence of Status Orders Across School Contexts

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Sociological observers of modern societies have long noted the tendency of adolescents to develop youth cultures that are often at odds with the official demands and values of the school system. Due to their institutionalized separation from their parents and legally enforced exclusions from key adult domains and rituals, youth come to build an “adolescent society” that tends to develop quite autonomously or even in opposition to the values and norms of the adult society. In particular, youth may develop a status order that does not reward academic performance or at times even negatively sanctions high effort and performance. Different lines of research have argued that specific groups are more prone to develop an oppositional culture in the school context than others, attributing this tendency particularly to boys (“the problem with boys”) and racial or ethnic minorities (“acting white”). We attempt to identify more general mechanisms that allow us to specify the scope conditions of local gender-based or ethnicity-based oppositional youth culture. Analyzing large-scale longitudinal data on complete networks across a large number of schools, we investigate how the composition of school classes affects whether oppositional status orders will emerge and when they will align with gender or ethnicity. To this end, we use stochastic actor-oriented models to examine the social acceptance of high-performing students across contexts, while controlling for other tie-formation mechanisms. The work demonstrates the potential of an ecological perspective that helps to understand the contextual conditions under which oppositional youth cultures become manifest in tie-formation processes.

Local Cultures of Tie Formation: the Impact of Context-Specific Institutions on Advice Tie Formation

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Advice networks of egos who account for innovation attempts are crucial for their success. Considering the importance of advice networks in this context, the question arises of how to explain the formation of such networks. Previous research identified two relevant explanatory approaches, namely (1) partner selection decisions and (2) opportunity structures. However, a comparison of studies conducted in different—yet supposedly comparable—social contexts reveals a need for further theory development. An explanatory gap persists with regard to variances in patterns of tie formation between these supposedly comparable social contexts. First, it has not been satisfactorily clarified why the established approaches are effective in some contexts but not in comparable others. Second, the context-related specification of these approaches is needed, but there is a lack of conceptual basis for this. We propose to consider the local cultures of social contexts systematically to fill these theoretical gaps. To this end, we define culture as an ensemble of institutions established in a social context. Actors structure their tie formation activities based on these. Only few studies elaborated on context-specific differences of tie formation and assumed a cultural impact. Nevertheless, they cannot systematically show the impact of culture because they did not compare different contexts and did not integrate culture into their analysis. To empirically capture the effect of culture, we compared advice tie formation from an ego perspective in different social contexts. Following a qualitative approach, we combined semi-structured interviews with event-based diaries and unstructured network maps as narration triggers. To reveal differences between local cultures, we compared advice tie formation in two entrepreneurial communities among each other (56 interviews in total) and from three R&D departments of large enterprises among each other (interviews with 42 developers, reconstructing 132 interactions). Our findings show significant differences between comparable contexts, as the following two examples illustrate. While partner selection can be explained by indirect ties in one entrepreneurial community, indirect ties are largely irrelevant in the other. Encounters in public situations are willingly used to form advice ties in one R&D department, whereas the developers from another department consciously avoid it in such situations. By systematically including culture in the analysis of the tie formation processes, we are able to explain both the context-specific relevance of the different mechanisms and their context-specific characteristics. We develop propositions about the impact of local cultures on ego's advice networks that might guide future research on advice tie formation. Two things vary between contexts: which of the previously recognized mechanisms work and how exactly they work. Current theories on tie formation

are not able to explain these variances between social contexts. This lack of context sensitivity considerably limits the explanatory power of the previous theory and brings a huge risk of invalid generalizations. Our contribution is to develop the current theory on tie formation further, with regard to the explanation of these variances by showing the influence of local cultures on the basis of in-depth comparative analyses.

Action Networks – Exploring Dynamic Organizational Routines in Outpatient Clinics

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Behavioural patterns in organizations are often explored in network analysis as relationships between agents such as interactions, knowledge exchange, advice giving or friendship. Understanding the spatial, organisational and cultural context in which these relations are embedded has gained importance in recent years. In order to understand the embedding of actors in multiple contexts, it is suggested here to view relational patterns not between actors themselves, but between their actions. This builds on the work of Brian Pentland and Martha Feldman on organizational routines and narrative networks. They argued that routines in organizations can be seen as both structure and agency. Through the performance of actions a patterning emerges, where certain activities occur in often repetitive but varying sequences. This allows exploring routines as dynamic organizational constructs. In this talk, care processes in outpatient clinics will be explored as action networks. Based on the observation of actions of healthcare workers (physicians, nurses and clerks) across five different outpatient clinics in two different hospitals, one in the Netherlands and one in Canada, networks of action will be created using the ThreadNet application. In these networks, a node will be an activity (communicating, documenting, patient care, walking, etc.) occurring in a particular location of the outpatient clinic (corridor, exam room, reception, etc.) and a tie will be the sequence of actions. The empirical data consists of 170 hours of observations shadowing 127 healthcare workers for around 80 minutes at a time resulting in 8238 distinct activities. The two different hospitals have very different organizational routines, which is evident from the duration of activities, which tend to be much shorter in hospital A (mean duration=60.0 sec) than in hospital B (mean duration=106.2 sec). The hospitals also have different architectural layouts with hospital A being more open plan and boasting larger viewsheds, whereas hospital B has a traditional corridor layout with more partitions and less visibility among healthcare workers. It is hypothesized that the more open layouts in hospital A resulted in a more dynamic environment with shorter activity duration, whereas the more segregated layouts of hospital B created less dynamic environments. In order to push the argument on dynamic routines further, the action networks of the five clinics of hospital A will be compared to those of hospital B. Differences in the degree distribution of the action networks will be analysed as a proxy for the levels of dynamic emergence of routines. A more equal distribution of degree centrality would point towards a more dynamic system, whereas starker differences in degree centrality would point towards routinized, less dynamic patterns of actions. Results suggest relevant differences between the two sites, but also point towards differences in care processes across the specialities of the clinics. Reflections on the embedding of routines into spatial contexts and the role of

space in shaping organizational actions will be made as part of the conclusions.

Status Systems as Dynamic Network Ecologies of Perception – a Theoretical Framework and Empirical Test in the School Context

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This article offers a theoretical framework of the evolution of status orders which extends relational approaches with a focus on contextual flexibility in the emergence of status systems. Previous accounts assume that status orders are predominantly built out of actors' preferences for high quality alters, form in a similar fashion across context and are stable once established. In contrast, I will argue that only certain ecologies of perception produce highly status-aware actors and emphasize fluidity in the formation and processual maintenance of status systems. By marrying structuralist network theory with concepts from phenomenology and findings from cognitive science, I will outline how the creation of reputations and the successive hierarchization of perceptions among actors are shaped by contextual characteristics. Thereby, I argue that size, demographic composition and external factors are crucial for the formation of status orders, because they influence interaction frequencies and the sedimentation of reputations among actors. In addition, I detail which configurations of characteristics should lead to the occurrence of status systems with extreme social positions. Expectations derived from this theoretical perspective are tested in the school context. I combine network analytical models and meta-regressions to investigate the temporal co-evolution of multiple tie types among schoolchildren. This allows me to test whether processes necessary for the crystallization of extreme positive as well as negative social positions are more pronounced in grades marked by certain configurations of contextual characteristics.

When Do International Technology Transfers Become Reciprocal? Empirical Evidence from German Network Data

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It is well known that legal and economic contexts matter for the volume of technology transfers between companies. For example, U.S. companies tend to transfer substantially more technology to companies in countries with high levels of patent protection and economic development. Less well known is when and why unilateral technology transfers become reciprocal technology transfers. To put it differently, when do companies based in the U.S. or Europe not just license technology to companies in India or China, but also license substantial amounts of technology from companies based in these countries? This question is highly relevant for a deeper understanding of the social dynamics behind trade, yet it has thus far remained unanswered due to a lack of data on international technology transfers. In this paper I make use of a new relational dataset in order to identify mechanisms through which knowledge is transferred across legal and economic contexts. This dataset - constructed from reports of the German Bundesbank - is unique in the sense that it can be used to model companies' license payment flows from and to a particular country as an evolving ego-network. Preliminary analyses of the German ego-network between 1963 and 2011 reveal how unilateral license flows from the United States to Germany quickly gave way to reciprocal license flows between both countries. It also shows how the role that German companies played for companies in emerging economies is similar to the role that U.S. companies played for German companies in the decades after World War II. The paper will rely on country-level data to explain the precise timing and nature of this shift.

Network Ecology: Tie Formation in Context(s)

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Social networks are embedded in material, cultural, and institutional settings that affect tie formation processes and the resulting network topologies. For example, romantic entanglements are subject to social and cultural norms, country-specific legislation constrains firm alliances, and adolescent friendships are conditioned by classroom settings and neighborhood effects. In short, context matters for the formation and sustainment of social relations. How it does so (and when), however, remains to be established. In this paper, we present 'network ecology' as a general framework for identifying how the proximate environment shapes network structures by affecting interactions and dyadic relations, and how those interactions and Relations in turn shape the environments in which networks unfold.

Personal Networks and the Life Course (Sessions F2, F3, F4)

Chairs: Laura Bernardi, Marlène Sapin, Eric D. Widmer

Shared Intimacies? a Longitudinal Analysis of Two Partners' Networks of Emotional Closeness

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What happens in two partners' networks of emotionally significant relationships during the first years of marriage? The conventional idea is that as two partners become committed to each other, their individual networks gradually 'grow in' and start to overlap. This has been referred to with the concept of marital network, meaning the joint network of partners in a stable, long-term relationship. This paper reports findings from an on-going study in which two partners' (in a couple) emotionally significant relationships are analysed at two time points. Data consist of information on the networks of 13 Finnish mixed sex couples in their first marriage. Longitudinal data were collected at the time of couple's wedding (T1) and after three to eight years of marriage (T2). Different kinds of data are used: personal narratives of wives and husbands interviewed individually and longitudinal structured information on the people they consider emotionally significant at the two time points. The analysis draws from a figurational perspective that combines insider and outsider perspectives and highlights both the subjective view of research participants expressed in qualitative interviews and the relational setting delineated with tools of network analysis. The results highlight differences in the relational processes of two partners in a couple and a variation in extent to which being in a couple (and becoming a parent, for example) influences an individual's circle of the closest persons.

Personal Networks in the Life Course of Military Families

Vida Cesnūyte

General Jonas Zemaitis Military Academy of Lithuania, Lithuania

Personal networks changing during life course. At individual level, it depends on particular age of an individual. For example, it is related to adulthood and event such as move from school to professional education, or later adulthood when individual move from education to labour market, or to singlehood to familial life and so on. Each time, individuals adapt to new social environments, including changes in their personal networks. The research question is how these processes influence personal networks of military family members? Persons who chose professional military career are involved into strongly defined structures with limited possibilities to construct personal events in the life course, as well, personal network. On the other hand, families of military professionals go through similar life course events like most families: marriage, birth of children, raising children, solving everyday problems etc. Situation is even more complicated when members of these families should go through stages of living-apart-together because of obligations of family member – military professional, for example in the periods of military missions. So, another research question is who constitute personal networks of military families during the periods of military missions? What kind of roles play members of these personal networks? The research based on quantitative and qualitative data collected by the sociologists of General Jonas Zemaitis Military Academy of Lithuania. Quantitative data collected in 2015. The sampling unit is wives of military professionals who spent some time in military missions abroad, and standardized questionnaire applied in the survey. Later in the same year, qualitative data collected. Several qualitative surveys conducted: focus group with military professionals who spent some time in military missions abroad; focus group with wives of military professionals who spent some time in military missions abroad; focus group with wives of military professionals who had not event in their life course like military mission abroad. The research results revealed, that military professionals themselves, usually, focus on rather limited and defined personal network consisting from nuclear family plus friends – also military professionals. Meanwhile, their wives extend personal networks including extended family members, friends plus institutional servants and wives of other military professionals. It is especially true in cases of families of military professionals who spent some time in military missions abroad.

Changes in Personal Networks in Times of Conjugal Transitions

Claire Bidart

CNRS, Frances

The dynamics of personal networks reflect and accompany the transitions of the life course. Indeed, relationships emerge in social contexts, these change as people grow older, patterns of sociability are transformed, relationships appear or disappear, their interconnections evolve, especially during important life transitions. More precisely, I focus here on transitions in the field of conjugality: romantic encounter, living in a common dwelling (with or without marriage), birth of a first child, and separation. Biographical transitions related to conjugality have a particular impact on the composition and structure of personal networks, which is not surprising since these transitions are precisely at the junction of relational and biographical dimensions. What are the precise relational effects of these transitions on the composition of the personal network and on its structure? What types of new links appear, what old ones are broken? By comparing the lost, maintained and emerging relationships, it will be possible to further study the relational characteristics that are relevant in these circumstances (strength, length, multiplexity, homophily, interconnections...). The way new relationships emerged, from which contexts, and how they have connected to the network may be compared with the older ones. The structure of the personal network is also evolving (density, modularity, centralization. . .). Are the effects of these different conjugal transitions comparable? For example, does the separation "undo" what the couple installation had done to the network? Such an analysis is made possible on the empirical basis of a qualitative longitudinal panel survey of a population of 87 young people, some of whom were followed over 20 years. The procedure for each survey wave combines the collection of biographical data and narratives of the Egos, the collection of their personal network by a procedure of name generators based on contexts, and the collection of the interconnections between their Alters from Ego's point of view. The replication of surveys over time makes it possible to identify biographical transition sequences and to compare the personal networks of the same person before and after these transitions. The survey design combines qualitative and quantitative methods (with all survey waves we have 306 stories, 306 networks, 219 periods from one survey wave to the next, and 11,770 described relationships). The effects of these different conjugal transitions will be better analyzed by comparing them with each other. By confronting them, we can advance a little further in the understanding of the challenges that these transitions represent for the personal network and the changes in the forms of sociability that are involved.

Patterns of Resources and Strains in Family Networks and Mental Health: Empirical Evidence from a General Population Sample

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Several studies have investigated the role of social capital, as network resources, in relation with health and mental health, with inconsistent findings. Fewer have assessed the straining effect of social relationships, such as demands or conflict. Literature on personal networks shows that family relationships are a primary resource of care and support. Family networks may however create stressful interactions, which may contribute in their own way to poor mental health. This paper examines family-based social capital, defined as resources provided by family network members, in also considering conflict relationships. Based on MOSAiCH 2013 data, a national representative survey including respondents from age 18 to age 90 living in Switzerland, we explore the whole patterns of resources and strains in family networks, using a typological approach, considering structural features of support and conflict relationships jointly. We also evaluate the extent to which such patterns of support and conflict relationships relate to the social structure and to specific life stages. Results shows that the whole patterns of family-based social capital and straining relationships matter with regard to depressive mood and that, in some extent, contribute to a cumulative disadvantage, as found associated with other social disadvantages.

Does the Structure of the Personal Networks of Patients with Severe Mental Illness Differ from the Common Types Found in the General Population?

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Introduction. The social support network (SSN) of an individual is the set of people who interact with the individual and with each other to provide support to the individual. The SSN is a key element of the care for patients with long-term conditions, e.g. patients with severe mental illness (SMI), providing a variety of resources. It is well established that the size and the composition of the SSN influence patients' symptomatology, social functioning, and service utilisation. Recent studies also suggested that the network structure may affect patient's care outcomes, though these studies are inconclusive and considered only a limited number of structural indicators. In this context, the establishment of a typology of SSNs makes it possible to explore diverse structural indicators and their association, among themselves and with patient's outcomes. Recently, Bidart and colleagues established six types of ego-networks with distinctive structural shapes in the general population. Therefore, we sought to investigate the extent to which the SSN of SMI patients were fitting these network types. **Method.** We collected data on the SSNs of 380 SMI patients recruited in psychiatric services. We applied Bidart's typology, which is based on the combination of four structural indicators (betweenness centralisation, modularity, density, and diameter) to the patients' SSNs. Then, we assessed the differences found in our sample compared to Bidart's types. **Results.** Patients' SSN classification only fits partially Bidart's typology. A particular type, named 'regular dense' in Bidart's typology, appeared to be much more heterogeneous. A significant proportion of the networks in this category (81.7%) had a lower density than the median in Bidart's typology (0.38). In addition, these networks were small (11 nodes on average), highly fragmented (69.4%), and had small components with many isolated nodes (5.5 components including 4.3 isolated nodes on average). **Conclusion.** Bidart's typology cannot be applied to the SSNs of SMI patients without adjustments. Results suggest that the misclassification issue is related to the smaller size of networks as size is likely to affect the structural metrics used, and to the high fragmentation, which would induce a low modularity, even in case of low density. Yet, further analysis is needed to determine if the issue can be solved methodologically or if it reflects major differences between the structure of the SSN of SMI patients and of individuals in the general population.

Later-Life Transitions and Overlap of Spouse Networks; a Longitudinal Study of Couple Networks in Switzerland

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Background: The spousal relationship is among the most influential personal relationships one can enter. Marriage has a central position in the personal relationships of individuals and constitutes a strong impetus for couples to merge their respective personal networks into a larger overlapping network in early stages of family life. Personal network overlap between spouses has positive implications for social support, marital capital, value consensus and the overall quality of the partnership. However, the factors stabilizing, increasing, or decreasing such overlap during the later stages of married life remain rather unknown, despite the functional importance of such overlap for partnerships. To fill this gap, this study considers two transitions typical of older adulthood that we hypothesize will influence network overlap. We test whether the departure of children from the familial home and retirement are associated with increased spousal network overlap, while examining these processes separately for husbands and wives because of potential gender effects associated with such transitions. Methods: The study used the Swiss Couple Data, "Social Stratification, Cohesion and Conflict in Contemporary Families", a longitudinal survey which started in 1998 on 1,534 couples living in Switzerland. The study focused on couples which stayed together and had children on wave 3 (2011) and wave 4 (2017) of the survey (N=394). Ordinal logistic regressions were used to predict changes in husbands' and wives' reports of joint visits with family, joint visits with friends and overlap of friendship ties. Results: Overall, both types of transitions were related to increased overlap of ties, measured as joint contacts with family and friends and overlap of friendship ties. In relation to the empty nest transition, husbands whose children left the household between waves reported increased joint contacts with friends. In regard to retirement, husbands whose wives retired reported more joint contacts with kin and friends. Wives reported more joint contacts with kin if their husbands retired or if both partners retired between the measurements. The overlap of ties was impacted to a larger degree if the children were not living in the household during both waves and if both spouses were retired in both waves. Discussion: The results provide evidence on how key family transitions impact spouse networks. They emphasize the importance of the linked-lives principle by demonstrating that husbands and wives' transitions have profound effects on their relational environment. That is, the departure of children out of the home, a transition that might be more relevant for women, affect men's reports of joint contacts, and the retirement of the husband affect the wife's reports of joint contacts. Overall, the transitions associated with later life strengthen what was achieved by the

transition to partnership and the transition to parenthood, in which the same kind of processes of network overlap were on display. Overall, the various stages of family life make networks more shared with partner, a process that has positive consequences for marital quality and well-being.

Collecting Multi-Actor Family Network Data Among Divorced and Non-Divorced Families

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Why do some families fare better after parental divorce than others, in terms of conflict, family relationships, and well-being? Previous divorce research by Amato and others, showed that parental divorce affects children, their divorcing parents, and extended family members (like grandparents and aunts/uncles). Thus, parental divorce can be thought to have a ripple effect, starting a chain of changing relationships not only affecting the nuclear family but also extended family members. In order to understand how parental divorce affects the family as a whole, the structure of relationships within the nuclear family (i.e., parents and children), and between nuclear and extended family members needs to be studied. Regarding families as social groups, or in Lindenberg's terminology sharing groups that produce the common good of family well-being, is a fruitful approach to study the functioning of a family and its interdependencies by collecting data on the – multiplex – family social network. First, the network delineation covering children, parents, grandparents, aunts/uncles, and potential stepfamily is discussed. Second, the design of the data collection among divorced and non-divorced families is explained, including sample selection in a large cohort study and the questionnaire design based on the Bengtson's and colleagues solidarity-conflict model, informed consent procedures and non-response issues. Finally, preliminary analyses on these multi-actor family network data will be presented.

The Bigger, the Better? – Personal Network Development and the Mobilization of Intra-Organizational Social Capital

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The purpose of this paper is to increase our understanding of the processes involved when newcomers develop a personal network at the organizations they join and mobilize social capital as they start out on a new job. It focuses on the question whether newcomers derive more social capital from their personal networks over time when they foster initial ties or when they add new ties to their network. Whether their networks develop more in terms of tie stability or tie replacement may further explain differences in the types of intra-organizational social capital they mobilize. Respectively, the paper investigates the effects of changes in personal network size and composition on the development of social capital resources mobilized by newcomers during socialization. Drawing on a review of extant research, the paper formulates two competing hypotheses about the personal network development of newcomers as they become integrated and increasingly embedded as organizational insiders: They can be expected to increase their social capital by developing ties to alters already in their network, or by developing new ties to actors through which they mobilize other or additional resources. Based on data from a 3-year panel study, the paper investigates whether evidence can be found to support either of the proposed change trajectories. It reports on three waves of panel data collected from a group of 24 newcomers in 9 different organizations. Standardized network data on alters and tie characteristics allow for a classification of the newcomers' network development after 3, 12 and 18 months on the job. The newcomers also reported on the social capital resources mobilized, indicating changes over the points of measurement. In a mixed-methods design, the paper first probes for effects of different forms of personal network development on social capital mobilization using Bayesian inference. A qualitative analysis of narrative interview data is then conducted to increase validity of findings through triangulation. As such, the study adds to longitudinal studies on the development of personal networks which theorize and measure change in variables. It contributes an original focus on social capital and mobilized resources. The paper discusses how its findings increase our understanding of mechanisms to be investigated as predictors of successful newcomer socialization. It delineates implications of its findings with regard to the design of organizational onboarding measures, socialization trajectories, and mentoring programs.

Dynamics and Stability in Ego-Centered Network Data

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I am conducting an inquiry into the evolution of ego-centered networks over time and how they are affected by the socio-demographic characteristics of the surveyed panel members. Data basis are the survey waves 2011 and 2016 of the socio-economic panel in Germany. The dataset contains 13,350 respondents who were between 23 and 101 years old at the time of the 2016 survey. In 2011 and 2016 five identical name generators were used, each with five possible mentions. These included talking about important things, Help with career advancement, Help with long-term care, with whom one occasionally has disputes and who is allowed to tell unpleasant truths to the respondent. Although only the relationship type was available to characterize the persons within the network, some measures could be calculated from this, such as the IQV of the relationship context, the network size and the proportion of family members. In my presentation, in the first step I will discuss the stability in the individual relationship types as well as changes in the supportiveness of the network. In the second step I analyze the influence of the sociodemographic characteristics and the role changes of the respondents on the structural properties of the networks between 2011 and 2016.

Open Mind – Open Network? the Interrelation Between Cognitive Patterns and Social Networks

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This contribution examines the relationship between a person's open-mindedness and a number of important network characteristics. It is argued that a network rich of weaker ties, with a high diversity, and a broad range of resources is associated with more tolerance and lower dogmatism than a network that is more 'closed'. Data from the 2nd to the 4th wave of the Survey of the Social Networks of the Dutch (SSND) are used and networks as well as tolerance/openness are measured at three moments in time between 2007 and 2018. Preliminary analyses support the idea that network heterogeneity and an open mind go together but in particular, if these relationships are strong. Subsequent analyses will inquire into the question how changes in openness and changes in network patterns through the life lifecourse are related.

Application of Guanxi and Ego-Centric Network to China's Outward Foreign Direct Investment in the UK

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The paper deals with the guanxi and ego-centric network application to China's outward foreign direct investment (OFDI) in the UK. Since guanxi has been defined as relationships or social connections based on mutual interests and benefits, which is achieved by exchanging favors giving social status between guanxi partners, and guanxi factors consist of Jiaoqing (social guanxi quality), Ganqing (Blood guanxi quality), Mianzi (reputation), Renqing (physical or non-physical favors) and Xinyong (trust). In Chinese context, individual-individual personal guanxi networks are likely to be important to China's OFDI. Based on processing of primary data collected in 2018-2019 from 100 managers of various China-funded subsidiaries operating in the UK via survey, and these participants have experience in dealing with personal guanxi networks when working in the UK. As ego-centric networks consist of a single actor (ego) together with the actors they are connected to (alters), in fact, this approach is valid for guanxi factors in exploring the guanxi qualities of the participants' personal guanxi networks through modelling guanxi networks and making analysis of relevant composition and structures by using E-NET that is a software to organize ego network data. Furthermore, in order to investigate how personal guanxi networks influence the relevant firm performance, the paper builds the regression model in capturing the extent of guanxi factors influencing firm performance. On the base of the obtained primary data, the research findings not only find different levels of guanxi qualities, but also highlight the different impacts by guanxi factors on firm performance.

Mobility flows in education system (Session G4)

Chairs: Giancarlo Ragozini, Maria Prosperina Vitale

The Analysis of Student Mobility Flows in Higher Education. a Multimode Network Perspective

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The Italian student mobility in higher education represents an emerging issue for the academic system, especially for the regions located in Southern Italy. Indeed, such mobility generates massive student flows from the South to the North of the country. This phenomenon yields a brain-drain and a weakening of the human capital in this area. In the case of master degree programs, the mobility is even more consistent. The determinants of the student mobility are of various types. Several classifications have been proposed in the literature taking into account economic, social, cultural, institutional and organizational factors. Economic drivers are only one of the motivation for highly skilled people to migrate. The choice to move from the place of residence, even if for a limited period, is a complex decision that people often make to improve their quality of life. In the present contribution we aim at exploring the student mobility flows among Italian geographical areas by defining networks in which regions (as well as Provinces or Universities) represent the set of nodes and student exchanges between units represent the set of links between them. Moving from this theoretical framework, a multimode network perspective is considered. The data on cohorts of students enrolled at the Bachelor and Master Degree of Italian universities are provided by the Italian National Student Archive. Many possible sets of nodes can be derived from this database, such as provinces of student residence, university of enrollment at bachelor level and at master level, and so on. These data structures give rise to multimode networks that could be analyzed by using the approaches proposed in the literature. More specifically, we will explore the use of both community detection algorithms and blockmodeling analysis in order to find homogeneous territorial sub-areas.

Network Measures and Attractiveness Indexes for the Analysis of the Italian Student Mobility Flows in Higher Education

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The analysis of the phenomenon of intra-and international student mobility in higher education has become of increasing relevance in the academic system. Indeed, the study of the push and pull factors which drive university students' flows across geographical areas is a key asset for the redefinition of university programs, the implementation of policies to boost attractiveness and the allocation of public financial resources to universities. Several studies have focused on this topic in order to describe the flows of students considering the attractiveness of different territories and the university's reputation. In this scenario, social network analysis perspective was adopted to better understand the complexity of student mobility especially within the Erasmus mobility projects among European countries. Moving from this theoretical framework, the aim of the present contribution is to describe the incoming-outgoing flows of Bachelor and Master degree students between territories and universities in Italy by defining both statistical indexes and network measures. Among these latter, we adopt Hubs and Authorities indexes in order to explore the attractiveness of geographical areas with respect to their tertiary education supply. To provide further insights in the student mobility network, the presence of a core-periphery configuration is also investigated by means of clustering and blockmodeling analysis. It seems that peripheral area encourage students to attend higher education programs in core countries with the aim to increase the overall technical skills. Starting from data provided by the Italian National Student Archive on students' cohorts enrolled for the first time at the public and private universities in Italy in different academic years, we will investigate student mobility choices focusing the analysis on both the movements from the place of residence and the university destination during their academic career.

A Multilayer Approach to Analyze Mobility and Collaboration Networks in European Countries

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The internationalization of higher education has become a priority for the university system. Universities are diversifying and expanding international collaborations to strengthen the quality of their research and teaching activities and they encourage students and/or academic staff to participate in international mobility programs. Likewise, the collaboration in research projects among countries is a key factor for knowledge diffusion and economic growth for a country or a region with welfare implications. The aim of this paper is to investigate the relationships and the overlaps of mobility network defined among European countries according to the exchange of students and academic staff involved in the Erasmus programs and the collaboration network at country level starting from the co-participation in EU-funded projects. In this theoretical framework, most of the studies have focused on the these networks separately, without examining the connection between them. A combined approach is, instead, useful given that the collaboration networks furnish information about connections between educational and non-education institutions, while mobility networks show the attractiveness of the universities in each country. To this aim, we extract the data from the official European Commission website on Erasmus-Statistics and on the research projects funded by the European Union under the seventh framework programme for research and technological development. Then, we define a multilayer network, where two layers consist of the countries involved in the Erasmus student and academic staff mobility programs, and the third layer consists of the same countries involved in the co-participation in EU-funded projects.

(Session G5)

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Criminal network analysis (Sessions A4, A5)

Chairs: Paolo Campana, Nynke Niezink

When Things Turn Sour: a Network Event Study of Violence Among Organized Crime Members

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What drives organized crime-related violent acts? Organized crime activities require – by definition – a degree of coordination. But what happens when things turn sour among co-offenders? More specifically, do some types of criminal activities, e.g. involvement in the supply of specific drugs, increase the likelihood of victimization? And to what extent is violence reciprocated among organized crime members? In this paper, we use a network perspective to study the emergence of violence committed by organized crime group (OCG) members. We rely on data on around 7,000 crime events that were classified as involving violence against a person and that took place in the jurisdiction of a mid-size Police Force in the United Kingdom. For this project, we had access to organized crime-related police record data collected by the Force between 1995 and 2016. This set of data is particularly rich as it goes well beyond arrest data to include all encounters with the police. In total, the dataset includes around 700 organized crime members and 4700 other individuals (non OCG members), both in the role of co-offender and/or victim. Relations among criminal offenders are manifested in criminal acts of co-offending and offending (e.g., violence among criminal actors). Therefore, police record data on criminal events can help to provide insight into the relations among criminal actors. In our paper, we focus specifically on how violent behavior is affected by OCG members' history with violence and by how they are embedded in other transactional networks (e.g., drugs-related co-offending networks).

Explaining Tie Formation in Salafi-Jihadi Networks Operating in Western Contexts

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This paper focuses on three often mentioned but empirically poorly studied factors influencing the formation of terrorist networks operating in Western contexts: radical leaders, radical settings and pre-existing ties (family/friends). We do so by analyzing unique primary source data on a Salafi-Jihadi network emerging and evolving in The Netherlands over a five year period, with 80 actors involved. The data on this network follow from our full access to Dutch police files and were supplemented with interviews held with police officers and public prosecutors. Applying a Mixed Method Social Network Analysis (MMSNA), combining both quantitative (exponential random graph models; ERGM) and qualitative analysis, this allows us to empirically study the effect of radical leaders, radical settings and pre-existing ties on individual tie formation. Within the overall network two sub-networks were identified by the police, with different actors, radical leaders and radical settings (phone shops, apartments) involved. Including some additional mechanisms known to influence tie formation in social networks (e.g. ethnic homophily, closure, preferential attachment, co-location) and controlling for possible biases following from police focus on specific actors, the ERGM results for the overall network show radical leaders to be more active in forming ties, and participation in radical settings and pre-existing ties to increase the likelihood of individual ties. However, not all of these factors were found to influence tie formation in the two sub-networks we studied. Whereas participation in radical settings increases the chance of ties to form in both sub-networks, pre-existing ties do so only in one sub-network. As for leaders found to be more active in the overall network and to have a tendency against brokerage between the other actors participating, leaders were not found to be more active in the two studied sub-networks and, on the contrary broker positively in one of the sub-networks. Qualitative analysis of the police files extended our ERGM results by (1) confirming the importance of frequent meetings in radical settings, (2) showing pre-existing ties to matter, but not in all sub-networks (in one sub-network people met during religious courses and formed ties in the subsequent meetings held in private, radical settings) and (3) explaining the positive brokerage activities of one leader by connecting the people he met during his asylum period and some of the other actors (who mostly grew up in The Netherlands) during the frequent lectures he gave in different radical settings.

Dynamics and Disruption: Structural and Individual Effects of Police Interventions on Two Dutch Jihadi Networks

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The dynamics of criminal networks over time is considered to be one of the most intriguing aspects of these networks, as the ability to adapt and respond to changes in internal and external environment is crucial for their functioning. Changes may affect both the overall network structure and the tendencies of actors to interact with others, two aspects that must be distinguished because tracking only the structural level may mask variability at the individual level. This is important considering attempts to disrupt these networks by law enforcement might disrupt the network at the structural level, while triggering contradictory unintended consequences by increasing individual-level connectivity. Longitudinal studies of criminal networks are rare as suitable data is scarce. Our study aims to contribute to knowledge about the structural and individual implications of disruption in criminal networks using a unique longitudinal dataset on two Dutch jihadi networks (n1=57 and n2=26). Both these networks were tracked over two time points – before and after disruption. At the structural level, both networks seem like mirror opposites – the larger one is becoming sparser, decentralized, with longer distances and slightly increasing transitivity, whereas the smaller network counter-intuitively becomes structurally more cohesive after the disruption. To obtain the actor-level tendencies, we used stochastic actor oriented models (SAOM) to analyse the change between the waves. The model specification is based on a theory of action which posits that actors in criminal networks under disruption seek security rather than efficiency and try to remain concealed as much as possible. In spite of the differences between the networks, the tendencies of actors are similar in both studied networks with actors being inclined towards triadic closure and translation of pre-existing ties to cooperation ties. We discuss our findings in the light of their policy implications. We conclude discussing the limitations of SAOMs for networks with large composition change.

The Social Network of a Criminal Youth Gang. Size, Core and Key Players

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In this study, we examined a criminal youth gang of 35 persons in the Netherlands, using social network analysis, to answer the following questions. To what extent is it possible by means of police records to estimate the size of the social network surrounding this criminal youth gang? To what extent are members of this youth gang part of the core of the complete network? To what extent have members of the original group a central position in the complete network (key players) and are, as such, responsible for holding the complete network together? Information is derived from police records including both criminal and non-criminal affiliations. Results show that the size of the total network of this criminal youth gang consists of almost 600 individuals with a core of around hundred persons. Seven persons were identified as key players, among which six persons belonged to the original group. The social network approach in this study provides police and justice important indications for a more tailored approach regarding individuals within criminal networks.

Political Judiciary in the Provincial Courts of Vienna 1935

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How politically influenced was justice during the autocratic corporate state? We are working with a unique dataset of 1800 court cases tried at the provincial courts I and II of Vienna in the year 1935. There, we examine the extend of political judiciary. The corporate state of Austria (1933-38) gives a close-knit case example on the transformation of the justice system to serve political purposes. The formerly democratic state was remodelled to an autocratic "austrofashist" state by its chancellors Engelbert Dollfuß (1933-34) and his successor Kurt Schuschnigg (1934-38) using emergency decrees. One of the first actions of this new regime was to criminalize opposing political engagement and to strengthen the vigour of the police in the fight on the streets. Consequently, the criminal law was aggravated. A police judiciary and previously unconstitutional legal practices were introduced, and the judiciary got purified. Disagreeable judges were removed, and the remainders were sworn in on the new authoritarian state. These practices fit the definitions of political judiciary by Otto Kirchheimer and Ernst Fraenkel very closely. On this background, we examine the structural forms of political judiciary in the consolidated phase of the regime in 1935. Research so far has focused on a qualitative evaluation of the political repressive system in the early years of the great show trials against political agitators (1933/34) and on the later period before the integration of Austria into NS-Germany (1938). This talk gives a quantitative analysis of political-led judiciary in the Viennese courts of the more consolidated regime in 1935. We are able to identify patterns of political prosecution: We use a multimodal network approach to show that there are specializations and cooperation of court personnel to sentence certain political groups. We are able to provide statistically significant results using ERGM on the influence of these within the legal practice. We examine why these structures are evident taking the peculiarities of the source material into account.

Community Social Structure and Corruption

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We propose to relate the social structure of towns and cities to the presence of corruption in their local governments using data from Hungary. We measure corruption risk using data on public contract awards and social structure using data from iWiW, a defunct online social network. We find that towns with a fragmented social structure have significantly more corruption risk in their contracts, while towns made up of people with more diverse networks have significantly less corruption risk. These network measures provide substantial additional explanatory power for corruption risk above a baseline model controlling for covariates including education, income, and employment. Public procurement contracts constitute a major channel of public funds to private hands and are highly vulnerable to corruption. Recently, a set of corruption risk indicators have been derived from public contract data, for example, counting how often contracts attract only a single bidder or if competition was somehow restricted. Averaged to the regional or national levels, these contract-based corruption risk measures have been shown to predict quality of government indicators and higher cost outcomes for internationally comparable goods such as CT machines. In the Hungarian case, we find that settlements involved in a recent corruption scandal have significantly higher corruption risk in their contracts. We therefore use such indicators as a proxy for corruption in local government of Hungarian settlements. With such a measure in hand, we proceed to quantifying social structure in the settlements using connectivity data from an online social network. We suggest that the online social network, used by upwards of 40

Qualitative Perspectives in Social Network Analysis (Sessions E4, E5)

Chairs: Stefan Bernhard, Andreas Herz, Luisa Peters, Inga Truschkat

Character Networks in a Collection of 19th Century German Novellas

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Novellas are a literary genre that is characterized by tight restrictions on form. While these do not apply explicitly to character constellations, we are interested in whether there are commonalities in the structure of character networks nevertheless. Character networks are constructed from different types of relations that may exist between characters, and they may evolve over the course of the plot. We propose methods to analyze similarities in character constellation networks by using network motifs, spectral distances and a similarity measure based on the dynamic variation of social balance. Compared to previous approaches on dynamics of character constellation networks focused on co-appearances of characters, our procedures allow to explain both, the coherence of those networks having a similar behavior as well as those that seem to show an unusual behavior. In a case study we apply these methods to the Deutsche Novellenschatz, a corpus compiled by Paul Heyse and Hermann Kurz as a canonical collection of 19th century German language novellas.

Communicative Practices of Transnational Memory - Social Network Analysis of a Historical Online Forum

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The interdisciplinary field of memory studies researches questions of collective memory. What do various groups consider as their history and how are these events instrumentalised in current agendas? The research project is rooted in the intersection of two intertwined "turns" in memory studies that emerged within the past two decades: the "digital" and the "transnational" turn. Most theoretical findings in memory studies suggest that the advancement of the Internet will lead to the development of a global memory narrative, a synchronisation of memory. They prompt that the Internet is a presupposition for the emergence of transnational synchronised memory. However, research in computer mediated communication and Internet studies suggests that online communication leads to positions becoming more pronounced and more extreme over time, thus indicating not a synchronisation, but a growing polarization. There seems to be no clarity about the dynamics of debates about memory online, as well as its potential to become transnational. Apparently there is a discrepancy between the interpretations of different levels of influence of the online sphere on a global level versus the level of interaction between the users. The project uses social network analysis for the research of user interaction on a historical online forum. I use data from one of the largest WWII-themed forums online, the English-speaking Axis History Forum. When the forum launched, the focus of the platform was the history of Axis powers, but broadened quickly and soon all aspects of World War II history were discussed by users from all over the world. The data of the forum has been harvested and archived: over 62,000 users have written over 1,8 million posts divided into 55 thematic subforums. Within the project, the interactions on the forum are interpreted as transnational practices of vernacular memory. Network models based on commenting practices of AHF users were constructed. In order to navigate a model of this size, the Simmelian Backbone algorithm was applied, which helped identifying key groups in the forum debates. Meaningful results could be achieved with different adjustments of the shared neighbours property. Thus, I was able to identify groups of users interested in particular sets of topics. A further interpretative step included the analysis of the group discussions and members in order to identify whether the cohesive subgroups share properties that go beyond their structural closeness in the network. These possible common grounds are examined through the lense of memory studies.

Shared Reading

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Reading is central to both personal development and social discourse. Even though digitalization has led to repeated talk of the end of reading, there is more reading than ever before. Digital devices in particular support this trend. Digitalization does not mean that reading is lost, but that reading habits change. However, reading is becoming more social due to the Internet and the associated networking. Whether in topic-specific communities or social media, people read, discuss and write. Digital reading thus becomes interactive. The research project "Shared Reading" deals with the reading behavior of young people. We assume that reading literature does not become less through digitization and that the distinction between reading classical books and using e-readers is not central. However, the way literature is read and discussed is changing. Specifically, we are interested in how young people use Online Literature Communities. There are countless Online Literature Communities where people interested in literature can get together. The two international and multilingual platforms goodreads.com and wattpad.com are particularly relevant for German-speaking countries. In addition, the exclusively German-language platforms lovelybooks.de, buechertreff.de and fanfiktion.de are of relevance. The platforms usually provide users with the following functions and possibilities for networking: The users can compile their own books in the form of book catalogues, gain insight into the book catalogues of other users, manage book collections, write reviews, and discuss in groups. The research project "Shared Reading" investigates the impact of digitization on the reading behavior of young people using Online Literature Communities. Specifically, the following emotional, cognitive and social aspects will be considered: - Social bonds through the sharing of literature - Reflected speaking on literature - Empathy - Adoption of perspectives - The ability to concentrate in order to follow longer courses of action and complex figure constellations The so-called Scaffolding is used as a theoretical basis. This refers to the dialogical support system, which is essential for language and narrative acquisition in children. Sharing narration goes hand in hand with a mutual commitment to supporting the communicative goal. Sharing in this social-interactionist sense means mutual engagement, the commitment to common attention and mutual support. Scaffolding is of great importance in the first phase of language and narrative acquisition. With the change from family to peers in adolescence, reading behavior changes. For example, group affiliations among young people determine how texts are understood. In addition, digital interactions influence the choice of reading, especially social media. Methodologically, the research project is divided into three parts. First, the relevant Online Literature Communities were identified and categorized with regard to their functions. In a second step, the practices of digital reading by young people are examined in guided interviews. For the interviews, young people between the

ages of 12 and 17 were recruited, who use Online Literature Communities. Subsequently, quantitative methods will be used to investigate the functions of digital reading for young people. In the context of the presentation, the procedure and the results of the qualitative study will be discussed.

Qualitative Insights in Organizational Membership-Networks

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What does a formal network graph tell? Obvious facts such as graph density, different node sizes, network forces such as repulsion and attraction, different attributes manifesting in different node colors and the distinct form of the network (periphery and center) are quickly identified. What will be mentioned less likely are qualities of ties, norms and beliefs that underlie the formal structure. This is where qualitative analysis is needed. The interest in qualitative social network analysis has steadily increased since the cultural-cognitive turn in relational sociology has set in. Although there are attempts of integrating quantitative methods in a qualitative methodology, the cultural-cognitive turn in network analysis remains restricted to relational datasets, while fundamental concepts that focus on values, worldview or taken for granted institutions are rather neglected. An explanation is that qualitative perspectives in social network analysis are a methodological issue rather than a methodical issue. Qualitative methodology combined with quantitative formal measure instruments, facilitates, for instance, multilevel investigations, which enable insights on hierarchical aspects in networks. Furthermore, cross-fertilization allows a thorough investigation of qualitative insights such as narratives, norms, values, myths and institutions. However, most research questions require quantitative measurements. Yet, formal networks are socially embedded structures. Thus, the goal must be to integrate theory and methods, both understood as tools and instruments, under an overarching methodology to reach beyond disputes about labels and methods and focus on the main questions and how they can be addressed. By investigating the formal intraorganizational interconnectedness in a Swiss guild, I try to involve formal methods in an overarching qualitative research setting. Today, Swiss guilds can be categorized as membership organizations among many others, pursuing not for profit goals (like lodges, service clubs or fraternities). However – and unlike most other nonprofit organizations – the organization's means and ends remain shady, since many aspects of the guild-life are kept secret and member recruitment is highly selective. Specific intraorganizational practices arise on the ground of distinct organizational values. These value-based practices shape the way members interact, how they select new members and who is in charge. In order to tackle questions of value and norms, qualitative analysis was applied (document analysis, participatory observation, interviews, media reports and archival research). The guild is constituted through a dense mesh of values and (micro-)institutions such as the myth of chosenness (manifesting in rigid selection practices), idealized forms of intimacy (manifesting in brotherhood narratives) or a shared value-based worldview (manifesting in political affiliations). Hence, values, identity, institutional leadership and organization-specific norms are stabilizing the guild from the inside and allow it to only partially react with its technical and institutional environment. By combining quantitative and qualitative

methods and following a thorough qualitative methodology, I find, that the guild operates as a hidden and dense strong tie network, composed of locally influential members with high potentials for economic and political network effects. The members are united by shared beliefs and worldview, which in turn influence the selection processes.

Support Repertoires of Adolescents and Young Adult Cancer Patients: a Qualitative Ego-Centered Network Analysis

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Adolescents and young adult (AYA) cancer patients are in need of various forms of support. Emotional, informational, and instrumental forms of support are provided by a wide social network of formal and informal supporters. Instead of relying on one source of support, AYA cancer patients are searching for help in various digital and non-digital communication channels where a wide range of supporters exist. Thus, also research and treatment measures should pay attention to this diversity. Based on the concept of media repertoires and ego-centered network analysis, we therefore developed the concept of support repertoires. The support needs of AYA cancer patients significantly differ from the needs of children or older adults suffering from cancer. Their social structures are not yet well established (e.g. separation from parents, independent strong ties, long-term partners). The coping of a severe disease is a very untypical development task among peers, which additionally hinders the provision of social support in the personal social network of AYA cancer patients. Existing research already shows that AYA cancer patients frequently use digital forms of media, such as online cancer groups. However, studies often neglect the overarching perspective on the various forms of social support, including interpersonal contacts within the existing social network, online support groups, support by health professionals, and support from many other sources. Against this background, six qualitative interviews including social network maps were conducted with male and female cancer survivors aged 20 to 40. Duration of the interviews was between 45-138 minutes. A qualitative ego-centered network analysis was used to identify support repertoires of AYA cancer patients. Results confirm that the concept of support repertoires allows for a complex and wider perspective on support sources, because it includes media- and non-media-related ties and actors. On the one hand, we found actors or entities, who provide the support (i.e. the alteri). In addition to the known providers such as health professionals, parents, partners, and friends, AYAs also reported about the central role of online and parasocial supporters. Furthermore, media activities such as gaming, music streaming, or picture watching often provide emotional or esteem support. On the other hand, different digital and non-digital media constitute the tie to the provider of support (i.e. the ego-alteri-relationship). The results indicate that mobile and social media significantly improve the connection to various (mostly informal) providers (e.g. via WhatsAppgroup or Facebook) and also improve the autonomy of the patient. Beyond the clarification of relevant alteri and ego-alteri-relationships, network analysis also provides information about alteri-alteri-ties. It seems that health professionals and informal sources are not well connected, while digital media improve the connections between informal

support groups. Our results have several theoretical, methodical and clinical implications. Some forms of support that we identified (such as parasocial supporters), are often ignored or considered as troublesome in research and therapy, although they might be very helpful for the patient and should be integrated in (tele-)medicine. Network maps are very fruitful method to identify support repertoires, because many forms of support were only realized via visualization.

Symbolic Interactionism as Analytical Framework for Qualitative Network Research

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Qualitative approaches have become more prominent within social network analysis (again), but there are still just few systematic debates on theoretical and methodological foundations of qualitative social network research. Being one of the momentous approaches within the interpretative paradigm, we investigate implications of the Symbolic Interactionism as theoretical and methodological framework for qualitative social network research. Although using interaction as key concept just very few researchers discussed the potential and relevance of Symbolic Interactionism for social network analysis. We investigate the contribution of Symbolic Interactionism for qualitative network research and outline implications of an interactionist social network perspective. Looking at relevant publications on Symbolic Interactionism in the tradition of the Chicago School our interest is twofold: First of all, we expose ontological foundations and perspectives of Symbolic Interactionism. In order to elaborate perspectives on social networks as research objectives we discuss and define key concepts such as social relations and social networks from an interactionist perspective. In a second step, we outline epistemological implications for studying social networks. Based on the idea of research as an interaction and “the researcher as self” we discuss how to consider the researcher subject reflexively during the whole research process. Subsequently, we outline methodological consequences for an interactionist network research. Finally, we discuss implications for the research practice and locate interactionist approaches within qualitative network research.

Assessing Collaboration Networks to Support Systemic Innovation in Mountain Areas

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Mountain areas are increasingly affected by diverse drivers of change, such as climate change, migration, evolving local to international policies, and land acquisition by non-resident actors. These create the need for mountain communities to adapt in order to make the best of the coming changes or avoid their negative impacts. Mountain stakeholders can develop adaptation pathways to reach their desired vision of the future, as part of regional planning processes. The development and implementation of effective adaptation pathways requires innovative and adaptive communities. Collaboration networks are central to achieve these. Network structures, and the characteristics of network actors and ties (such as information flows) determine the potential of communities for social learning, innovation, and adaptation. As part of the Mountain Pathways project to develop pathways for adaptation to global change in the Swiss and French Alps, visions for the year 2040 were co-created by local and regional stakeholders. At the begin of this participatory process, collaboration networks were mapped and quantified. We find that meeting the vision developed in France will require systemic innovation to accomplish a this regime change. In Switzerland, however, innovation that is incremental and cumulative is required to support the persistence of the current regime. Upon analysis of the structure and components of their collaboration networks, we illustrate the innovative capacity of the two mountain communities and discuss it in the context of the innovativeness of vision elements. On this basis, we propose adjustments to the collaboration networks in order to facilitate the achievement of visions.

Assessing Community Innovativeness by Metrics, Contextual Resilience Adaptive Waves Phases and “Reality” in Qualitative Data

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The interpretation of social network metrics allows for the theoretical estimation of how resilient a community system is. Resilience here is understood as the adaptive and innovative capacities of a social community to respond to and prepare for change. In a project to develop pathways for adaptation to global change in two communities of the Swiss and French Alps, visions for the year 2040 were co-created by stakeholders, and their collaboration networks were mapped. Given the interpretation of the metrics, the Swiss community appears to be more resilient than the French community. The Swiss is more centrally steered, has more direct and shorter communication paths, and is overall quicker to adapt. The signs for innovative capacity were rather unclear: both have the same number of clusters; the Swiss has higher clustering coefficient, the French higher modularity. Innovativeness as one component of resiliency was qualitatively assessed using the constructed visions and staging them for their local, regional and global degree of innovation. Two different viewpoints are discussed in relation with the meaning of the metrics and the economic state of both communities on a resilience level in the adaptive waves model: the Swiss community has more local and regional degrees of innovation, which could correlate with the denser, shorter ties – and the conservation state of the community on the brink to a possible release phase, envisioning efficient “fixes” to maintain the current economy. The French community has less innovation “buzz” going on, but shows a global degree of innovation as of envisioning a de-growth economy. Being in a kind of re-organization to growth phase, this could correlate with a network structure that does not need the connectivity the Swiss system may need related to its phase and vision pathway. Overall, we discuss established metrics interpretation with the contextual resilience adaptive waves phases, and the underlying “reality” hidden in qualitative data.

Gender and social networks (Sessions: F5, F6)

Chair: Elisa Bellotti

Humans May Prefer Balanced Structures but This Can Differ from Females to Males: Linking Triadic Relations Model to Theories

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Perceptions of social relationships serve as a tool for humans to comprehend how members in a social environment are connected. Such understanding enables individuals to adapt their behaviors accordingly and thus facilitates good use of resources embedded in a social context (e.g., social support, knowledge, power). This study focuses on the role of self, sex, and personality in perceptions of friendship. It is believed that humans prefer balance not only in their actual friendships but also in perceptions of friendships. Previous experimental research suggests that humans tend to cluster people into triads when encoding fictional social networks. Nevertheless, little is known regarding the situation where perceivers are embedded in friendship triads. Since categorizing information as relevant to oneself or not may act as a central mechanism in perception, it is expected that self can play a significant role in people's reports of balanced structures. Specifically, this study assumes that a perceiver's status in a triad may influence her/his report about the friendship between the other two parties in the triad. Given that females are found less likely to expand a dyadic friendship to include a third person than males are, a perceiver's sex may moderate the effect of self on network perception. Additionally, perceivers' personality traits are included based on literature indicating their influence on perceptions of relationships. To answer the research question, the current study analyzes multiple cognitive social structures data sets of Chinese college students. Krackhardt in 1987 proposed to represent perceived social networks by a cubic structure indexed by perceiver, sender, and receiver, calling it cognitive social structures (CSS). Despite its popularity, it remains challenging to model CSS data due to its complexity. The triadic relations model (TRM), an extension of the social relations model, explains perceptions of relationships, with dependency in CSS data captured by individual and dyadic random effects. However, the translation from theories to parameters in the model is not evident. This paper endeavors to link the TRM to theories of network perception.

Women in Science. Research Collaboration in Italian Academia from a Gender Perspective

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The paper analyses and compares the networks of scientific collaborations of male and female scientists in the local system of public funding in Italian Academia. In specific, we look at 10 years (2001 – 2010) of the Italian Ministry of University and Research funding of Projects of National Interest (Prin) in all disciplines. In this dataset we observe the percentage of men and women funded in each discipline (over the total number of male and female appointed in Italian Universities), their academic ranks (full professor, associate professor, researcher), and their geographical location (North, Centre, South of Italy). We then select the top funded men and women across all disciplines and compare their collaboration networks, to see if women adopt different network strategies to their male counterparts. Previous studies suggest that women should have more constrained and hierarchical networks than men, while men are supposed to be more efficient and homophilous. Results show that while there is no significant difference in the structure of collaboration networks between male and female, men significantly prefer to work with other men in all the disciplines under analysis. Together with the finding that women are still under-represented in Italian Academia, that they occupy less prestigious roles and overall receive less money than male scientists, our results pose serious questions to the structure and organization of Italian academic system, where gender barriers are still very much in place, and men exclude women from scientific research either deliberately for strategic reasons, or unconsciously for stereotyped biases.

Dyadic Analysis of Partnership Quality and Satisfaction Based on Household Labor Division and Gender Equality Measures

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Partnership satisfaction and quality consist of among many other component mutual trust, similar attitudes and beliefs, similar views on childbearing perceptions and the division of household labor practices. The quality and satisfaction of partnerships might also vary in time of life events and might differ in the time of transition to adulthood or after childbearing. In our analysis we use a dyadic approach to study couples' satisfaction with their partnership in their early twenties. All couples were cohabiting and yet childless. We used a dyadic approach to analyze the couple's level of mutual trust, their perceived quality of time spent together and their satisfaction nomination regarding their partner's amount of time spent on household labor. As contextual variables we used a gender ideology scale, the ego's future plans on childbearing practices such as the time when they would like to have a child or the extent of being child-centered and their timescale of household labor. Our findings from our analysis showed that the couple's gender ideology affects their ways of division of household labor and the couple's partnership satisfaction. We examined the correlation between gender equality measures with dyadic nominations of trust between couples and conflicts of division of housework. Our data showed that those couples that were homogeneous related to their gender ideology were more prone to household labor related conflict. If the male partner were more traditional related to gender roles that caused more conflict in both partners even though the female partner were doing much more housework than the male partner (2,5 hours more than the male partner, which was average among all female partners in the sample). In case the female partner was more traditional regarding gender roles that caused only minor conflicts as both the male and the female partner nominated as this was the righteous way to organize tasks. If couples were homogeneous regarding gender ideology they were more balanced regardless they were more traditional or modern in respect of gender roles. Our findings also show that unexpectedly the division of household labor is much more balanced in homogeneous couples related to gender roles. This can be explained with more balanced power relations among dyads with homogeneous gender ideologies. We also found that homogeneous couples would have more conflict regarding household conflict nominations if other basic dyadic nominations are not reciprocate such as trust or childbearing perceptions. Regarding these findings partnership satisfaction does not only stem from balanced agreement on gender roles but on reciprocal nominations of trust, enjoying time spent together and childbearing perceptions. To test our hypothesis and findings we also recorded the conversations of couples for two weeks' time. We will also analyze the conversation dynamics of couples regarding partnership satisfaction and quality with the above mentioned variables using text analytics methods.

The Formation of Female Directorship Ties Amongst the FTSE 350 – a Network Analysis

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The under-representation of female directors serving on boards has been an area receiving a high level of research interest in the last decade (Adams, 2016). In the UK, this has been a salient topic since the publication of recommendation reports including the Cadbury Report and Higgs Review, along with the formation of interest groups (such as the 30

Gender as a Relational Institution in Interpersonal Ties

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The presentation advances a conceptualization of gender as a “relational institution”, and it offers provisional analyses of how contemporary interpersonal relationships (in the US General Social Survey) follow gender-typical patterns. Building on French post-structuralism (de Beauvoir, Foucault, Wittig, Butler) and on relational sociology, gender is seen not as a natural-biological distinction, but as a culturally established form of classifying people. The gender category is strongly connected to the construction of interpersonal attraction, sexual desires, and social relationships. This means that gender is inscribed in “relationship frames” – cultural models for the construction of personal ties like romantic (heterosexual) love, friendship, and the bourgeois family. They prescribe particular kinds of interaction and network patterns between lovers, friends, and family members. Also, these kinds of relationships are expected to run between people in particular gender combinations: Romantic love is (still) by and large heterosexual, friendships form easier within-gender, and families assign different roles with particular interaction patterns to others. The gender category is thus tied to the distinction between these different types of tie, and it rests on network patterns to by and large conform to these prescriptions. This also entails the gendered division between household / family as the female domain, and public-economic life (including the workplace) as male. Like ethnic categories (Barth), gender organizes interaction within and across the category, and it depends on the interaction following suit. Overall, the traditional cultural model implies that women should have stronger connections to the family (children, parents, the wider family) and men more personal ties to work colleagues. Love and marriage ties should be chiefly heterosexual, and friendships mostly to the same gender. These expectations are supported by logistic regression analyses as to which gender is more likely to name particular kinds of alters as important confidants in the 2004 U.S. General Social Survey (male friends / female friends, parents / children, wider family, work colleagues). These partial correlations prove significant controlling for marital status, age, labor status, and number of confidants. Also, the strong preferences for same-gender confidants among siblings and neighbors are striking and theoretically important. While these findings resonate with everyday experience, they strongly support the theoretical notions above: Our personal relationships are heavily imprinted by the relational institutions of gender and of relationship frames. This gendered world of personal relationships contributes to socio-economic inequality and to different cultural knowledge and worldviews of men and women.

Gender Diversity Outcomes: an Organisational Network Perspective

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Is gender diversity good for organisational outcomes? Gender diversity has been found to have both positive and negative influences on organisational outcomes. We propose a new explanation for this conflicting finding based on previously untested gendered interactions. Specifically, when there is sufficient cooperative interaction among diverse gender groups, we argue that gender diversity positively influences organisational outcomes. We study these cooperative interactions using sociometric data from 392 teams, embedded in 94 organisations, spanning across 9 countries and 6 sectors. However, given that men and women differ in how they interact with each other, this relationship is unlikely to be linear. Thus, we devise a “bifocal lens” to look at gender diversity based on both, the employee’s gender and the gender composition of their networks. This approach constructs a continuum of varying gender compositions in the networks of men and women along which organisational outcomes can be assessed. Additionally, as interpersonal cooperative interactions could have different implications on the individual and the team level, we assess organisational outcomes at both these levels. This provides us a delineated assessment of the gender diversity – outcome relationship along outcome levels and individual genders. These delineated results not only facilitate identification of paradoxes along the gender diversity continuum, but also provide tangible policy implications.

Gender Differences in Learning Hierarchical and Nonhierarchical Networks

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It has been reported repeatedly in the scientific literature that professional networks of women are less resourceful capital compared to professional networks of men. Paradoxically, recent research suggests that women are superior at memorizing and recalling networks of relationships roles, while there is also ample evidence that women are better in many emotional skills than men. So, why do women not transfer these advantages into resource professional networks within organizations? A potential (partial) explanation for this paradox is that most work environments are structured in a way that may nullify sociocognitive advantages that women have. Many if not most organizations are hierarchically structured. Influence and power is dispersed down a line of formal and informal authority. Being able to perceive networks of influence relationships accurately is a basis of effective networking, and hence a source of social capital. Literature suggests that boys and men tend to form dominance hierarchies more readily, while girls and women tend to form balanced dyads. Previous research also suggests that men have learned or are adapted to operate in dominance hierarchies. Dominance hierarchies in all-men groups are more stable in the sense that conflicts to establish a dominance hierarchy diminish considerably after establishing a dominance hierarchy in all-men groups, this decrease is less strong in all-women groups. Following this literature in this study I hypothesize that men will learn hierarchical networks at a faster rate than women, while women will be better in learning networks consisting of symmetric dyads. I test this hypothesis using a classic paired association test developed by DeSoto. 191 participants carried out an experimental task that involved learning influence relationships between four individuals. Participants were randomly assigned to one of two conditions. One condition consisted of learning a hierarchically structured (linear ordered) network, containing 6 asymmetrical dyads. The other condition was an incomplete network. It contained two symmetrical (reciprocal) dyads, and one asymmetrical dyad. The results show that men are learning hierarchical networks significantly faster, while women learn incomplete consisting of dyads networks faster. Overall women and men do not differ significantly in learning the networks. Since many organizations resemble dominance hierarchies, this finding may at least partially explain the paradox that women are better at network cognition, but have less resourceful networks.

Agent-based models: Linking complex social phenomena to social network dynamics (Sessions A6, A7)

Chairs: Federico Bianchi, Andreas Flache, Károly Takács

Homophily and Minority Dynamics in Face-to-Face Interactions

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Homophily plays a significant role in social dynamics. It shapes the way people interact and influences the development of social networks. Recently, researchers have traced a link between homophily and minorities, revealing that homophily accentuates underrepresentation in rankings of social networks with minority groups. In our work, we study the impact of such dynamics on face-to-face interactions. Precisely, we characterize discrepancies in the interactions of minorities and majorities, and then we develop a model to explain them. First, we expose some characteristics of the networks that emerge from face-to-face interactions: degree distribution, strength distribution, and contact duration distribution. In line with previous studies, we find that the average degree of sub-groups deviates from the overall average degree in the network. Here we argue that homophily plays a role in these differences. We replicate some previous studies and measure the homophily in the aggregated network. For this, we evaluate attribute assortativity and the connectivity between classes then compare it against a null model, that is, $P[k]$ configuration model. Finally, we propose a network model of face-to-face interactions based on attractiveness and homophily. We show that the discrepancies in the data can be explained by the addition of homophily in the model. In the end, we discuss a possible bias when ranking individuals based on a micro-level attribute (e.g., degree), and propose a ranking method that accounts for homophily.

Social Network Dynamics and Grading Discrimination: an Agent-Based Model

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School grades are important determinants of educational attainment since they are taken into account at tracking and admission to the next educational level in many countries. Several empirical studies, however, found evidence for the existence of a gap in teacher assessments for different groups of students after controlling for blind and unbiased test scores. Girls, for instance, were found to receive better non-blind assessments than boys with similar blind test results (Hinnerich et al., 2011; Kiss, 2013; Lavy, 2008; Lindahl, 2007). An ethnic difference in grading was also observed in several countries (Botelho, Madeira, & Rangel, 2015; Burgess & Greaves, 2013; Hinnerich et al. 2015; Kisfalusi et al. 2019; Kiss, 2013; Lindahl, 2007; Ouazad, 2008; Rauschenberg, 2014). Such differences in grades might be the result of various social processes. Teacher assessments are often intentionally or unintentionally biased and influenced by other factors than students' competence (Archer & McCarthy, 1988; Hardré, 2014; Malouff, 2008; Zoeckler, 2007). The status characteristics of students such as gender or ethnicity also influence how competent others perceive them (Berger et al. 1972; Grow et al. 2015; Grow et al. 2016; Kisfalusi et al. 2018; Ridgeway, 1991). Furthermore, certain groups of students might perform below their achievement level during the class because of feelings of stereotype threat (Steele, 1997; Steele & Aronson, 1995) or due to peer pressure arising from anti-achievement norms (Fordham & Ogbu, 1986). These mechanisms are hard to disentangle in empirical studies, because they mutually influence each other over time. Moreover, social network processes may amplify the negative effects of biased grading on achievement: selection into homophilous friendship groups and peer influence with regard to academic motivation and efforts (Frank et al., 2008; McPherson et al. 2001; Shin & Ryan, 2014b, 2014a) might increase the grading gap over time. If discriminated students select other discriminated students with diminished academic motivation and achievement as friends, they might negatively influence each other's academic performance in the long run. Using agent-based simulation, we examine to what extent various sources of the gap between grades and competence can influence students' later academic achievement and educational attainment. Moreover, we investigate how and to what extent network mechanisms such as homophilous friend selection and peer influence are able to amplify the negative effect of biased grading on students' academic achievement and attainment over time. To calibrate our agent-based model, we use the data of a longitudinal social network study in Hungarian schools.

An Empirical Model of Network Formation on Coauthorship

Ibrahim Emirahmetoglu

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We develop an empirical model of strategic network formation for analyzing longitudinal data from coauthorship networks. Our model decomposes the formation of links into two parts: a meeting process and a decision-making process. In the meeting process, two nodes meet with some probability determined by exogenous environmental factors (e.g. affiliation, fields of research, lineage), endogenous network factors (e.g. mutual connections, numbers of recent connections) and time factor. In the decision-making process, conditional upon meeting, nodes choose whether or not to form a link based on their individual characteristics (e.g. gender, race, age, number of papers, number of citations) and endogenous popularity factor. To provide a richer model for the rules governing the dynamic change in the network, we take the temporal and sequential aspect of the data and recurrent links into account, even though it increases the computational complexity significantly. To the best of our knowledge, this is the first study proposing a strategic model of network formation for longitudinal data. To see whether estimating this model is feasible or not, we generate a dataset for researchers who have published in prominent economics journals over a certain period of time and make a simulation using this dataset. Finally, we show that estimating the network formation model over multiple sequential observations is computationally feasible using Hamiltonian Monte Carlo methods, and the simulated values can be recovered by our model.

Searching for Individuals Whose Early Adoptions Signal Future Success in a Nationwide Socio-Economic System

Manuel Sebastian Mariani¹, Yanina Gimenez², Jorge Brea², Francesco De Collibus¹, Martin Minnoni², Claudio Juan Tessone¹

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Forecasting success in complex socio-economic systems is inherently hard. Our ability to predict success can be indeed limited by various factors, including the possibility that success patterns are largely determined by random factors, the fact that we often cannot capture the fundamental laws that describe agents' behaviour in complex systems, and the existence of theoretical limits to predictability. Due to the fundamental difficulties associated with prediction in complex socio-economic systems, uncovering and exploiting regularities in individual behaviour and their connection with potential pathways to success is of utmost importance. An appealing idea in social sciences, network science, and innovation diffusion research is that some individuals disproportionately impact on the eventual success of a diffusion process. Despite the long-standing interest in these individuals (typically referred to as opinion leaders), there is not yet agreement on whether we can leverage the behaviour of specific groups of individuals to forecast future success trends. Are there individuals whose early adoptions of an innovation mark increased odds of success for the adopted innovation? If such individuals exist, which demographic and socio-economic traits characterize them? Driven by these questions, we identify key individuals for success prediction solely based on their actualized, observed behavior rather than their position in the social network. Differently from recent studies on prediction in social systems that mostly focused on online systems, we analyze a unique, three-year Credit Card Record to study a nationwide "physical market" where individuals visit shops in a developing country in America. Importantly, we can partially match the individuals in the CCRs with the individuals in the Call Data Records (CDRs) of a major nationwide mobile phone operator. Therefore, we use the CCR to extract meaningful information on individuals' behaviour and economic traits, whereas we use the CDRs to infer individuals' network centrality together with other social traits. We use a statistical procedure to unveil the existence of a set of individuals – called discoverers – whose early visits to recent shops mark increased odds of success for the visited shop. Shop-level classifiers based on the identified discoverers better predict shop success than classifiers based on sets of top-individuals selected according to measures of social network centrality and socio-economic status. We find that the discoverers are not necessarily highly-connected in the social network nor have a high flow of communication. Compared to social hubs and structural influencers, they tend to visit more locations and communicate with fewer people, suggesting that they play a substantially different role for the diffusion of innovations. Our findings deepen our understanding of the role of segments of adopters in

diffusion processes, and indicate that adoptions by properly-identified groups of individuals can be used to early-predict success in social systems. Besides, they raise several questions about the social processes and basic values behind the discoverers' behaviour.

Looking for Best Descriptors to Map Networks via Subgroup Discovery. First Results from a Simulation Study

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Constant production of network data, increasingly frequent use of them and multilayer nature of some real problems, lead to a multidimensional approach on networks. Considering several networks with different sizes belonging to the same research field, we are interested in grouping them into clusters that are homogeneous within and heterogeneous among them: these more general objects can be interpreted and considered as a condensed view on the entire collection of networks. Hence, we distinguish two problems: First, how to map networks in the space, and second, determining the descriptors. For tackling the first problem, individuals usually have their own properties measured by variables and these allow us to group them into higher level objects. Analyzing networks (instead of individuals, objects or other) it is possible to use their descriptors (as features/variables) to map them. From this, the second question rises: what are the descriptors that allow us to uniquely identify the networks? In other words, to make possible that two non-isomorphic networks are mapped into two different values, what are the descriptors having the best discriminative power and uniqueness? This question, part of our research purpose, is legitimized by literature, in fact it is known that “every known single index has a certain degree of degeneracy, that is, the measure cannot distinguish non-isomorphic graphs by its values. Hence, single structural indices only are not suitable for determining graph isomorphism.” Mostly when we face with different size, descriptor distributions of networks with distinct behavior tend to assume a similar or equal shape, then the network-case could be confounded and the first step (mapping) towards a correct application of clustering is not “solvable”. In order to apply descriptors in real case studies, we simulate networks from different generative models, with different parameters and sizes; after selecting a large set of descriptors, we look for the best subset. For that purpose, considering the generative models as target variable, we apply the method of Subgroup Discovery, in order to identify subgroups of networks that are characterized by specific combination of selectors using systematic search on the set of available descriptors. This method is well-suited for our purpose for two reasons: it has excellent performance on large data sets; setting the response variable as the generative model, in one analysis we can get the best descriptors for the optimal mapping taking into account the natural clustering through the generative process, regarding the behavior of the network. Using subgroup discovery, then all sets of descriptor combinations are implicitly considered at the same time and assessed with respect to their discriminative performance, i.e. for characterizing specific networks. Our first results indicate the efficacy of the approach for network characterization in terms of

network descriptors. In conclusion, this research has a relatively general scope for network science. Therefore the method and results can potentially be used in many circumstances where it is necessary to map networks and to apply multidimensional analysis on them.

On the Local Network Mechanisms and the Global Network Structures

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Understanding the link between micro social mechanisms and macro social output is one of the central interests of social scientists. In the context of social networks, different micro social mechanisms are operationalized by local network mechanisms while macro social outputs by global network structures. The relationship between the selected local network mechanisms and the selected global network structures is addressed in this presentation. A global network structure is operationalized by a blockmodel which is a network where the nodes are clusters of equivalent units from the studied network (Doreian, Batagelj, & Ferligoj, 2005). As the selection of the local network mechanisms and the global network structure depend on the social context of the study, two such contexts will be considered in the second part of the presentation. Firstly, based on the observations of the interactional networks of preschoolers, the symmetric core-cohesive blockmodel type will be defined. It is a combination of the well-known symmetric core-periphery blockmodel and cohesive blockmodel. It will be shown that the most commonly treated local network mechanisms (mutuality, popularity, assortativity and different types of transitivity-related mechanisms) can cause the emergence of this blockmodel. Secondly, the hierarchical blockmodel that appears in many companies when measuring knowledge-flow will be considered. For the growing networks with the hierarchical blockmodel, it will be shown that the tenure or the hierarchical position of the units have an important impact on the group formation. Yet, the hierarchical structure can emerge also when tenure is not included as a mechanism, but the following many times mentioned mechanisms in this context are considered: popularity, hierarchy, transitivity and distance between two units.

Social Network Dynamics: Individual-Level Mechanisms and Aggregate Outcomes

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In this paper we pursue a theoretical investigation of mechanisms linking social network structure to individuals' generalized trust, willingness to cooperate, social utility and economic performance. We propose a novel computational agent-based model with a realistic demographic and social network structure, where the network evolves endogenously as individuals build new ties and some old ties are dissolved. The model elucidates how social networks give rise to the accumulation of social capital – defined as the aggregate of resources accessible to individuals through their social networks – and how in turn social capital enables the creation of trust and cooperation, and eventually social utility and economic performance. The structure of our model is motivated by a set of empirical findings documenting that social network structure can have a sizable impact on individuals' social trust and willingness to cooperate as well as – ultimately – social utility and economic performance. Effects have been observed both at the individual level (e.g., individuals with more bridging social capital tend to be more willing to cooperate and economically better off), and at the aggregate level (e.g., societies that either are better connected or exhibit lower frequency of local cliques, tend to record relatively better aggregate economic performance), see e.g. Coleman (1988), Dasgupta (1988), Putnam (2000), Inglehart and Baker (2000), Zak and Knack (2001), Burt (2005), Granovetter (2005), Growiec et al. (2018). More detailed features and baseline parametrization of the model setup draw from our empirical findings for the Polish society (Growiec et al., 2017), based on a unique, detailed cross-sectional survey dataset. To our knowledge, all related earlier studies have based their findings on a snapshot of network structure at one point in time. Against this background, the contribution of the current paper is to inquire the range of potential outcomes from allowing the social network structure to evolve over time, driven by purposeful decisions of individual agents. We find that the evolving social network in the steady state of the simulation exhibits small-world topology – a type of network that is observed in real life. This emergent behavior of the system, to our knowledge, is unique among networks endogenously generated in multi-agent models with explicit economic and social motives guiding the creation and destruction of social ties. Beyond that result, in an extensive comparative statics exercise we find that societies with a higher frequency of social tie creation and destruction, both per annum and within each individual's lifetime, are – ceteris paribus – more trustful and cooperative, and exhibit better economic performance. By contrast, they display lower levels of bonding social capital and lower average social utility. Opposite effects are observed for societies where the durability of social ties is relatively strongly linked to agents' family closeness: they

are less trustful and their economic performance is worse, but they imply more bonding social capital and social utility. We also find that societies where young individuals enter their adult life in relatively inclusive, non-clustered networks tend to be more trustful and exhibit better economic performance.

Proposing Boundary Roles as a New Indicator for Network Analysis

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This study aims to propose “boundary role” as a new indicator for the network analysis. The concept of network boundary role has not been discussed in the literature. However, this novel approach will enable to analyze the interaction capabilities of the nodes. It is an important measurement for network analysis to determine whether there is more important node within existing nodes. The importance of a node varies depending on what network models. For example, in a network which is describing the relationships between individuals a node with a high degree would be an effective person. This concept of importance in network analysis is called centrality. Higher centrality is higher information advantages, control and learning opportunities to the focus node. There are various measurements of centrality that determine the relative importance of a node in the network. Four measures of centrality commonly used in network analysis; degree, closeness, betweenness and eigenvector centrality. While the degree centrality shows the ability to communicate directly with others, the betweenness centrality shows the ability to restrict the communication of others, and the closeness centrality shows the ability to reach a large number of alters based on the least number of mediators. Eigenvector centrality shows the ability to gain advantage from the relations with actors with high degree centrality. In this study, a new definition is made about the importance of a node: boundary role. The boundary role is based on the concept of degree. However, in order to determine the boundary roles, networks must have two basic features. The first one is that relations in a network must be directional relations. The second one is that nodes should differ in at least one attribute in the network (such as men-women, old-young, local-global). In this study, the boundary role function is proposed as a criterion for evaluating the positions of the nodes. Thus;

- It will be possible to determine the boundaries of a network independently of the sample.
- Boundary role demonstrates the ability to establish relationships between different networks or groups.
- Analysis of the interaction between two different groups will be possible.

Four different categorizations have been revealed for boundary roles: 1) Collector Transmitter: It refers to a boundary role which transfer knowledge or relations they have obtained from the internal and external networks to the own group with a similar or lower intensity. 2) Collector Diffuser: It refers to a boundary role which transfer knowledge or relations they have obtained from the internal and external networks to both the own group and other nodes with a similar or lower intensity. 3) Converter Transmitter: It refers to a boundary role which transfer knowledge or relations they have obtained from the internal and external networks to the own group with a higher intensity. 4) Converter Diffuser: It refers to a boundary role which transfer knowledge or relations they have obtained from the internal and external networks to both the own group and other nodes with a higher intensity.

Organizational Networks (Sessions B6, B7, B8, B9)

**Chairs: Spyros Angelopoulos, Emmanuel Lazega, Francesca Pallotti,
Paola Zappa**

Matching Collaboration to Disruptions: Relational Event Modeling of Inter-Team Collaboration During Organizational Disruptions

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The majority of organizations regularly face disruptions, resulting in substantial financial and reputation damages. Because such actions usually require the collaborative efforts of several teams from different organisations, the members of these teams need to interact with other teams inside and outside their organisation to effectively coordinate tasks, exchange information, and represent teams' decisions and activities. While most of the team research has been optimistic about the effectiveness of collaboration between teams, less is known about in which situations is higher frequency of inter-team collaboration beneficial, and in which it might lead to a collaborative overload. Following insights from team research and the contingency approach, we aim to examine how can teams optimize the way they collaborate to effectively deal with different types of disruptions. We suggest that the success of disruption resolution depends on the effective alignment between teams' collaboration and type of disruption. We argue that more complex or severe disruptions, which pose greater demands on the teams, require more centralized collaboration structures. In these circumstances, one or a few team members initiate collaboration on behalf of all teams. Conversely, during less severe or complex disruptions, we expect that teams relying on decentralized collaboration would be more effective in resolving disruptions. We test our conceptual model using data from a public water-supply company in the Netherlands. Collected longitudinal data consists of detailed information about the characteristics of over 8000 disruptions, including indicators of disruption severity, and the effectiveness of disruption resolution, operationalized by disruption duration. In addition, we obtained anonymized information on the telephone communication between organizational teams that dealt with the disruptions, and used it to measure centralization of collaboration. We treat these telephone records as relational event data, temporarily ordered in a sequence of telephone calls. To test the expectations related to the effects of different collaboration patterns on disruption duration, for more and less complex disruptions, we apply relational event modelling. The present study aims to demonstrate that the collaboration forms need to be adapted to the disruption characteristics, challenging the widely held belief that increased collaboration is beneficial in all situations. Most of to-date studies on resilience have relied on some form of subjective data, while the existing empirical studies predominantly used cross-sectional design. We rely on the objective measures of team collaboration, as we analyse interaction behaviour of teams dealing with real disruptions, in their natural surroundings. We leverage the richness of our time-stamped data, and apply relational event modelling to contribute to the recent attempts to investigate team dynamics using event-based approach. Practically, our study provides recommendations about how can practitioners design collaboration

procedures between teams to effectively handle varying disruptions.

Professional Advice Networks Among Organizations: Does Personality Matter?

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Interpersonal collaboration across organizational boundaries has been stressed as a crucial source of organizational learning. While the influence of several drivers, such as individuals' social networks, on the establishment of relationships between managers has been studied, the influence of managers' 'Big Five' personalities is widely unaddressed. To the best of our knowledge there has been no empirical network study analyzing the impact of the Big Five psychological factors on work-related professional networks across multiple organizations. This is remarkable given that the Big Five personality traits – comprising extraversion, conscientiousness, openness to experience, agreeableness, and neuroticism – are one of the most cited personality measures in the literature. The popularity of the measure can be attributed to the coherence of psychological and neurological factors of individuals. Moreover, the Big Five personality traits are relatively stable over time and, lastly, it has been suggested that these personality facets significantly influence interpersonal interaction. To address this research gap, we link the Big Five personality traits with social network analysis. We take a relational network view into account and investigate to what extent the personality traits of managers affect their behavior in terms of sending and receiving work-related advice ties. Thereby, this study contributes to the literature by combining the psychological perspective with a social network approach. In this respect, we advance the understanding of personality traits as a determinant of boundary-spanning collaboration ties among managers. Empirically, we applied exponential random graph models with key drivers of work-related advice-seeking, including control variables, network endogenous effects, and the personality traits as actor-based effects. Our dataset comprises the work-related advice relations of 81 managing directors of cluster organizations. Our findings reveal that personality impacts advice-seeking and -giving differently in clearly business-driven advice networks compared to what has been found by studies of other types of networks such as those among students. What is more, three out of five personality facets negatively affect the tie creation process, which indicates that, beside important network aspects, personality plays a considerable role in deriving maximum benefit from the social network.

Organizing for Complex Product Innovation: How the Case of Smart Materials Inspires Towards an Explicit Network Conceptualization of Innovation Ecologies

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Reviews of the concept of innovation ecologies rather unanimously bemoan its lacking conceptual rigor, theoretical foundations, and its varied, often metaphorical use. As a form of organizing for solving complex problems, such as complex product innovations, the concept is not only intuitively appealing, but potentially fills a crucial gap that prominent related concepts, most notably, innovation systems, innovation networks, and business ecosystems, are not equally well equipped to fill. Rather than discarding and replacing the concept for its weaknesses, the present paper aims to advance its conceptual development. With the aim of finely specifying and thus enhancing the analytical power of the concept, we present a network analytical anchoring of innovation ecologies. Our thinking is solidly grounded in and will be illustrated by the empirical case of a complex product innovation task, namely the search for promising product applications of smart piezoceramic materials. Over a period of so far more than five years, rich case material (e.g., participatory observations, interviews, and documentary material) has been gathered as part of three successive and still ongoing projects of engaged scholarship in the field of smart materials. In line with recent advances in complex network modeling, we propose to model the innovation ecology in the case at hand as a two-layered network. The first layer is conceptualized as a supply network with material artefacts as nodes and directed flow relations as edges; the second layer is conceived as a network of actors with multiple actor attributes and corresponding multiple types of ties. Furthermore, we identify a number of network metrics that are specifically relevant for complex innovations, such as structural holes and optimal walks and paths. As an anchor, this modelling allows a fine-grained specification of the complex innovation task that innovation ecologies are thought or specifically designed to help fulfill. Most notably, we elaborate on iterations of intra- and cross-layer (re-)coupling as core catalytic process tasks. We conclude by outlining a distinct network conceptualization of innovation ecologies as a multilayered form of organization enabling and entwining the emergence and steering of processes of innovation together with innovative outputs.

The paper is valuable in three regards: first, it clearly and distinctly defines and substantiates a network grounded concept of innovation ecologies along with its core constitutive elements and dynamics. Second, it stringently grounds the conceptualization in an in-depth analysis of the task to be organized, namely complex product innovation. It thus clearly spells out the boundary conditions of the concept. Third, it weaves organization, network, systems, and complexity theory into the conceptualization and thus harnesses this work for the challenge of organizing for complex innovations.

Uncertainty, Risk Allocation and the Structuration of Multilevel Networks: the Case of French Public-Private Partnerships

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This paper looks at the effect of high levels of uncertainty and long term risk allocation on the structuration of multilevel socio-economic networks (advice and contracting) promoting new public policy. Substantively we focus on a population of financiers, industrialists, public servants, and professionals involved in negotiating 30 years-long public procurement contracts in France, the so-called 'public-private partnerships' between public authorities and private consortia. We measure the extent to which these actors' judgments about who (taxpayers? private businesses?) should incur specific risks associated with these contracts have an effect on the structure of two different kinds of networks: an advice network between these key players and a contract network between the organizations in which these individuals are affiliated. Multilevel ERGMS show how risk allocation shapes these actors' exchanges and alignments of advice taking and contracting activities, including cross-level effects in this system. We argue that these multilevel network models help us propose a new approach to institutional entrepreneurship.

Identifying and Comparing User Roles Across Companies in Organizational Social Networks

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Employing social networks in enterprise environments is more and more common nowadays. In particular knowledge organizing, knowledge sharing and knowledge exchange platforms are becoming more and more popular and see widespread application. Typically, these networks are not merely administrated, but also animated by community managers to boost their utility for a company. Analyzing the social networks and emerging interactions taking place on the platform can help community managers better understand the social network members and thus their community as a whole. This understanding can help community managers better interact with social network members and foster the relationship among them and as a result the usage and utility of the platform as a whole. Social networking analysis methods that are typically employed are often basic in nature, such as plotting social network diagrams or graphs, or showing scatter plots of activities. Alternatively, basic statistics, such as node in- and out-degrees and node centralities can be used to classify network activity. As can be seen from the literature, however, it is possible to identify influential or susceptible members or derive user role topologies from user behavior. These elements can give community managers more insight into the structure of their social network and thus guide them in their platform design or promote suitable structures. Thus far, little research has proposed user role topologies for enterprise social networks. Indeed, there are immense variations in collaborative usage dynamics present across different companies. Whereas some participants merely observe without interacting, others publish content without further interaction, and mixed usage of observing and publishing content, or collaborative usage patterns also exist. Our goal is to analyze if and how user role topologies proposed in the literature (e.g., by Füller) hold up when faced with communities that are internal to organizations, showing different degrees of and large variations in dynamics proper to the enterprise social network. We try to establish if existing topologies are stable and can be found in enterprise social networks. Additionally, we propose adapted clustering techniques adapted to the variations in dynamic collaboration found in the analyzed community. In our research, we are fortunate to have access to the raw data of several real-world organizational social networking knowledge-sharing platforms. The companies employing the social networks come from different industrial sectors in France and Belgium. Our work contributes to better comprehend knowledge sharing social networks in a professional context. The employed methodology can be applied to other networks, thus enabling further research into the subject matter to confirm the validity and applicability of previously established typologies applied in public innovation communities or others.

How New Ventures Form Organizational Ties: the Varying Impact of Personal Ties in Berlin and Silicon Valley

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Networks have a positive effect on the success and innovativeness of organizations, because they provide access to valuable information, scarce resources, and informal learning. Trust, reciprocity, mutual dependence and risk sharing promote the timely exchange of information and resources necessary for organizational growth and innovation development. Thus, innovative new ventures strongly rely on networks since they—as resource-poor actors—have to face the liability of newness and smallness. Interestingly, exactly these characteristics that make networks so important for newly founded growth companies also heavily constrain tie formation. Organizations prefer partners with whom they previously worked together, who have the same status, or who worked with a shared third party or an established organization with high reputation. Innovative new ventures can hardly rely on any of these signals. How do innovative new ventures form organisational ties in their early founding stages? Previous research either focused on the search for partners, or the selection of partners, mostly neglecting to analyze how ties are actually formed. Yet, a more differentiated understanding of tie formation processes promises valuable insights about the form, function and the dynamics of organizational networks. My research compares organizational tie formation of innovative start-ups and university spin-offs in Berlin and Silicon Valley. Based on 91 semi-structured interviews with entrepreneurs and other entrepreneurship-related actors, comprising unstructured network maps as narration trigger, I analyzed tie formation practices from a structurationist perspective. As previous research on partner search showed, personal relations are extremely important, especially during the early founding stages. Yet, we lack a differentiated understanding of the role of personal ties for the formation of organizational ties. I emphasize the important role of personal ties for the formation of organizational ties, arguing that both types of ties have to be differentiated clearly and analysed in their interplay. My findings indicate that the importance and use of personal ties to form organizational ties varies considerably between innovative start-ups and university spin-offs in Berlin, but not so much between innovative start-ups and university spin-offs in Silicon Valley. Thus, my research makes two major contributions. First, I develop a theoretical framework to analyze the role of direct and indirect personal ties for the formation of organizational ties and zoom in on the actual practices of tie formation. Second, I show that the role and use of personal relations varies systematically between start-ups and spin-offs in Berlin, and between Berlin and Silicon Valley, emphasizing the impact of the social context on organizational tie formation.

Boundary Spanning in Mandated Hospital Networks

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New collaborative arrangements within the public sector imply more flattened structures with an increased lateral (horizontal) focus that can be visualized as a network of interactive bodies. Networks of organizations are linked together through a diversity of regulatory mechanisms that shape the beliefs and conduct of individuals or groups of individuals. These networks create opportunities for greater influence derived from structural advantages that emerge in collaborative arrangements. This paper addresses the challenges of collaboration in the public sector and investigates the role of a control system in facilitating collaboration in a mandated hospital network characterized by low, medium, and high geographical distances. In particular, this study focuses on integrative liaison devices - social interactions such as teams and meetings to examine the structure of social links intended to embed members of different hospitals in this mandated public hospital network. Building on prior organizational studies and the management control literature this study focuses on horizontal structural arrangements that span organizational boundaries. The aim of this study is to examine how interaction opportunities facilitate participants' engagement with each other in an effort to encourage behaviour towards collectively desirable practices in the delivery of clinical services across an acute network clinical directorate. We examine the bilateral social connections that emerge between mandated partner members facilitated by meetings' attendance to understand how social control practices are used to support understanding of organization's mission and integration in the mandated network. This paper draws on a case study of 5 public hospitals in a mandated network in Ireland which emerged as part of the process of modernization of the national healthcare system. The structure of social interactions was mapped from group meetings' attendance records and analysed using Social Network Analysis (SNA). The analysis provides evidence on the potential of social controls to promote and encourage inter-organizational collaboration. There is a notable asymmetry in the participation of hospital-based staff in meetings and a higher representation of H1 (the tertiary care unit of the hospital Group) at meetings. The scheduling of all meetings at the H1 location and the central position of the H1 members within the social structure suggests the dominance of the H1 staff in the hospital Group. Central actors in social structures have the ability to exercise influence and to impose their dominant views or practices on other members that might create tensions within the hospital network and give rise to resistance. Peripheral site members might fear losing autonomy and independence in the decision-making process. Limited meetings attendance represents lost opportunities to contribute to the development of norms and common values. It also deprives the regular attendees of the potential contributions of non-attendees and possibly impedes integration. In this context, the development and implementation of

standardization across the hospital Group might be difficult and might generate tensions between participants. This paper contributes by identifying the advantageous positions created and cemented by regular attendees to influence emerging group policy procedures and practices.

Financial Performance Effects of UK Director Interlocks: a Panel Study

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The results of investigations into the effects of interlocking director networks on the financial performance of large companies have been mixed and fleeting. In the corporate finance field, models involving simple, degree, variables have been found to be associated with performance and used to support recommendations for external director minima on boards. But studies making more use of the abundance of network metrics available in SNA have been few and results limited. In fact, in a sophisticated ERGM model, Robins and Alexander (2004) found no interlock network effect on performance at all. A major limitation of existing studies of director interlock effects on performance is the predominant cross-sectional design. Because directors hold multiple year tenures, interlock networks tend to persist with limited change over time. Financial performance of firms, by contrast, tends to vary greatly year by year. Thus, cross-sectional snapshots are likely to surface differing associations in each case, leading to mixed results in aggregate. With the increasing quality of readily available data on board composition and financial performance of firms, it has become feasible to employ more comprehensive longitudinal models to test persistent relationships between director interlocks and financial performance of firms over time. In this study I employ a panel data model, the first use of this approach for this purpose. I consider the interlocks and financial performance of firms listed in the FTSE All-ordinaries index over an 18 year period 2000-2018, encompassing approximately 1500 firms in any year. This research design uncovers hitherto illusive persistent effects of the UK interlocking director network on the performance of large firms, supporting Useem's (1984) theory of the value of directors' 'corporate scan.'

Ownership and Retaliation in Self-Managing Organizations: Learnings from Wikipedia

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In recent years, organizations are becoming more and more concerned on shaping decentralized environments that allow less-bureaucratic decision making. This is particularly relevant in the production of creative goods, characterized by iterative revision-adaptation rounds between management and employees, during which products are altered until accepted. One governance strategy that has been shown to best fit this type of work is based on the use of lateral rather than vertical leadership schemes, where feedback and guidance are given in a peer-to-peer fashion. Previous research has shown how such work arrangements – called open collaborations – benefit by endowing individuals with higher levels of autonomy, intrinsic motivation and feelings of ownership of their work than traditional work frameworks. However, less is known about the negative dynamics that stem from such novel arrangements and potentially hinder their success. For example: how do individuals react to a peer member threatening the object(s) of their ownership? We know from the psychology literature that individuals tend to retaliate when their job-based ownership is threatened. In traditional organizations, however, managerial structures prevent individuals from vindictive behavior against their superiors due to power and dependency in work relationships. What happens, then, when power relationships are minimized by non-hierarchical organizational design? Is the reaction of the individuals influenced by the legitimacy and characteristics of the offense? Do differences in roles still have an influence? This study aims to shed some light on these questions by using fine-grained data from a knowledge-production setting characterized by high levels of autonomy, low managerial hierarchies and intrinsically-motivated agents: Wikipedia. In particular, we use relational-event models (REMs) to analyze the edit history of a series of articles and test the effect of the damage to the job-based psychological ownership and the difference in roles within the community of both the offender and the victim on the probability of retaliation when contributors have their edits totally or partially reverted. Our research contributes to the literature of open collaborations by investigating the causes of processes that hinder collective production.

Building the Team: an Empirical Analysis of Team Assembly Mechanisms and Network Embeddedness in Robot-Assisted Surgery

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Similarity, competence and familiarity are recognized team assembly mechanisms – general principles that individuals adopt to choose others with whom they want to work. According to the principle of similarity, individuals are more likely to choose partners that are similar to themselves along contextually relevant dimensions. According to the competence principle, social selection is driven mainly by an evaluation of compatibility between individual skills and requirements of the task. Finally, the principle of familiarity implies that people who have worked together in the past are more likely to repeat their collaboration in the future. In this paper we use data that we have collected on surgery teams to explore how the effects of the team assembly mechanisms implied by these generic principles: (i) are embedded in known network self-organizing mechanisms that link internal team members to shared external partners, and (ii) are contingent on the complexity of the task that the team faces. Relational event models estimated on several hundreds of surgeries provide evidence that similarity, competence and familiarity affect partner selection through a variety of triadic mechanisms in which surgeons are embedded, and through which knowledge is shared. The analysis also reveals that the effects of social selection mechanisms are contingent on the complexity of the team task, which in our sample is determined by the clinical conditions of patients entering surgery.

The Structure and Geography of Internal and External Co-Worker Ties

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In the organizational literature, it has been acknowledged that so-called boundary spanning leads to informational advantages by the access to external sources of information (e.g., Tortoriello and Krackhardt, 2010). Building on this, Ter Wal et al (2016) argue that the cognitive schema of firms and the network structure have a joint effect on creative outcomes. Because closed networks offer redundant knowledge (Uzzi, 1997), linkages to third-parties with similar knowledge in an already closed network would consequently lead to over-embeddedness. However, making a simple distinction between internal and external networks is not sufficient for understanding how different types of networks interact. Recent studies show the importance of “long ties” (i.e., ties that connect actors in one region to actors in other regions compared to within-regional ties) when assessing the impact of social networks on regional growth (e.g., Holzbauer et al, 2016). This aligns with recent arguments in the innovation literature showing that Norwegian firms with a greater diversity of international partners are more innovative compared to firms firmly embedded in the local or national context (Fitjar&Rodriguez-Pose, 2011) This paper uses a novel approach combining survey data on the structure of internal firm networks among programmers and software developers in an ICT-cluster covering 221 employees in 16 firms, with data obtained from their LinkedIn profiles. In the survey, we collected data about employees’ network according to three dimensions: information, cooperation and socialization. From their LinkedIn profiles, we gathered workers’ skill sets, in addition to workplaces and the location of their external connections. Combining these datasets makes it possible to formulate the following hypotheses on the relation between internal and external networks: (i)The greater variety of external networks (entropy of firm connections and local-global dimension) the more valuable this person is in the firm, and hence the more central in the internal network. (ii)Due to asymmetries between how men and women are valued on the labour market, we expect female external ties to be less valued in the workplace compared to the ties of men and therefore the composition of female links should be adversely linked to the centrality in the network. Moreover, using detailed skill information of each worker in the dataset, we will also assess the extent to which skill complementarities influence link formation. Previous studies have shown that a moderate overlap of skills in a workplace is associated with individual- and firm-level productivity (Boschma et al. 2009; Östbring et al. 2017) as well as innovative capacity

(Dibiaggio et al. 2014). The few available studies that do assess within-firm skills beyond a low-/high dichotomy however proxied skills as the variety of education directions and/or industry experience without exactly capturing the work-specific skills of each individual. Capturing the exact skills of the respondents we therefore hypothesize that (iii) Co-workers are more likely connected if they have complementary skills (share some skills, but not all), while co-workers with identical or totally different skills are less likely to connect. We are using exponential random graph models and meta-analysis of the coefficients for testing our hypotheses.

Social Selection Mechanism in Corporate Governance Network

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This paper investigates network structures that evolved as a result of the executive and non-executive directorship selection processes in a Danish corporate governance context. Primarily, the paper focuses on discussion of legitimacy of a board and top management selection processes that emerge on two fronts – supervisory board selection of cooperatives, and their choice of executive directors (top-management). The paper utilizes the exponential random graph models on Danish corporate governance data for the period of five years (2010-2014) to reveal network structures in order to estimate tendencies for the social selection processes. This method is applied to enable unfolding of a discussion on how different interests and scarce resources over preferable social actors (team members) create network dynamics, and how legitimate those processes are. Findings show that corporate governance network in Denmark tends to evolve around the most active top-managers and supervisory board members, while homophily effect related to knowledge and experience of actors plays significant role only within the supervisory board level, while not in the network between supervisory board members and top-managers.

Dynamics of the Academic Hiring Networks Among European Business Schools

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Academic hiring networks impact scholarship and innovation capabilities for individuals, universities and society. The position of the university within the hiring network impacts the status hierarchies and universities' ability to attract resources and talent, and to attain performance. While research established that hiring networks exert profound influence on the essential outcomes for academics, universities and society at large, we lack understanding of factors that contribute to the dynamics within academic hiring networks and the impact of national institutional environments on the network evolution. In this study I analyze faculty mobility of more than 2500 faculty members among top 50 business schools in Europe over the period of 6 years. I apply stochastic actor based modeling of social network dynamics (RSiena) to zoom on the co-evolution between academic hiring networks and universities' reputation as assessed by rankings, taking into account the national institutional environments.

Hybrid Semantic Networks as Grounds of Cognitive Maps

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This work shows the use of collective cognitive maps by means of hybrid semantic networks. As part of an exploratory study on circular economy issues, constructs shared by members taking part in four focus groups were elicited. The subjects were local policy makers involved in the implementation of policies aimed at enhancing environmental safety actions in four different institutional contexts. The collective cognitive maps were built up using the usual techniques of similarity between concepts and links developing from individual cognitive maps. In this method, the paths of the different semantic types were traced: "definitional", "assertional" and "implicational". Among the latter one, those of a causal nature have been made explicit. The comparison between the maps benefited from clustering metrics and from combining them with the usual graph analysis tools. This helped us highlight the argumentative strategies followed on a collective level and represent the nodes on which the reinforcement attitudes promoted by the individuals works.

A Social Network Approach to the the Happiness Industry Social Field

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In this paper we use the SNA theoretical and methodological approach to analyze and visualize the configuration of the happiness industry social field. Happiness is becoming a very large industry formed by the interactions between the interests, activities and dynamics of a large spectrum of actors providing definitions, suggesting ways and offering products and services to attain it, along with those attempting to regulate it and those pursuing it. We see the happiness industry social field as product of interactions between actors, meanings and actions creating tasks and social niches. We focus on the structural relations between organizational forms, systems of definitions and systems of practices. Surveying the web, we have created a large dataset of 914 web pages related to the happiness industry with information of types of actors and organizational forms defining, providing, selling and buying happiness along with the meanings they give to their role and the activities taken or to be taken to attain happiness. We have transformed the information into relational matrixes and used them to analyze and visualize the social field of the happiness industry. Different combinations of elements, combinations of meanings and actions (defining products and services, how to reach happiness, types of actions) along with organizational forms and systems of relations, result in different models of happiness and how to reach it which shape the industry and market.

Market Dominance – Do Network Ties Matter? an Analysis of Interlocking Directorates of the UK FTSE350

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This study aims to look at how firms effectively utilise the interlocking directorates network to achieve the goal of higher market capitalisation – which we term market dominance. This is a market-based measure, which reflects forward looking expectations of firm performance and position (Hillman, 2005). The premise of the study is the UK FTSE350 firms, which are chosen based on their market capitalisation, for 2014 – 2018. We will make use of a temporal network auto-correlation model (Leenders, 2002; Leifeld, Cranmer, & Desmarais, 2017) to provide an examination of how firm characteristics and structural position in the interlock network affect market dominance over time. The analysis indicates that firms should establish effective ties (via the interlock network) to firms with high levels of market dominance to enhance their own market dominance, rather than creating linkages to a high number of firms.

Polarization in Social and Political Networks (Sessions C6, C7, C8)

Chairs: Laurence Brandenberger, Philip Leifeld

Analyzing Political Polarization and Legislative Effectiveness Through Partitioning Networks of U.S. Congress Legislators

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Over the past several decades in the U.S. Congress, there has been a decline in the fraction of bills introduced that eventually become law. This decline in legislative effectiveness has occurred in parallel with rising levels of political polarization, where coordination occurs primarily within not between groups, which are often defined by political party affiliation. However, in part due to challenges in measuring political polarization, the link between effectiveness and polarization is unclear. In this presentation, our first goal is to compare three approaches to measuring political polarization by examining consistency of political networks with the structural balance theory. This theory is conceptualized by Heider in the 1940's in the context of social psychology. A decade later, structural balance theory was formulated as a set of graph-theoretic conditions for a signed network to be balanced. A balanced signed network containing negative edges represents a highly polarized system because the nodes can be partitioned into two groups such that all the positive edges are inside the groups and all the negative edges are between the two groups. We use signed networks of legislators inferred from bill-cosponsorship data for U.S. Senate and House of Representatives between 1979 and 2016 and evaluate their level of balance using triangle index (the fraction of balanced triangles), algebraic conflict (the smallest eigenvalue of the Laplacian matrix of the network), and frustration index (the smallest number of edges whose removal leads to balance). The numerical results show an increase in political polarization over time in both chambers of the U.S. Congress. Our second and more substantive goal is to derive a measure of partisanship from the frustration index to examine the impact of partisan coalitions on rates of bill passage and test two competing theories on legislative control. Obtaining the frustration index, in principle, involves intensive computations to search among all possible ways to partition nodes of a given signed network into two groups in order to find the partitioning which minimizes the total number of intra-group negative edges and inter-group positive edges. Based on the legislative process used by the U.S. Congress, it might be expected that a chamber's bills are more likely to become law when the controlling party holds a larger majority. However, using our numerical results, we show that changes in bill passage rates are better explained by the partisanship of a chamber's largest coalition, which we identify by partitioning a signed network of legislators into two mutually antagonist but internally cohesive groups. To tackle the intensive computations, we initially provide upper and lower bounds for this number using a continuous optimization (linear programming) model, then solve a discrete optimization (binary linear programming) model which closes the gap between the two bounds and returns the frustration index alongside the optimal partitioning of the

The Price of Polarization in Open Peer-Production

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Online peer-production projects typically incorporate information infrastructures designed to support social evaluation so that participants can assess and appraise the contributions of others. Evaluation can be either positive (expressing agreement among participants) or negative (expressing disagreement) giving rise to signed event networks connecting participants through their contributions. How does the structure of this emergent network of positive and negative events affect the quality of teamwork in open peer-production? We address this question in an analysis of the entire production history of more than 10,000 articles in Wikipedia - one of the largest and most successful examples of peer production currently in existence. We assume that two participants consider each other as "friends" if they are strongly linked by positive relational events (agreement) and consider each other as "enemies" if there is strong negative interaction (disagreement) among them. Balance theory predicts that Wikipedia contributors, for instance, tend to agree with the enemies of their enemies and disagree with the enemies of their friends. It is well known that perfect agreement with the predictions of balance theory gives rise to polarized networks partitioning into two factions mutually fighting each other. However, different teams (i.e., groups of participants contributing to the same encyclopedic article) act in varying agreement with the predictions of balance theory and we hypothesize that this variation in the polarization of collaboration networks explains part of the variation in quality of the resulting articles. In a comparison of the network mechanisms underlying the production of about 5,000 high-quality articles with the network mechanisms in a contrasting sample of comparable articles of lower quality, we find that contributors to high-quality articles display weaker tendencies to conform to the behavioral predictions of balance theory. This result supports the "price of polarization" hypothesis claiming that polarization of teams in open peer-production decreases the quality of the artefacts produced by them.

Smoothed Bipolarization of Policy Debates: Are Coalitions in Discourse Networks Stable over Time or Punctuated?

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Conflict between political actors in a policy subsystem is a central concept of interest in the study of politics and policymaking. Several theories argue that political actors are members of coalitions and fight for discursive hegemony over normative policy stances. This generates a high degree of polarization between coalitions. However, to what extent the polarization of these coalitions is constant and what affects their potentially varying degrees of polarization over time are open questions. The present article presents a methodology for exploring variations in subsystem polarization over time systematically. The approach employs social network analysis to measure bipolarization. More specifically, we maximize the network modularity among a set of 12 graph clustering techniques for exactly two communities ($k=2$) in a time slice of a certain number of edge events of the relational event sequence of the two-mode network, and we smooth this measure over time by moving the time window forward with minimal overlap. This yields nuanced temporal descriptions of the bipolarization of the subsystem over several years as a smoothed curve. We subsequently apply the methodology to three case studies in different contexts in order to show how exogenously arising opportunities for seizing hegemony in a policy debate condition the timing of bipolarization or multipolarization in policy subsystems over time.

Incumbents' Strategies in Media Coverage of Climate Change: a Case of the Czech Republic

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Climate change is one of the most urgent challenges that modern societies face. In a European context, the increasing pressures exerted mainly by the European Union's energy and climate policies as well as an inherent uncertainty of the transition process encourage various struggles of the involved policy actors. Media discourse that facilitates or limits policy change through agenda-setting, framing, and other processes is one of such contested spaces. Importantly, the discursive struggles include also industry incumbents who have a vested interest in preserving the existing sociotechnical regime (Geels 2014). Thus, the research focuses on the position of the incumbents in terms of employed discursive strategies and tests whether the incumbents have been disproportionately more connected with decision-making actors (governing political parties). The research is a case study of the Czech Republic, a post-communist country with a coal-dependent economy, sceptical position on energy transition, and a strong influence of the energy industry incumbents. It compares media coverage of climate change in the Czech Republic in two periods: (1) between the Copenhagen (2009) and Paris (2015) Conferences and (2) after the Paris Agreement (2015-2018). The research uses discourse network analysis (Leifeld 2009) to analyze a corpus compiled from four daily newspapers and employs block modelling techniques to examine a hypothesis on discourse coalition between the incumbents and decision-makers.

The ABC of Human Rights like-Minded Networks in International Institutions

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What does it mean to be like-minded in terms of human rights in international institutions? While answering this question, this paper makes conceptual and methodological contributions. This study argues that “human rights like-mindedness” comprises two different dimensions, which are captured in original indicators developed with quantitative text analysis and discourse network analysis using data from reports of the Universal Periodic Review (UPR) of the UN Human Rights Council (2008-2016). On the one hand, C-Like is an indicator of the similarity of the self-image of states and how they see (“C”) themselves when they introduce their human rights situation to the international community. C-Like is a dyadic measure of the similarity of the national reports that states present in the UPR. On the other hand, B-Like is an indicator of the similarity of the expectations states have of other states and what they would like their human rights situation to be (“B”). B-Like is a dyadic measure of the similarity of the recommendations made by states during the UPR interactive dialogue, as observed in the reports of the Working Group. To show how these are distinctive from other measures, both B-Like and C-Like are compared to a number of A-Like indicators of states’ structural similarities.

A Network Approach to Measuring Polarization in Survey Studies

Gunes Ertan, Ali Carkoglu

Koc University, Turkey

Polarization is an inherently relational phenomenon. However, except studies using social media data, the relational aspect of polarization is rarely considered. By adopting a cognitive social structures design, we aim at developing an alternative approach for measuring polarization at the individual level using survey studies. Using a nationally representative survey study we ask respondents to answer their preferred/perceived ties for all possible dyadic relations among major political parties currently represented in the Turkish Parliament. After generating a cognitive political network for each respondent, we work on multiple whole network measures that may be reasonable proxies for operationalizing polarization including density, E/I index, Yule's Q, and modularity. We compare these measures with the ones that are derived from the commonly used Left-Right scale in survey studies in comparative politics. Our analyses show that network measures are not associated with measures from Left-Right scale. Next, we compare the cognitive political networks with the distance matrices derived from the Left Right scale. We show that each party dyad is evaluated based on different criteria in the Left Right scale. In other words individuals consider different policy issues when placing political parties in the Left Right scale. Therefore the Left Right distance matrix fails to accurately represent the perceived distances among political parties. Overall we demonstrate that the distances generated by the cognitive networks approach are much better proxies for measuring polarization at the individual level.

Policy Intellectuals in a Time of Crisis a Social Network Analysis of British Think-Tanks and the Field of Policy-Knowledge Production 2005 - 2017

Jordan Tchilingirian

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Much has been written about the impact of the 2008 financial crash and the rise of populism on the authority of policy intellectuals, but less is known about how this crisis has affected the wider field of policy-knowledge production. This study provides the first empirical investigation of the fluctuating field of policy knowledge production from a period of relative stability to politico-economic crisis. Through a mixed-method social network analysis of the funding and authorship networks of British think-tanks engaged in economic and social policy, I chart the impact of crisis on the material and ideational resources, and the changing intellectual teams that support/discredit policy intellectuals and their ideas. Existing analysis of think-tanks and political crisis often privileges specific political cliques. This study offers a novel community-wide approach to understand how think-tank navigate their field, and thus contributes to the study of policy research institutes, political crisis, and policy intellectuals more generally.

Policy Networks and Swiss-EU Interactions in the Energy Sector

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This talk will present the interaction patterns between Swiss and European actors in the domain of Swiss energy policy. The network of these interactions is crucial given the double challenge of organizing the energy transition – on the one hand – and coordinating Swiss energy policy with the EU – on the other hand. We rely on an original dataset on the 60 most important actors in this sector, including information on collaboration, perceived importance, and agreement/disagreement when it comes to policy options. The network includes the most important actors in Swiss energy policy, such as political parties, federal authorities, business associations and other interest groups, individual firms of the energy industry, as well as European and international actors. We exploit these network data to outline the existing actor configurations and their ties towards the European level. We then focus on the specific role that actors play within this network to identify coalitions and interactions patterns. Taking this approach, the paper identifies actors that can shape policies on a national level and/or interact on a European level, re-enforcing their national position. We show that the Swiss energy sector consists of a dense network, with actors from public administration as well as private actors (energy companies) taking central positions. Within this network are we able to distinguish different groups that stand for coalitions of actors. When it comes to the European level, we identify actors that approach European actors. In line with literature on Europeanization, only few Swiss actors in the energy sector hold relations with European actors, where especially Swiss state actors play an important role.

Identification of the Structure of Behavioral Patterns in Socio-Political Groups in Online Social Networks

Tamara Shcheglova

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The information space of social networks, as a special social and communicative environment, is a subject to social engineering. In the Internet space, attempts are regularly made to influence attitudes and social behavior on a large scale through online media or individual groups and individuals in order to have the desired effect on the target population. And online social networks play a key role in this influence, because, firstly, they provide access to specific target audiences, and, secondly, they open up the possibility of using the latest advertising mechanisms and promoting ideas and attitudes. For a long time already communities in social networks work according to a debugged scheme. The structure of roles existing in a group allows one to create and maintain user interest in certain political topics. There are not only administrators, moderators and “all other members” who constitute an online group. First of all, users are divided into active and inactive. The latter can also be of several types: who joined the group by chance, who is in it for a while and forgets to quit or who just quietly watches what is published and discussed in the group. Among active users may be moderators, content creators, information hubs, likers, reposters, commentators, bots, etc. Usually there are opinion leaders in almost every group, which set topics and moderate discussions on them, and often these are not official group administrators and moderators. Identifying the structure of roles and positions, firstly, helps to reveal manipulation schemes that exist in online groups, and secondly, allows political communication members to understand how to work effectively with specific groups. In this work, we would like to present design of the study and methodology for relational structure detection of online groups on social networks with some preliminary results. We are analyzing and comparing structures of online socio-political groups by defining the roles and positions of group members with a help of blockmodeling technique. There are different types of group structure and different combination of positions inside groups, that could possibly affect the effectiveness of the group. Modeling of block structures allows to select cohesion, center and periphery in the structure and to carry out ranking. On the one hand, blockmodeling is a mathematical method that helps to reduce a large, potentially incoherent network to a smaller comprehensible structure that can be interpreted more readily. On the other hand, it refers to several major theoretical concepts in sociology such as positions, roles and role sets, which are in the focus of our research.

Modelling (Session D6)

Chair: Sevag Kevork

Prediction of Equilibrium Dynamics Using Exponential Family Random Graph Models

Carter Butts

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While exponential family random graph models (ERGMs) are generally employed to model single graph realizations, they can in some settings be used to represent the equilibrium distribution of a network evolving under the action of a set of social "forces," whose natures are determined by the model's sufficient statistics and whose magnitudes are determined by the model parameters. Contrary to common misconception, a network in equilibrium need not be static, and indeed it may exhibit quite complex dynamics. Here, I describe an approach for leveraging the ERGM potential itself to characterize some aspects of these dynamics, in a manner that provides insights into the potential pathways through which an evolving network under the associated model is likely to change. I demonstrate this approach on a model system involving polarization along two different potential bases of solidarity, such that at any given time groups tend to be organized around one or the other factional differences. I show that the maximum probability change path involves excursions in which inter-group ties are added until a critical threshold is reached, with subsequent deletion of "excess" ties collapsing the network into its alternate state. Insights from this analysis into factors that would either enhance or inhibit state switching are also provided. I suggest that this approach provides a relatively simple way to obtain information on possible dynamic behavior from distributional models, particularly when replicated cross-sectional (but not longitudinal) data is available.

Bayesian and Spline Based Approaches for (EM Based) Graphon Estimation

Benjamin Sischka, Göran Kauermann

Ludwig Maximilian University of Munich, Germany

We propose a new method for graphon estimation using the principles of the EM algorithm. The approach considers both, variability with respect to ordering the nodes of a network and estimation of the unique representation of a graphon. To do so (linear) B-splines are used, which allows to easily accommodate constraints in the estimation routine so that essential properties can be achieved. The graphon estimate itself allows to apply Bayesian ideas to explore the plausibility of reordering the nodes. Variability and uncertainty is taken into account using MCMC techniques. Combining both steps leads to an EM based approach for graphon estimation, which yields for some cases much better results than previous methods. ArXiv: 1903.06936.

Iterative Estimation for Exponential Random Graph Models with Nodal Random Effects

Sevag Kevork, Göran Kauermann

Ludwig-Maximilians Universität Munich, Germany

Ludwig-Maximilians Universität Munich, Germany

Networks and the Study of the Human Past (Sessions E6, E7, E8, E9)

Chairs: Tom Brughmans, Martin Stark, Ivo Veiga, Bernd Wurpts, David Zbiral

Brokering Across Markets Not Persons: Network Organizations, Trade Specialization and Reciprocal Exchange in the Development of the Modern Economy

Bernd Wurpts

University of Lucerne, Switzerland

The brokerage concept has a central position in economic sociology and organization studies. Studies on brokerage identify network locations near gaps in social structure and their various consequences for individuals, organizations and larger social formations, but have almost exclusively focused on one-mode networks. In this paper, I extend this established literature by pointing to brokerage in two-mode networks, e.g. persons and places, and its consequences for network organization and economic development. There are two major points I would like to make: First, the establishment of connections between markets is a primary brokerage problem whereas brokerage between persons is secondary. Second, network organizations that rely on the alignment of interests among actors in different environments and geographic locations may be dependent on two specific forms of brokerage in two-mode networks, namely the spanning of distinct markets (arbitrage) and the tight connection of markets through reciprocal exchange. Using unique datasets from Northern Europe including thousands of traders in the years 1368 and 1492, I analyze specialization of traders in markets and trade goods. I estimate bipartite ERGMSs to study changing patterns of trade connections between merchants and their trade places and goods in the Baltic and North Sea region. Preliminary analyses suggest that network organization such as the famous medieval Hansa (alternately known as Hanse or Hanseatic League) may be dependent on the underlying structure of relations. Specialization of merchants in places and goods and the reciprocal nature of exchange between markets likely contributed to the functioning of the network organization, but changing patterns in trade specialization also may have contributed to its decline. This study shows how changes at the micro-level may lead to large-scale transformations such as the decline of pre-modern institutions and the rise of merchant capitalism.

Private Benefits, Public Vices Railways and Logrolling in the 19th Century British Parliament

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Vote trading among legislators can be an important enabler of political rent-seeking. However, it is difficult to identify, as voting records do not allow disentangling vote trading from preferences. In this paper we introduce methods to cleanly detect logrolling. We examine the role of the British Parliament in approving railway projects in the 1840s. MPs had vested interests in these projects, but parliamentary rules barred them from voting for their interests. Using social network analysis, we confirm that logrolling was prevalent (affecting, at least, a quarter of the projects approved) and socially detrimental, implying an aggregate loss of c.1

Corsairs and Careers in Economic Networks: Evidence from Ancien Régime Saint-Malo

Henning Hillmann

University of Mannheim, Germany

A pivotal period within world economic history was the age of mercantilism because it entailed the first expansion of overseas commerce on a global scale. What, then, were the local organizational foundations of this worldwide trade development? As a case in point, I focus on the port of Saint-Malo in the French Atlantic economy under the Ancien Régime (c.1681-1791). From a sociological point of view, one question is particularly salient for understanding how overseas trade was organized locally: what mechanisms facilitated the social cohesion of merchant communities? Answering this question is important because overseas ventures were organized as partnerships that offered efficiency gains compared to the rare occasion of lonesome entrepreneurs: risks were spread, trades diversified, and costs were shared. Understanding the sources of cohesion is important because the formation of such venture partnerships required networks of collaboration. Here, I first show that privateering enterprise (i.e. state-licensed commerce raiding of enemy ships during wartime) was particularly instrumental in joining partners from different merchant strata who would otherwise be disconnected from each other in the partnership network. This finding establishes macrolevel evidence that privateering facilitated social cohesion in the merchant community. Second, I show that privateering also served as a launching pad for the careers of rising new men in the merchant community. As these new men built their careers, expanding their venture partnerships from privateering into other trades, they eventually embedded their former and current partners into cohesive networks. This finding thus identifies a brokerage micromechanism that yields macrolevel cohesion through transitive closure over time. My empirical evidence comes from the complete surviving set of venture partnership contracts that were set up in Saint-Malo. The earliest documents date from 1681 and the latest from 1791. They include information on the purpose of a venture, the vessel (name, type, tonnage, crew, captain, weaponry), and most important, the names of the shipowners and their shareholding partners, including the amount of their investments. The ventures range from privateering to North Atlantic fishing, from slave to coastal trading, and from long-distance voyages to India and China to colonial trade with the Americas. From these rich data, I code longitudinal affiliation networks that embedded 6,298 individual merchants within 3,250 venture partnerships during the 1681-1791 period. I link individuals in the network with systematic information on their wealth from complete poll tax registers of Saint-Malo. I complement both datasets with information on the costs and returns of voyages, biographical details on selected merchants, including their officeholding in municipal, provincial and national politics.

Peer-to-Peer Credit Networks in Pre-Industrial Finland

Elise Dermineur

Umeå University, Sweden

Before the mid-nineteenth century and the proliferation of banks, most financial transactions took place through inner circles (i.e. informal networks). Nearly 90

Rivals of the Goethezeit. Network Models in Literary History

Thomas Weitin

TU Darmstadt, Germany

Text corpora with German-language novels from the beginning of the 18th century to the end of the Goethezeit are modelled as networks in order to be able to examine group formation processes and the centrality of individual works. The main aim is to confront the well-known canonical works with the part of literary history that, although it was popular at that time, has been forgotten by cultural memory. A majority of works belonging to this part was written by female authors. Starting with networks based on stylometric data, the first part of the talk will demonstrate how quantitative style analysis can be used as an instrument of literary history, how it can be modified, and what effects this has on grouping phenomena that are instructive in the comparison of the authors' gender. Targeted corpus manipulations allow to combine synchronic and diachronic perspectives, text classifications on the basis of machine learning lead to new results in the discussions on authorship that accompany female writing. The second part of the talk discusses the basics of topic modeling in detail and examines the extent to which the semantic profiles of male and female authors can be differentiated. This also provides the data basis for the final analysis step, in which semantic network models are constructed and compared with stylometric networks. Through this comparison, it is possible to determine how the observed grouping phenomena behave, depending on whether they are modelled according to stylistic or underlying thematic characteristics. From a literary studies perspective, it can then be concluded to what extent the category of gender can serve as a primary explanation of the results or whether it secondarily reveals the need for a redefinition of traditional grouping categories, such as epoch or genre.

“Building Cultures of Steel and Concrete. the Networks of Engineers in Portugal (1850-1900)”

Ivo Veiga, João Mascarenhas-Mateus

CIAUD, Research Centre for Architecture, Urbanism and Design, Portugal

This paper takes the case of the civil engineering field in Portugal during the second half of the nineteenth century, within the context of the Ministry of Public Works created in 1852, to identify and analyze the emergence of occupational boundaries. As a professional group, engineers were embedded in internal interdependent relations, which reflected their specialization, still very related to military engineering schools. They occupied positions in state institutions, were deeply involved in the creation of the new cultures of building based on standardized materials as steel and concrete, in the implementation of a territorial network of public infrastructures and in the constitution of engineering in different levels of education and vocational training. Yet, the engineering field, with its suppliers and clients, also encompassed interactions with many other professions. Building contractors are among their most prominent partners and clients. We will examine the constellations of relations between engineers, builders and architects relying on the professional journals, specialized magazines and legislation. These sources were a privileged medium of discussion and dissemination of work, innovations and trends, providing information on the interaction between different professions. We will explore the research corpus of the project Portugal Builds which systematises dispersed data on the history of building cultures during the 19th and 20th Century. Given the great amount of data, social network analysis is employed to find patterns and constellations of relations between engineers and other professionals. Hence, using social network analysis as an exploratory tool, as well as employing different concepts and centrality measures, we aim to understand why certain actors become more important than others and how they function as brokers within their expert knowledge. Furthermore, we intend to analyse how their international networks, related to their education and training, helped to attain relevant positions in the engineering field.

Assessing the Validity of Social Networks Constructed from Name Co-Occurrence: the Example of Medieval Inquisitorial Records

Tomáš Hampejs, David Zbiral

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The growing interest in the formal methods of network analysis in historical research has brought into focus older printed resources containing structured data, such as catalogues (of artifacts, inscriptions, manuscripts, etc.), dictionaries (biographical and other), gazetteers, various structured lists, etc. One such type of resource, widely represented in historical research, is indices of personal names contained in editions of sources, which may serve for constructing social networks on the basis of the co-occurrence of names in a textual unit (page, manuscript folio, paragraph, particular deposition, etc.). This paper will focus on selected medieval inquisitorial registers as a test case for quantifying the validity of this method through the comparison of networks validated by manual coding with those created automatically on the basis of name co-occurrence. The aim is to show that this seemingly rather rough method can produce comparatively valid outputs if used with discernment and in an iterative way, where the exploration of the outputs helps to fine-tune the initial index of persons and the process of network construction. Another point will be that the validity also depends largely on the kind of research question such an automatically constructed network is used to answer. Finally, the paper will demonstrate that empirical comparison between the outcomes of the manual and the automated approaches is not always in favour of the manual one, as we might expect; in fact, the automated procedure allows some errors typical of human coders to be avoided.

Discourse Network Analysis of the Satanism Representations in the Russian Legal Practice

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Juridical discourse could be considered as a carrier of social attitudes towards various phenomena. The text of court procedures represents the interaction between different types of social actors, which are involved in the legal process. Therefore, the social network discourse analysis could be helpful for the extraction of the actors and their positions towards the social issue. In this study discourse network analysis, proposed by P. Leifeld, was used to illustrate the standpoints on satanism in the Russian juridical practice. The goal of the study was to understand what discourse on satanism is constructed by the actors of the Russian legal system. It was supposed that contemporary Russian legal discourse could contain esoteric, reactive, rationalist or the combination of representations of satanism. These types of satanic discourses were suggested by J. A. Petersen, who defines satanism as a discursive milieu. The empirical base for the study was comprised of juridical cases from the Russian open base "sudrf.ru". 107 juridical documents published from 2008 to 2018 were included. This time period was chosen due to the policy of publication of juridical documents which exists in Russia. The analyzed documents were issued by the Russian courts of different levels and types of juridical processes. Chosen cases were manually coded, actors and their claims were identified. Semantic networks and bimodal discursive networks were constructed and analyzed. The methodology of the conducted study could be used for the investigation of the other representations of the social phenomena in the Russian legal discourse.

Using Formal Network Analysis to Reveal Political Stakes and Power Dynamics Shaping International Recommendations in Education (1934-1958)

Émeline Brylinski

ERHISE, FPSE, Université de Genève, Switzerland

As early as 1934, the International Bureau of Education (IBE) organized the annual International Conferences of Public Instruction. These conferences brought together more than 40 states in order to 1) share their national experience on a given theme, 2) prepare and debate a comparative report that gathered these experiences, and 3) vote a series of international recommendations constitutive of a “Global Chart of Education” (Hofstetter & Schneuwly, 2013), to which UNESCO has been associated since its creation (1946). If the vocation of the IBE is to establish peace in the world through education and science, States participate in this global project using techniques of intergovernmental collaboration. The annual conference aimed to be a “general assembly entirely neutral”(BIEA2-1-603), where States were expected to debate on educational issues, identify “global barriers” to the progress of education, and the so-called “universal” responses, without political footprints. A successful bet? If the published minutes of the debates barely mention any political stake nor conflict, likely attenuated by its author(s), are they nonetheless nonexistent? To which extent is there a “staging” of States in this international sphere? In order to historicize negotiation processes leading to the production of international recommendations, network analysis proves to be a relevant tool, “a way to view things” (Lemerrier, 2015, p.4). It allows approaching the source not as a mere recollection of shared knowledge based on individual interventions, but rather as a network of knowledge enhanced and influenced by actors’ positioning, which eventually affect final recommendations. In addition, this method reveals what is invisible to the reader’s eyes, such as the emergence of new geographies (Beauguitte, 2011), and raises further assumptions that can be confirmed with manuscript archives (Grandjean, 2018) In this study, formal network analysis is applied to published minutes covering 20 years of educational debates (1934-1958). Nevertheless when confronted to its application, several challenges have to be taken into account: first, the source, although systematic in its structure, may cast a writing style that varies according to several factors, leading researchers to adopt rigorous strategies when developing the coding scheme in order to overcome these issues ahead of the data collection. Secondly, the notion of “actors” in this type of network has to be problematized. Analyses tend to focus on the state as a unit, potentially stifling a transnational dimension certainly present in the discussions (Iriye, 2013). Further, this approach risks a loss of information, subduing dynamics of conflict, dissonance or even strategies of valorization of educational models. In the selected sources, the diversity of profiles and the emergence of new actors are similar to global governance mechanisms in education (Kuroda, 2014, Mundy, 2007, NORRAG, 2014), which allows a nuanced analysis of the role of individual

actors, States, and collective entities in the process of global governance in education. This work is part of a thesis entitled “Sociogenesis of intergovernmental cooperation: from pacifist propaganda to peace education” (Brylinski, 2017), as part SNSF project “The International Bureau of Education: a laboratory of educational internationalism (1919-1952)” (Hofstetter & Droux No. 100011_169747).

Social Sequence Analysis on Historical Big Data – a Case Study

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This research aims to show how integrating network analysis with social sequence analysis may enable historical social science to capture the unfolding of semi-rare social events. Being in the intersection of (digital) art history, network and data science and the sociology of art, the presentation also intends to raise epistemological challenges regarding data driven methods and Big Data usage in research tackling core-periphery power relations. Thematically the presentation will connect to the discourse on the social institution of canon formation. It will analyze the ways art of the semi-peripheral region of Central and Eastern Europe is represented through hub museum collections of the core region. During the research we built a dataset comprising all acquired artists in three arguably core collection of the western artworld; the Tate, the MoMA and the Centre Pompidou along with a complementing dataset comprising more than 100 000 exhibitions of more than 3500 non-acquisited CEE artist. Network analysis enables to grasp multiple and complex positional features in the change of the social networks of both the artists and the collections in different time periods. Sequence analysis enables to detect patterns in the continuity and interdependence of events to identify dominant routes of action within the field. Comparing artists' exhibition histories with sequence analysis based on categorizations derived from integrating multiple network analysis based characteristic to typical constructions of their social networks at given timeframes enables thus to show specific routes of transformation throughout the artists' and the collections' histories. Results both shows dominant ways of artistic transformations towards consecration and reinforces the concept of a dual mechanism of cooperation and competition among core region collections. It contributes thus to the deconstruction of the naturalized concept of canon-formation while connecting micro-meso and macro levels of the process. Using data driven approach in a case tackling center-periphery discourse related questions is nevertheless non-trivial, since one of the obstacles in Big Data usage regarding non-core countries and especially in historical datasets is precisely the lack of data, relative to geopolitical core countries on the one hand and the biases of the existing ones on the other. Although biases are "normal" signaling that datasets are built with certain means, since these means are reflected in the data one must reflect and contemplate on it while using it. What should thus one do? Collect the missing data manually? If available, match it with other sources? Estimate the missing data points and its features with statistical techniques and fill the gaps with them? The different strategies will result in effecting the research, its' implications and evolving possible interpretive frameworks in various ways. This research shows a case-specific solution to arrive at qualitatively inspiring quantitative results, but also raises questions for further discussion aiming to develop the self-reflexivity of such research agendas.

Measuring Systemicness in the International Financial Network During the First Globalization

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This work presents a detailed analysis of the international financial network during the First Globalization of 1880-1914. At that time, most international financial transactions took place through the London discount market for bills of exchange. Sterling bills of exchange were used by merchants, firms and banks across the whole world to finance their commercial and financial activities. We rely on a unique data-set built from a previously unexploited archival source: The Bank of England's Discount Ledgers. This source reports systematic micro-level information on all agents involved in the origination of bills of exchange circulating on the London discount market. Our data-set contains information on all individual bills rediscounted by the Bank of England during the year 1906 (23,493 bills) and it allows us to analyze the structure of the sterling bill market. Using network analysis, we reconstruct the complete network of linkages between agents involved in the origination of London bills. Sterling bills always involved actors in three roles: a "drawer" (a borrower in a foreign country), an "acceptor" (a London firm who guaranteed the bill's payment), and a "discounter" (an ultimate lender). Our descriptive analysis reveals that, in contrast to nowadays' interbank networks, during the First Globalization the international interbank network was a low hierarchical network without clear center-periphery structure. Today, interbank networks structures are determined by preferential attachment laws, where confidence is linked to the size/centrality of actors. As a result, the network's resilience to shocks depends on individual characteristics. This entails disastrous consequences when a centrally-situated node fails –as revealed during the global financial crisis of 2008. By contrast, in the 19th-century global interbank network the confidence problem between lenders and borrowers seems to have been solved. Traditional network indicators, but also role path analysis and structural equivalence study suggest that other rules than preferential attachment seem to have driven link creation. In the paper, we develop new metrics allowing to analyze to what extent this decentralized interbank network was resilient to shocks. Following the contemporary finance literature, we define "systemicness" as each financial actor's substitutability within the network. By simulating different scenarios, we analyze how various nodes were able to destroy other nodes' connectivity to the rest of the network. Our results suggest that actors were much more substitutable in the 19th-century network than nowadays, pointing to a better resilience to financial shocks.

Using the Relational Event Model with Diary Data: an Illustrative Example Based on Margaret Thatcher

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Appointment diaries have existed as historical sources since the mid-nineteenth century, and are now commonly used. Such records regularly appear in the private papers of individuals - such as politicians, civil servants, business people, and academics. Our research project attempts to appropriate historical appointment diaries as sources of network data. It encompasses the records of Margaret Thatcher (1962-90), Harold Wilson (1958-60 and 1966-88), and the ministers and permanent secretaries of the Department of Trade and Industry (1986-93). Here, we focus on the analysis of Margaret Thatcher's appointment diaries. Thatcher was the dominant public figure in the UK during the 1980s, and her social and economic convictions - though often divisive and polarising - have had a major influence on British politics. We explore the use of a Relational Event Model (REM) to analyse such diary data using the illustrative example of Margaret Thatcher's diaries. We discuss issues of data transformation, preparation, and using the REM to objectively identify patterns in the appointment network structures of different parliamentary sessions during her time as Prime Minister.

Reconstructing the Ties Between Jewish Settlements in Galilee via Multiplex Network: First Results

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The area today in northern Israel has been a region of interest for historians and archaeologists. Textual materials are various and useful to reconstruct the history of the region. However, Galilean archaeology is still at its early stages of expansion. Nonetheless, there are a lot of data coming from the material culture remains. In this way, archaeologists can start to shed light on the complex framework of cultures that developed in this small territory. In the period between the 1st century BCE and the 2nd century CE, the growing influence of the Romans characterised a major integration of Galilee in a more global context. The importation of goods increased and pottery production varied considerably. Through the analysis of some artifacts - such coins, pottery, etc. - and the application of new kind of analysis, it is possible to reconstruct cultural and commercial trades that affected the area. In this regard, in recent years network analysis methods have been used in archaeology: as a matter of fact, the application of network analysis to archaeological issues is now a topical subject of scientific debate. Indeed, in order to reconstruct an archaeological network of any sort, several researches have been carried out in archaeology by means of network analysis, so as to examine and infer the structure of archaeological relationships. In the present work, we aim at reconstructing the dynamic ties between Jewish settlements in Galilee on the basis of consistent evidence, speculating on the presence of links between them whenever proof lacks. Data referring many types of artefacts have been derived from the analysis of scientific papers and archaeological catalogue of excavations. In such a way we obtained a multiplex network in which the nodes are the sites and the links are given by the presence of the different artefacts. Here we present the first findings from an exploratory analysis. Visualization methods specific for multiplex are exploited, such as multi-force embedding and multi-task network embedding algorithm. More specifically, this latter that is based on link prediction seems to be particularly suited for the data we are dealing, in which the absence of a link could be due to a missing data. Moreover, in order to consider the way in which ties between settlements have changed over the reference period, a temporal approach is used. Indeed, multiplex network analysis can also be readily used to model dynamic networks where each layer corresponds to the network state at a given moment.

Exploring Visual Signalling Networks of Medieval Strongholds in Garhwal Himalaya, India

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Hundreds of strongholds are dotted throughout Garhwal Himalaya, Uttarakhand, India, occupying elevated positions on ridges and mountain tops in the Central Himalayan region. It is generally assumed that the fortification phenomenon in Garhwal has its origins following the downfall of the Katyuri dynasty around the 11th century and continued up to the 15th century AD when one of the rulers of the Parmar dynasty Ajaypal, consolidated the entire region of Garhwal (Dabral 1994: 79). We show that new survey data allows for more complex theories about the fortification phenomenon in Garhwal Himalaya to be addressed for the first time, and we will focus in particular on theories concerning visual signalling: the use of fire, smoke or light for communicating between Medieval strongholds in this Himalayan region. Do sets of strongholds form communities of small local-scale communication networks and can these be identified as small administrative units or independent chiefdoms? Can an integrated visual signalling network have existed to allow for efficient communication throughout the entirety of Garhwal Himalaya? Do those sites interpreted as major forts play an important role in this network as hubs or mediators? We formally represent and explore these theories using geographical information science (GIS) and network science. Our computational method consists of five steps: (1) we create a range of line-of-sight networks in GIS with differing maximum viewing distances (Floriani et al. 1994); (2) the structure of these networks and the role of individual strongholds is studied using exploratory network science techniques (degree, betweenness, density, isolates, components); (3) the sensitivity of these results to the possible non-contemporaneity of many forts is statistically evaluated (Costenbader and Valente 2003; Peeples 2017); (4) we count network configurations representing theorised visual signalling patterns (Brughmans et al. 2014); and (5) we explore these counts' significance using Bernoulli random graph simulation (Brughmans and Brandes 2017). Our results show that much of the region excluding the westernmost part could have functioned as an integrated visual signalling network, and that crucial clusters of short-distance visual signalling networks exist in the border regions in the directions from which enemy invasions into the region have been historically documented. References cited: Brughmans, T., & Brandes, U. (2017). Visibility network patterns and methods for studying visual relational phenomena in archaeology. *Frontiers in Digital Humanities: Digital Archaeology*, 4(17). doi:10.3389/fdigh.2017.00017 Brughmans, T., Keay, S., & Earl, G. P. (2014). Introducing exponential random graph models for visibility networks. *Journal of Archaeological Science*, 49, 442–454. doi:10.1016/j.jas.2014.05.027 Costenbader, E., & Valente, T. W. (2003). The stability of centrality measures when networks are sampled. *Social Networks*, 25(4), 283–307. doi:10.1016/S0378-8733(03)00012-1

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From Core to Periphery: Marine Insurances in the Naples Business Network over the 19th Century (1820-1900)

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The economic history of Naples belongs mostly to its port and sea. The largest port on the Tyrrhenian coast south of Leghorn, during the centuries, it catalyzed the most of Southern Italy's commercial fleet and import and export trade. With so much at stake, in the face of such associated uncertainty and risk, Naples had developed a long tradition in marine insurance. Literature generally describes local marine insurance companies as a strongly entangled business system before the Unification of Italy (Davis 1979) while, after 1861, when the old Bourbon kingdom opened to free trade, there is no further track about the sector consistency, its organizational dynamics or its power in the local economic landscape. The paper presents a first endeavor into exploring the Naples marine insurance business history across the entire 19th century, a rather overlooked field of research in the rich literature on the troubled economic history of Southern Italy. The paper focuses on evaluating and explaining the power position that this dynamic component of the South's economy had within the business environment of its most important metropolitan area. The analysis is based on still unexploited archival data on the universe of Neapolitan enterprises in the 19th century gathered in the IFESMez database (Imprese, Finanza, Economia e Società nel Mezzogiorno) and organized as to show the relationships existing among individual actors, among firms and among firms and individual actors. After typifying the sector in terms of number of companies, size of capital, average lifespan of firms, legal type, etc., the paper aims at capturing the insurance market structure over the 19th century by analyzing the network dynamics of the sector within the universe of the Neapolitan enterprises. The topic is addressed by analyzing the Naples business ownership structure and the corporate boards networks in the 80-year span 1820-1900, in order to define the role of marine insurance companies in terms of centrality and concentration of power within the Naples corporate network and understand some of the workings of the local financial elite in maintaining the control over the sectoral market. 1861 is taken as a natural experiment for comparing the network structure and composition before and after Unification. The interactions among agents and firms are analysed by using Social Network Analysis (Wasserman and Faust 1994), focusing on interlockings as one of the major techniques of power structure research. We look for the most central and powerful companies within the business structure by building interlocking networks (co-shareholding, interlocking directorates, kinship, etc.) for six sliding twenty-year periods before and after 1861. We capture the market structure by formulating and testing a core-periphery model in each time span, through blockmodeling approaches and we trace the trajectories of marine insurance companies within the local business structure. We find declining trajectories from core to periphery associated to a loss of interest of the most powerful

city-based elites in this kind of business over Unification, also related to the progressive specialization of financial activities, when insurances were “forced” to deal exclusively with their own sector.

The Letter Correspondence Network of 16th Century Reformers: Examining Possible Driving Factors of Communication

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The Reformation was a major transformative movement in early modern Europe. It has not only overthrown the established clerical order but it has also advanced economic, political and social changes that are still visible today. In order to understand how these wide-ranging effects were brought about, we have to ask the question of how reformers communicated to spread their ideas. During the 16th century letters became the main means of communication. The letter correspondences can be aggregated into a communication network which reflects interaction patterns among reformers. In this work we address the question of which factors affect the letter communication between reformers. The aim is to quantify the effect of different dyadic relationships between correspondents, such as geographic distance on the letter communication network. We construct a network from 17,000 letters, written and received by almost 2,500 people between 1510 and 1575. These data are based on the letter correspondences of seven reformers which were crawled from public online repositories. The Reformation-data pose two challenges for network methods. First, our network is incomplete, as it is a superposition of seven ego-networks where especially, but not exclusively, peripheral links are missing. This can be due to a historical bias (legacy of 'important' historical actors is valued more highly than that of minor ones), the fact that letters did not survive the course of time, or because they have not been digitised yet. Second, we have to deal with repeated interactions since reformers wrote multiple letters to each other. To overcome these challenge we apply a network method that is able to deal with missing and weighted links in the network. Specifically, we apply a network regression, a new network inference model based on the generalised hypergeometric ensemble. We use this model to estimate which factors explain dyadic interactions between reformers. The factors we focus on are homophily, reciprocity, and geographic distance. With respect to homophily we look at letter exchange patterns between different innerprotestant groups (e.g. lutheran, reformed). Reciprocity is relevant since missing letters in the data result in a number of non-reciprocated links in the network which introduces a bias. By quantifying the effect of reciprocity in the letter communication network we can estimate this bias, thus addressing its mitigation to the other model terms of homophily and distance. As far as geographic distance is concerned we are interested in how the relation between distance and letter exchange can be quantified. For example, below a certain maximum distance it might have been easier for reformers to talk to their correspondence partners in person rather than writing a letter. Our research bridges qualitative historical analysis with cutting-edge quantitative analysis.

Networks for Learning (Sessions G6, G7)

Chairs: Katerina Bohle Carbonell, Dominik E. Froehlich

Studies in Social Networks Journal 2000-2019: the Intellectual Structure of Social Network Perspective

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It is obvious that there is an increasing interest in network research since the early 1970s. The network perspective has become more popular in a number of social science disciplines because it enables researchers to model the relationships between actors. The aim of this study is to investigate the evolutionary development of social network theory and social network analysis. To detect the path of evolution we used papers published in the Social Networks Journal from 2000 to 2019 inclusive which is one of the pioneer journals of this field. Up to emerging big data the only way to understand the text was reading by eye. However, there is another alternative. Text mining is a bunch of approaches and instruments for analyzing the enormous amount of textual data. These instruments provide benefits like summarizing, classifying, visualizing the text. Text mining leans on breaking the sentences into words and calculating their occurrence for each document. This process helps to build an enormous matrix for seeking inter-conceptual relations. In this study, we employed text visualization to extract information from 766 articles from the Social Networks Journal. We used R language and its powerful visualization and reporting tool Shiny. We developed an open, interactive and flexible interface to investigate what was the real topic in the papers. The name of this interface is JournalAnalytics. By this interface, we could extract the most frequent words and bigrams (the phrases) according to the year. We also used world co-occurrence network analysis which combines word co-occurrence analysis with network analysis based on graph theory. It was possible to constitute word co-occurrence network hence we detected major groups of words that represent the intellectual structure of social network theory and analysis. In addition, Sankey diagrams were used to show the power of relations between co-occurrent words.

This Cloud Has a Silver Lining - Economic Crisis and Technological Exploration

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We investigate whether crises bring in qualitative shifts in the search behavior of regional actors so that it produces exploration at the aggregate, regional level. Building upon behavioral theory and the economic theories of opportunity cost and growth options effects, we argue that crises change the opportunity-structure for organizations, which respond by engaging in distant search, possibly along emerging technologies. We further argue that the crises trigger a churn in regional knowledge network. Inducing exits, layoffs, and termination of innovation projects, crises lead to the dissolution of existing ties. Simultaneously, responding to top-down incentives to pursue opportunities in new technology areas, inventors engage in a social search for collaborators. Thus, new ties are created between those working on new, non-core technologies. Such churning renders the knowledge network less hierarchical, thereby more supportive to exploratory search processes. We hypothesize that economic crises have an additional indirect effect on regional exploration, mediated through the flattening of its knowledge network. We test our hypotheses in context of US. Operationalizing regions in terms of MSAs, we establish a relationship between the intensity of Financial Crisis (2007-08) and the incidence of regional exploration. We use patent data to construct knowledge networks and measure regional exploration. We employ two empirical strategies. First, we employ fixed effect panel regression model (2004-14) to establish the relationship between the crisis, network structure (mediation analysis), and exploration. Further, we used difference-in-difference for a stronger claim of causality. For this, we exploited differences in the severity of Financial Crises on different MSAs. Our preliminary analyses support our hypotheses. We tested additional mechanisms, viz. changes in the organizational and inventor populations, lest they mediate the effects of shock on regional exploration. We failed to prove that any additional or alternate mechanism was at work. Our paper broadens our understanding of crises and downturns. Literature has asked whether firms increase their R&D-spending during crises and recessions, and whether such counter-cyclical investments in R&D have performance-effects. We further ask whether economic crises also alter firms' learning strategies so that it produces effects at the aggregate levels. As crises may trigger new path-creation through exploration, it connects to the research on regional, organizational and network resilience. Secondly, we join works that establish the effects of regional inventor network structure on innovation. Most existing works fail to take a dynamic perspective. Recently, Hernandez and Menon (2017) in their simulation-based study, have explored the effects of radical events such as node deletion due to exogenous conditions, on network structure. This paper adds a step forward in this direction, illustrating how a

sudden change in the external conditions in which inventors operate can trigger changes in the structure of knowledge networks, and in the behavior of inventors therein. Thus, we respond to recent calls of research on innovation networks from a dynamic perspective.

The Role of Teacher Attunement in Shaping the Classroom Normative Context: the Emergence of Status Norms for Bullying and Prosociality

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Norms are important regulator of students' behavior. The emergence of these norms can follow from the behavior of the high-status members of the classroom (norm salience). Previous findings showed that influence processes between classmates were stronger in classrooms where a certain behavior was reputationally salient, as popularity and unpopularity tend to be strong social reward/sanction, especially during the early adolescence. The aim of the study is to examine whether and how teachers can influence the classrooms' normative context. Specifically, we focus on the role of teacher awareness of students' social dynamics in setting the classroom status norms with respect to bullying and prosociality. Teachers' ability to recognize a wide range of students' social dynamics and roles has been referred to as teacher attunement. As teachers are important social referents, we hypothesized that teacher attunement might be a necessary, not sufficient, condition when teachers try to operate effective status management strategies aimed to promote new status structures, while limiting possible resistances. Thus, we expected that in classroom where teachers are more attuned, bullies will lose their status over time, while prosocial students will increase their status over time. Data were collected in 3 waves over one academic year from 1458 Dutch fifth grade primary school students (M age = 10.59, SD = 0.7, 47.4

Using a Mixed-Method Approach to Social Network Analysis in Exploring the International Collaborations in Primary Care Cancer Research: a CanTest Collaborative Study

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Background: The CanTest Collaborative, funded by Cancer UK, facilitates the international collaboration in primary care cancer research through joint research, training and academic exchange. Anticipated members of this community are all senior and junior researchers involved in early cancer diagnosis research in primary care around the world. Although it is assumed that building such a community is supportive in increasing the capacity and sustainability of cancer detection research internationally, the added value and the mechanism of community development remain unclear. **Objectives:** We aim to understand in what manner the CanTest Collaborative succeeds in strengthening and developing the research community by mapping the relationships that connect researchers directly associated with the network, and how those relationships contribute to the purpose of building a community of researchers who add to the early diagnosis in primary care. **Methods:** A mixed-method approach to social network analysis will be applied to analyse the community (development) in the CanTest project. The relationships that connect those researchers directly associated with the network (the 'ties') as well as the resulting value creation within the network (content of the ties) will be mapped by collecting social network data – retrospectively for the past two years, and prospectively for the remaining three years of the CanTest Collaborative. Due to the longitudinal design, this research will give information on the expansion of the community with people who did not belong to the CanTest Collaborative at the start. At three different moments, objective quantitative data will be collected on the basis of publications found in PubMed indicating which researchers within the CanTest Collaborative publish(ed) together, each year subjective quantitative data will be collected with questionnaires sent out to all participants within the CanTest Collaborative, and finally qualitative (subjective) data will be collected twice by conducting interviews with a sample of 20 participants within the CanTest Collaborative. The quantitative data will be analysed on network size and network measures such as diversity and diameter of the network. Qualitative data will be analysed on network measures such as perceived strength and quality of the network. **Conclusion:** This project aims to demonstrate in what manner the CanTest Collaborative succeeds in strengthening and developing a research community to support the delivery of diagnostic research for primary care, and to stimulate its development.

Peer Effects on Educational and Academic Aspirations in Hungarian Schools

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Aspirations are relevant in educational research, as they are shown to have an impact on future academic achievement and educational attainment (Haller, 1968; Homel és Ryan, 2014; Gutman and Akerman, 2008). The main aim of the study is to investigate the connections between educational and academic aspirations and friendship ties. According to previous research, students' educational aspirations are influenced through many channels: their abilities, their academic performance and some characteristics of their family background; and the latter is also related to children's abilities and academic performance (Boudon, 1974; Bourdieu, 1973; Breen and Goldthorpe, 1997; Cunha et al, 2006). During early adolescence, friendships gain more significance among other relationships, peers tend to spend more time with their friends and have a greater impact on each other (Berndt, 1992). In that life stage, peers could also affect students' educational and academic aspirations. Similarity among friends is an often documented characteristic, also among adolescents, which can be engendered by two different processes: selection and influence (Brown and Larson, 2009; Steglich, Snijders and Pearson, 2010; Ryan, 2001; Veenstra and Dijkstra, 2012). The selection hypothesis suggests that actors tend to choose friends who are similar to them. On the other hand, peers can also influence each other through reinforcement, peer pressure, behavioral display (or modeling processes) and structuring opportunities. The research investigates the relationship between academic and educational aspirations and friendship ties among primary school students. The study examines whether there exists similarity among friends concerning their educational and academic aspirations and if it does, whether selection or influence does play a greater role in that. The investigation is based on the interrelated association of educational and academic aspirations, and friendship ties in primary schools in Hungary. The study examines the co-evolution of both educational and academic aspirations (measured by academic achievement aspirations in Hungarian literature and mathematics and by the choice of secondary school type - whether a student applies to grammar school or not) and friendship networks with stochastic actor-oriented models using longitudinal data gathered by the MTA TK "Lendület" Research Center for Educational and Network Studies (RECENS). Although grades could be directly observable and hence can ground friendship ties, and at the same time grades could re-inforce or pull back aspirations, for the sake of simplicity, they are only considered as control variables. Preliminary results suggest that peers can affect educational and academic aspirations even after controlling for academic performance, academic performance, gender, family background, ethnic identification. Peer effects on the application choice to grammar school can be observed. The higher the odds that one's friends apply to grammar school, the higher the odds that one applies

to grammar school as well. Concerning future academic achievement aspirations, there is a difference between Hungarian literature and mathematics aspirations. Students' academic aspirations in mathematics does not seem to be influenced by their friends' aspirations. On the other hand, students' academic aspirations in Hungarian literature can be partly positively affected by their friends' aspirations, but only in case of having very high-achiever friends.

Teaching Applied Social Network Analysis with R/Igraph for Undergraduate Students

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Hochschule der Medien, Germany

Acquiring data and network literacy is a core competency for the 21st century. However, traditionally SNA is taught in social sciences or advanced courses. This presentation show how SNA can be introduced in a curriculum by a mix of self-learning video repositories for R and igraph as well as a semester challenge for second year communication In the first semester students acquire core skills in handling igraph datasets by interactive methods (e.g. drawing a Harry Potter Network, running a survey in the course) and using these datasets to understand and illustrate network structures and topologies. Each students submits a research design and is evaluated by his or her peers. During a pitching session students form research teams to generate a research question. Each team designs a codebook and runs the data collection in the semester The following semester starts with an intensive three day class in network visualization and analysis with igraph. Students prepare a research report and poster presentation for the follow-up class. All code is stored on a reproducible R Notebook on a joint github The presentation will show the development of the curriculum, testing, self-learning repositories and showcase student samples. The results can help to benchmark undergraduate SNA courses or exchange ideas about teaching styles.

The Inclusion of Immigrant Students Within Chilean Classrooms: Analysing Teacher-Student Interaction Networks

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The standard for educational inclusion of immigrant students has evolved from securing access to formal education to guaranteeing equality of learning opportunities. In Chile, progress has been made in recent years in terms of ensuring unrestricted access of immigrant students to formal education. However, little is known regarding the pedagogical inclusion of immigrant students within schools and classrooms. Chile's growing immigration trend, as well as new regulations of the education system, will require schools and teachers to work with more heterogeneous student intake than in the past, and the challenge in this context will be to provide equal learning opportunities to all students regardless of their background. This study investigates the inclusion of students of immigrant origin within their class' teacher-student interaction networks, its moderators, variation across classrooms, and the classroom-level variables that explain that variation. Data from 38 Chilean mathematics teachers/classrooms and 933 seventh graders were analysed using an innovative combination of systematic classroom observation methods, social network analysis and multilevel models. The data collected on teacher-student interactions resembles partial ego-networks, with a focal node "ego" (i.e., the teacher) and the nodes to whom ego is directly connected to, "alters" (i.e., the students), and was depicted through sociograms and examined using descriptive social network analysis. We find that first-generation immigrant students are significantly less frequently approached by their mathematics teacher than native students but they are also more likely to initiate interactions with their teacher than their non-immigrant peers. The opposite is true for second-generation immigrant students. Student mathematics achievement moderates these associations. In addition, there is significant variation in the inclusion of immigrant students across classrooms that is partially explained by teacher self-efficacy in working with diverse classrooms in total teacher-initiated interactions and by classroom immigrant diversity in pedagogical teacher-initiated interactions. The study advances the field by (1) exploring the educational inclusion of immigrant students in a country with an emerging trend of immigration, (2) contributing further evidence on the within- and between-classroom inclusion of immigrant students and their predictors, and by (3) demonstrating the combined use of systematic classroom observation, descriptive social network analysis and multilevel models for investigating equality in learning opportunities.

Diversity and Differentiation: Curricular Tracking, Friendship Selection, and Achievement Stratification

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How educational outcomes are patterned – socially, geographically, and institutionally – is a perennial sociological concern. Adding to a large body of work on school effects, there is now an emerging literature on social network dependencies. However, it remains to integrate these separate contexts into a coherent whole. This paper adopts a comparative approach to study how tracking regimes structure the stratification of achievement in students' peer networks. Applying newly developed multiple-membership multiple-classification (MMMC) models, I decompose the variance of achievement into the level of the school, classroom, friendship network, and individual. The paper tests the hypothesis that comprehensive schooling brings with it greater within-school variance ("diversity") but that this is offset by greater stratification between classrooms or friendship networks ("differentiation"). The hypothesis receives partial support: between-school variability is markedly larger in tracked systems (Germany, Netherlands), while between-classroom variability is slightly larger in comprehensive systems (England, Sweden). There is also considerable stratification at the friendship level, but this is of a similar magnitude in all four countries. Even with potential offsetting effects considered, therefore, comprehensive systems appear more effective at exposing students to peers of a diverse range of abilities.

Complex Social Networks (Sessions A8, A9)

Chairs: Kai Fischbach, Haiko Lietz, Marcos Oliveira, Martin Stark

War Pact Network Model: a Generative Model of Networks That Shrink

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Many real systems can be described by a set of interacting entities forming a complex network. To some surprise, these have been shown to share a number of structural properties regardless of their type or origin. It is thus of vital importance to design simple and intuitive models that can explain their intrinsic structure and dynamics. These can for instance be used to study networks analytically or to construct networks not observed in real life. Most models proposed in the literature are of two types. A model can be either static, where edges are added between a fixed set of nodes according to some predefined rule, or evolving, where the number of nodes or edges is increasing over time. However, some real networks do not grow but shrink, meaning that the number of nodes or edges is decreasing over time. We here propose a simple model of shrinking networks called the war pact model. We show that networks generated in such way exhibit common structural properties of real networks. Furthermore, compared to classical models, these more closely resemble international trade, correlates of war, Bitcoin transactions and other networks. Network shrinking may therefore represent a reasonable explanation of the evolution of some networks and greater emphasis should be put on such models in the future.

A Network Approach to Calculate the Entropy of Social Organisations

Christian Zingg, Giona Casiraghi, Giacomo Vaccario, Frank Schweizer

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Social organisations are ubiquitous in our everyday life, ranging from the project team we are working in to the special interest group we are contributing to, online. Our experience tells us that social organisations are highly dynamic. Individuals continuously enter and leave an organisation, and the way they interact is subject to change. We can study all these processes from a "microscopic" perspective, focusing on single events. But we aim at a macroscopic perspective that allows us to understand to what extent such events are within the expected dynamics of the organisation, or beyond what should be expected. This will allow us to define the dynamic stability, or resilience, of the social organisation in a completely new way. The key element of our approach is a measure of the potentiality of the organisation. This expresses the ability to recover from shocks, that the organisation experiences (individuals leaving, interactions interrupted, etc.). Every social organisation is subject to effects that restrict the possibilities of the individuals in how they interact. From a macroscopic perspective this means that the set of attainable configurations of the organisation is restricted, and hence fewer ways to recover are available. Network science allows to study a social organisation in terms of networks, where nodes represent individuals and edges their interactions. To calculate the potentiality, we combine methods from network science, information theory, and statistical modelling to quantify the diversity of attainable configurations, or networks respectively. In particular, by appropriately fitting the recently developed generalised hypergeometric ensemble of random graphs to the observed interactions, we describe the attainable configurations in terms of a probability distribution. We then measure potentiality by computing the Shannon entropy of this distribution. The lower the number of configurations, or the more similar the possible configurations, the lower the potentiality of the organisation, because fewer options are available for the system to operate. The higher the number of possible configurations and the more diverse they are, the higher the potential of the organisation to recover from a shock as more and more alternative ways of interacting are available for its elements. We apply our measure to three empirical data sets that capture the interactions between the individuals of three different social organisations. By doing so, we find fundamentally different potentialities that match our previous knowledge about the organisations and how they behave. The individuals in the first organisation are free in choosing with whom to interact, resulting in a very high potentiality of the organisation. In the two other organisations the communication between the individuals follows stricter patterns such as via a particular group leader. This is reflected in a much lower potentiality compared to the first organisation. With these applications we illustrate how our potentiality measure can be compared for different organisations based on real-world data.

The Multiplexity of Lobbying Coalitions

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The world of lobbying is a world of complex social relations. Lobbyists routinely form social ties with one another for the purpose of exchanging information and coordinating political action. Social ties often morph into formal coalitions. The formation of coalitions, then, becomes a reason to intensify existing social ties and to build new relationships with new coalition partners. As the field of coalitions grows, it too becomes interlocked, with many coalitions sharing members. Almost all lobbyists and coalitions have ties to Congress and political parties, which adds to the complexity of relations in this arena. This study models the multiplexity of the health policy lobbying arena in the United States by examining the relationships among lobbyists, coalitions, and congressional offices. We test hypotheses that the structural properties of these networks are interlinked. Analysis is performed using Exponential Random Graph Models (ERGMs) with two endogenous dependent variables (lobbying communication and coalition membership). The preliminary results show that triadic closure in lobbying communication predicts triadic closure in coalition membership, and vice versa. We plan to extend this analysis to incorporate data on communication with congressional offices. This relationship helps to build a deeper understanding of how actors in policy networks works with one another in the process of advocating for policy change.

Urban Segregation Conditions Network Effects on Income Inequality

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Distribution of wealth is becoming increasingly unequal, which hinders health development, economic growth, and technological progress. Social networks are claimed to induce inequality in a vicious circle if connections are driven by similarity effects. Such topology breeds inequality because segregated groups tend to diverge in terms of prosperity, especially when the base of segregation refers to economic opportunities. Cities and towns account for large shares of unequal distribution of wealth and are spatially segregated because similar individuals prefer to cluster together and because they are selected on the housing market by income into neighborhoods. However, how the topology of social interactions is linked to inequalities in cities and towns is unknown because large-scale social networks reach beyond the borders of these neighborhoods. An important further question is what major underlying force drives social network fragmentation and indirectly, inequalities? In this paper, we investigate the empirical relation between income inequalities in Hungarian towns, measured by the Gini index, and the fragmentation of a large scale social network compiled from a social media that used to be popular in the country. Such social networks have been used to infer on the relations between the network topology and economic development of towns. We find empirical evidence that income inequalities increase more in those towns where initially high levels of inequalities are paired with fragmented social networks. To disentangle how the complex phenomenon of network fragmentation is influenced by many dimensions of individual similarity, we apply a machine learning framework to look at the statistical relationship between network fragmentation and its various sources including unequal access to education, political divide in local communities, ethnic and religious segregation, and a new index quantifying how the built environment contributes to segregation. We find that the structure of built environment has the strongest explanatory power in comparison with other dimensions of segregation. Our index has two elements. First, it quantifies the extent to which living areas in towns are segregated by rivers, railroads and major roads. The index takes a high value if these geographical borders segregate large populations from each other. Second, we compute the distance of living areas from the towns' center of gravity. This index is high if neighborhoods are relatively distant from each other. In the final step of index creation, we generate the Urban Segregation Index as the principal component of

the above two measures. We find that fragmentation of social networks is stronger in those towns where Urban Segregation is high. This index is not correlated with income inequality but correlates with network fragmentation, which enables us to instrument network fragmentation with urban structure in a regression framework. Our final finding confirms that the novel urban structure index works well as an instrumental variable for fragmentation when estimating income inequality. We find novel evidence that urban structure conditions network effects on income inequality. These results suggest that urban inequalities can be partly tackled by designing better cities.

Emergence of Order in Scientific Conferences

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Collaboration in science is typically studied through co-authorships. Publications, from which co-authorship networks are derived, are formal outcomes of collaborations. To study how scientific collaborations are initiated we study data on face-to-face interactions at scientific conferences, in particular the 3rd GESIS Computational Social Science Winter Symposium (CSSWS) and the 3rd International Conference on Computational Social Science (IC2S2). Interactions are recorded using the SocioPatterns platform of RFID proximity sensors. Network data is enriched through surveys by socio-demographic attributes (e.g., gender, academic status, or nationality). A previous study has uncovered that professors connect and interact significantly less than other participants. We follow up on this work using a relational approach. Networks consist of 138 nodes (CSSWS) and 262 nodes (IC2S2). Graphs are weighted and can be layered. Layers correspond to conference events (e.g., opening, first talk, first break, etc.). Edge weights resemble the number of 20s interaction intervals summed for each event. To detect positional patterns, we use the degree-corrected hierarchical stochastic blockmodel. The method is applied on each layer individually and on a network with multiple events as layers. The entropy of blockmodels is taken as a measure of order. To obtain roles in the network, we describe each block using personal attributes. Finally, we uncover construction mechanisms at the micro level with a pattern mining approach. At this point, results exist for CSSWS only. We find that the interaction networks for individual events are more ordered on the second day than on the first day. Blockmodels are more similar to themselves at the second hierarchical level on the second day than on the first day (i.e., a positional pattern is emerging). Based on this finding and to obtain hierarchical partitions for the whole conference, we fit a model using all events from the second day. Our results reveal that regularities are stable throughout the second day. Yet, the layers are informative, judged by comparison to a model where the layer configuration is obtained randomly. The emergent pattern is more clear for the conference breaks, during which much of the interaction takes place, than for the talks. We propose that blockmodeling is performed by the attendees at conferences to find control in an often novel environment. Initiating a scientific collaboration may be such a control project. Other than in our models, however, attendees do not process the full information that we do. As a second-order observation, blockmodeling is an example of endogenous coarse-graining, a general principle how complex systems (e.g., macaque societies or deep neural networks) self-organize into an ordered state by a two-step process of information accumulation and aggregation. In our context, the first phase consists of persons screening a conference for topics they are interested in and for roles they may take in collective interaction. The aggregation phase

consists of the emergence of groups of persons with similar positions in relation to other groups. It is this continuous adaptive process of the emergence of order and downward causation that we observe in this study.

The Relationship Between Global Network Measures and the Robustness of Centrality Measures

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Measurement errors are omnipresent in network data. In recent years, several studies have investigated the effects of these errors on network analysis methods, especially on centrality measures. The robustness is a concept commonly used to measure the reliability of centrality measures. We define it as the expected correlation between the centrality values in the clean and the erroneous network. It has been observed that the robustness depends particularly on the network structure, the centrality measure, and the type of error. Previous findings regarding the influence of network size on robustness are, however, inconclusive. It is unclear to what extent measurement errors in large networks pose a problem for the application of centrality measures. We prove for Erdős-Rényi networks that the robustness is independent of the size of the network as long as the average degree remains constant. We show that for an arbitrary network size, there exist robust and non-robust networks w.r.t. centrality measures. Based on a random sample of twenty-four real-world networks, we investigate the relationship between global network measures, especially network size and average degree, and the robustness of the degree, eigenvector centrality, and PageRank. We demonstrate that, in the vast majority of cases, networks with higher average degree are more robust if nodes or edges are missing. In contrast, for spurious edges, there is no clear pattern recognizable. In the second part of our study, we employ multiple random graph models to specifically analyze the influence of the average degree on the robustness. We observe, for example, that the robustness of Erdős-Rényi networks decreases with an increasing average degree, whereas with Barabási-Albert networks the opposite effect occurs: with an increasing average degree, the robustness also increases.

Global Games on Social Networks

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We look at how information sharing over a network influence outcomes of games on incomplete information. First, the conditions for existence and uniqueness of equilibrium are proposed. Later, comparative statics of equilibrium strategy in the game are analysed. Our results indicate that introduction of network and information sharing imposes stricter conditions for uniqueness of equilibrium. Player's incentives to expand her neighbourhood differ depending on player's beliefs and network topology. In extreme cases players may prefer to not establish any connections in the network to maximise their utility.

Challenges and opportunities for studying evolving stakeholder networks (Session C9)

Chairs: Örjan Bodin, Manuel Fischer, Lorien Jasny, Christina Prell, Christian Steglich

Social Capital Theory as a Framework for Stakeholder Connectivity Within an eHealth Innovation Ecosystem: a Case Study of the EPIC Project

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Innovation ecosystems can be described as inter-organizational, political, economic, environmental, and technological systems of innovation that are conducive to business growth. eHealth or digital health is the use of apps, websites, internet of things, robotics etc. in health and care. Numerous cities and regions around the world are trying to establish eHealth ecosystems where stakeholders on the demand side (clinicians, patients, carers etc.) can work with providers (SMEs, digital companies, services etc.) and education and research to provide innovation ecosystems in eHealth (Figure 1.). These eHealth ecosystems can be thought of as networks, where interconnected actors work together in order to fund, develop, usability test, evaluate or adopt health technologies. EPIC (eHealth Productivity and Innovation in Cornwall and the Isles of Scilly (CloS)) is a European Regional Development Fund project that is developing one such eHealth innovation ecosystem. Based on a number of scholarly interpretations, social capital can be understood as a “metaphor about advantage in which social structure is a kind of capital that can create, for certain individuals or groups, a competitive advantage in pursuing their ends” (Burt 2017: 31). From a social capital perspective, societies can be viewed as a market in which people exchange all variety of goods and ideas in pursuit of their interests. The social capital metaphor postulates that better connected actors enjoy higher “returns”, however disagreements exist between social capital scholars when determining how and when actors are considered better connected. From a network’s perspective, two historically conflicting theories underpin one’s ability to achieve increased social capital, the structural holes argument (Burt: 1992) and the closure argument (Coleman, 1988, 1990). Despite these two previously distinct theories of social theory within network research, Burt recently suggests (2017: 52) that based on the latest empirical evidence “structural holes and network closure can be brought together in a productive way”. Although the mechanisms remain distinct and the empirical evidence supports the hole argument over closure, Burt comments “while brokerage across structural holes is the source of added value, closure can be critical to realizing the value buried in the structural holes”. Based on Burt’s (2017) developments in social capital theory, this paper will discuss our approach to increasing the capacity, capability and productivity of the ecosystem. Firstly we will outline our methods of longitudinally mapping connectivity within the ecosystem using an online network survey, alongside our approach to facilitating targeted and monitored networking activities between relevant stakeholders. Secondly, we will discuss our attempts to increase network closure within pre-established groups, whilst maintaining structural holes throughout the network to prevent increasing tie redundancy. Finally, we will discuss

the challenges we faced in mapping the development of the ecosystem and will highlight the benefits and limitations of the social capital approach we have adopted in order to develop a vibrant, productive and sustainable eHealth ecosystem.

To What Extent New Auction Systems and Political Ties Increase Competition in Public Procurement? New Evidence from Emerging Markets in Ukraine

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In this paper, we ask as what is the effect of the new procurement system on competition in the Ukrainian markets, and who are the new emerging actors that benefit from this new system? A new system of public procurement auctions called ProZorro was installed in Ukraine in 2015. We look at two markers – pharma and gas and use the novel ProZorro data to evaluate the number of suppliers and the degree of competition among them in 2015-2018. The analysis shows that the market structure has changed. The number of suppliers increased and on average they began to supply to more buyers. Furthermore, the density of the markets has decreased. The density is a measure that shows a proportion of all observed connections in a graph to all possible connections. In our case, connections represent auctions. Suppliers were connected to a contractor by participating in an auction. Some suppliers participated in many auctions and some in a few. Sometimes, different suppliers systematically participated in the same auctions, and sometimes they were isolated from each other and their paths never crossed. In our case, lower density could mean that the markets have become more structured. The number of ties increased, but these ties are established between certain suppliers and contractors. There are fewer and fewer small stars on the periphery of the graphs. Instead, over time there are more suppliers that connect to certain buyers in a clustering matter. This suggests that certain market niches become more structured. All in all, the ProZorro procurement data for the gas and pharmacy market show that the number of suppliers increased between 2015 and 2018, that the number of their auction participation increased as well, and that the market overall became more structured. These metrics are indicative of competitive markets. In the final part of the paper, we present new actors that entered the stage after the new reform was installed and compare them with the old actors. We test whether their connection to political elites (through ownership) plays any role in their economics access.

Messing with the Boundaries: the Challenges of Defining and Studying a Participatory Stakeholder Network

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Studying participatory stakeholder networks poses some unique challenges to the network analyst. By participation, we mean not only that stakeholders are active in the network, but also that these stakeholders help shape the goals and activities that determine the very network in question. Such participation can lead to meaningful insights into complex environmental (or other) problems, but it can also result in shifts to the size and composition of the network overtime, making network boundary specification difficult. As new topics emerge via participatory dialogue, new stakeholders are identified and invited, and other stakeholders may decide to leave. In this paper, we consider these challenges to boundary specification, and to the analysis of the evolving stakeholder network, in the context of an ongoing, participatory research project situated on the Deal Island Peninsula, in the Chesapeake Bay, near Washington, D.C., USA. We demonstrate how, over the course of 3 years, the stakeholders' participation and dialogue shifted the network boundary in question; we also discuss our decisions in defining the network boundary; we discuss some of the analytical challenges we face studying this network (e.g. model specification and convergence); and present some initial findings.

Social Influence (Sessions D7, D8)

Chairs: James Hollway, Nynke Niezink, Tom Snijders, Christian Steglich, Andras Vörös

Modelling Individual Differences in Network Evolution

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We consider heterogeneities in selection and influence processes within networks. Assuming a stochastic actor-oriented model for network dynamics, we explore the potential for latent variables to capture differences in the sensitivity to peer effects – is there a class of individuals that are susceptible to network and peer effects and is there a class of individuals that are impervious to social pressures? Latent classes may reflect structural positions that manifest themselves in near group-like structures. We propose a latent-variable, stochastic actor-oriented model for network dynamics, and a Bayesian inference scheme for simultaneously inferring network dynamics and network position.

Is Depression Actually, Really Contagious? A Confident Answer to a Related Question

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Whether depressive symptoms are socially contagious has far reaching consequences for the treatment of affected individuals, health policies and our understanding of the psychosocial dimension of mental health. Consequently, scientific studies from multiple fields have attempted to understand contagion of depression using various paradigms and methods. Using a promising social network approach, the coevolution of friendship networks and depressive symptoms has been modelled multiple times using panel data and (usually) SOAMs (Siena Models). However, this approach has some shortcomings. First, the theoretical mechanisms assumed to underlie the contagion of depression is assumed to work on the level of mood contagion in day-to-day interactions, for example through co-rumination. Analysing panel data of (vaguely defined) friendship networks in which waves are up to one year apart is in the relation under analysis as well as in the time-frame far removed from the assumed mechanism. Second, analysing contagion or other types of social influence using observational data comes – as is widely known – with multiple, serious challenges. Even when using the most advanced statistical modelling techniques (Siena Models), researchers need to make the assumptions that they have included all relevant individual-level characteristics in the model and that there are no unobserved heterogeneous environmental effects that affect both, selection and influence processes, which includes other individuals that are not surveyed (the network boundary problem). We overcome these problems with an innovative research design. Two independent groups of adolescents (a youth choir and a youth orchestra) that were on extended concert trips away from home were surveyed daily about their interaction partners and their mood this day. As the participants were on a group trip together, they were (mostly) subject to identical environmental influences during the trip that are modelled using daily fixed effects. As they were in a foreign country, interaction with individuals not surveyed are very limited. The daily survey, as well as the focus particularly on interaction and mood brings us close to modelling the assumed mechanisms. Thus, we are confident to credibly model mood contagion in the population under analysis. We find that mood is socially contagious and that influence on negative moods is more pronounced than influence on positive moods. Furthermore, mood homophily plays no role in structuring interactions between individuals.

Cooperation and School Success: Network Dynamics and Micro-Macro Links

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Life chances, success and educational careers are not equally distributed in the population. They depend to a large degree on cognitive ability, economic resources and parents' characteristics. Additionally, such dynamics are also subject to macro-level factors, such as teacher characteristics, class size, social norms and the climate in the classroom. Recent research suggests that prosocial values and cooperative behaviour is also very important for school success. However, cooperativeness is very much affected by the social context. If someone is surrounded by uncooperative others, it is much less likely that they will behave in a cooperative way in comparison to if they were in a highly prosocial environment. In this project, we ask whether the social embeddedness of cooperative behaviour can lead to a social norm in the classroom. In particular, we investigate whether kids in cooperative classes achieve higher school grades in comparison to those in uncooperative classrooms. Studying three levels of interdependent characteristics, the individual, the peer, and the classroom level, is methodologically challenging. With the recent development of multi-level social network models (hierarchical stochastic actor-oriented models, SAOMs), these dynamics as well as their interdependencies can be analysed in one, unified model, taking a holistic approach that fits the theory. We use this framework to analyse large-scale Swiss social network data from the recent Values in School-Project. In total, we include 1,258 individuals in 57 high school classes in seven schools in our analysis. We measure cooperativeness through a series of monetarily incentivized dictator games that were part of two waves of the survey.

Mental Health in Friendship Networks: Symptom-Specific Selection and Influence

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How mental health and social ties affect one another has been the focus of numerous studies. These studies, however, mostly use aggregated indicators of mental health (e.g., the sum of a depression scale). We argue that this aggregation is too reductive and might bias the detection of social selection and influence processes. Instead, one should investigate how specific symptoms (e.g., sad mood) are subject to social selection and influence processes. An analysis on the symptom level allows, for instance, to make statements on within-symptom influence (e.g., does the sad mood of my friend affect my sad mood) and between-symptom influence (e.g., does the stress of my friend affect my sad mood). Hence, in this study, we investigate symptom-specific social selection and influence processes in friendship networks. For this, we use the Swiss StudentLife dataset, in which individual of an emerging student community reported friendship ties and indicators of mental health six times during the first year of their studies. The co-evolution of social ties and specific mental health symptoms is modeled within the framework of stochastic actor-oriented models for one-mode (friendship) and two-mode networks (symptom reports). In this analysis, we show how particular symptoms affect selection and influence processes within friendship networks. This study emphasizes that theoretical and empirical considerations of symptom-specific analyses of social network processes can shed new light on the social nature of mental health.

The Dynamic of Gossip: an Empirical Study How Interpersonal Communication About Others Changes Opinion-Based Support

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Understanding cooperation between people is one of the most important problem that have been investigated by a broad range of disciplines. Among many explanatory mechanisms, specific attention is paid to gossip as a solution for cooperation dilemmas. However, it is difficult to understand how it functions. Several rival explanations exist on what intermediate mechanisms lead to its final effect on social cooperation. The most widely explored function of gossip is the indirect reciprocal information sharing about potential cooperation partners or the punishment of targets. Besides transmitting reputational information on a third party, gossip can facilitate social bonding with receivers as well. The study investigates the question of how gossip within an organization affect opinion shifts and the extent of support between colleagues. Among less-experienced volunteers there is a strong emphasis on seeking help from colleagues. Therefore, we collected network data from 32 volunteers twice a day during the largest pop festival in Hungary. Daily questions involved both professional and interpersonal conversations among volunteers as well as help requests and gossip. Altogether, we collected 25 waves of data. Based on our results help requests are closely linked to professional circles. Furthermore, estimating a Dynamic Network Actor Model (DyNAM) we have found that a personal conversation about a third-party further facilitates help requests. The fact that people are more likely to ask for help from their gossip partner can be an empirical evidence of the social bonding function of gossip. However, gossip may have a negative effect as well. It was also shown that individuals tend to change their opinion in a negative direction about those who they think shared negative gossip about them.

Board Processes, Director Selection and Risk-Taking Behaviour of Firms

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Extant literature shows board of directors as internal control mechanism of corporate governance and responsible for determining the appropriate levels of exposure to risk for a firm. To this end, risk-taking and governance focus on three different attributes. The first set of attributes relates to selection of directors (using characteristics like gender, experience and compensation) and its impact on the risk-behaviour of firms. The second set of characteristics is the board structure that looks at board size, composition, presence of audit committees to understand risk-taking behaviour of firms. The third set of attributes looks at behavioural dynamics and board processes to capture relationships between executive-non-executive directors, board meeting effectiveness and director busyness. The literature on risk-taking behaviour of firms have two key limitations. First, while each of the three sets of attributes helps understand the risk-taking behaviour of firms, they do not conclusively explain the firms' risk-taking. Risk-taking is a function of complex relationships between board structure, director characteristics and board processes that takes into account the subtle behavioural dynamics between the directors that develop over time. Another key limitation of studies in the risk-taking scholarship is that they look at firms as isolated units not considering the embeddedness of the firms in inter-organisational relationships. To overcome these two limitations, this paper uses the Italian interlocking directorate network from 2007-2016 and looks at these three contributory elements of board effectiveness as a conceptual framework comprising director characteristics, board characteristics and firm characteristics to understand the behavioural and network dynamics of director selection and the impact on the risk-behaviour of firms. More specifically, this research seeks to (a) ascertain the board processes and structures before and after the financial crisis of 2008/09 (b) ascertain how these processes and structures have changed after the introduction of the Italian interlocking ban 2012 (c) examine the board decision-making in relation to risk behaviour. This study contributes to understanding the relationship between corporate governance and risk-taking behaviour of firms embedded in interorganisational networks as exercised through the processes, structure and behaviour of boards of directors. It contributes to showing a causal relationship between director selection and how this explains the risk-taking decisions of firms by clearly distinguishing the sociological processes of selection and influence using a two-mode network of directors and firms. Using the Stochastic Actor Oriented Methodology (SAOM) the findings show that while formal structures of the board explain risk-taking to a certain extent, the risk-taking behaviour of firms are more complex and influenced by subtle factors of network dynamics and pervasive network structures in which firms are embedded. Consequently, at the board level, risk management is, to

a great extent, a sociological process, as opposed to being a procedural factor that is idiosyncratic and is characterised by constructive interactions and relationships between board members.

Health Behaviour Networks (Sessions F7, F8, F9)

Chairs: Thomas Friemel, Sarah Geber

Evaluating Social Contact Patterns of Children for Infectious Disease Transmission in Rural and Urban Kenya Using a Personal Network Approach

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[No Abstract]

The Influence of the Venue-Based Network to the Anogenital Human Papillomavirus Infection in Men Who Have Sex with Men: an Application of Temporal Network Autocorrelation Model

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Background and Aims The role of social network among men who have sex with men (MSM) in association with sexually transmitted infections has received increasing attention, yet little is known regarding human papillomavirus (HPV) infection. We investigated anogenital HPV infection in association with connections formed from going to same sex-seeking venues in a community cohort of MSM. **Methods** A total of 253 adult MSM were recruited from Southern Taiwan in 2015-2016 and 182, 159 and 108 participants were followed at the 6th, 12th and 24th month after baselines, respectively. At every visit, participants were screened for HPV infection to identify 37 genotypes. In each follow-up survey, each man completed a self-reported questionnaire including an egocentric social network assessment and reported where they visited to meet potential sexual partners in the past 6 months from a list of popular socialization venues. Those who reported to go to the same venue for sex-seeking were regarded to be potentially linked. We generated a venue-based network linking participants by these connections for each of the follow-up wave. Temporal network autocorrelation models (TNAM) were used to address network dependencies between observations. Network centrality measures (e.g. degree, betweenness, eigenvector) were tested for the association with HPV infection. **Results** There were 33.05%, 29.66% and 33.90% participants tested positive at anal sites and 23.89%, 17.12% and 23.08% at penile sites in the 3 follow-up visits. TNAM results show that both of degree centrality (estimate of coefficient=0.0694, 95% confident interval=0.0214, 0.1237) and eigenvector centrality (estimate of coefficient=8.3695, 95% confident interval=2.8697, 15.0878) were significantly associated with penile HPV infection in our sample, but betweenness centrality was not. There was no centrality significantly associated with anal HPV infection in our sample. **Conclusions** HPV detection at the penile site was associated with a higher number of members an individual share the same sex-seeking venues with, or with having connections with those who have more ties in the network. The potential mechanism might be that the central and influential group who go to popular venues for sex act as key roles in the network and thus possibly facilitates the transmission of penile HPV infection. Venue-based social connection plays a role in MSM's penile HPV infection. Identifying one's sex-seeking venue may be important in the interventions.

Alcohol Consumption in University: Social Influence and Its Perception

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Background: Psychological theories emphasize the role of social norms in the prediction of health behaviours. However, they typically take only perceived norms rather than actual group behaviour into account. This study explores the extent to which such norm perceptions and other cognitive constructs can explain the social influence of friends on alcohol consumption within a social network. Methods: At three time points across three months, 109 psychology freshmen indicated their perceived norms, attitudes, self-efficacy, and intentions with regard to alcohol consumption as well as their actual drinking behaviour. In addition, they nominated friends among their fellow freshmen. RSiena longitudinal models were applied to explore both social influence and friend selection processes of self-reported drinking behaviour. Findings: The average alcohol consumption reported by friends influenced the individual alcohol consumption in the following month ($b = 1.89$, $OR = 6.64$, $95\%CI [1.28; 34.50]$, $p = .022$) even controlling for effects of cognitive variables such as perceptions of friends' behaviour. Contrary to social influence, the selection of friends itself was not influenced by individual alcohol consumption (all $ps \geq .279$). Discussion: Social influence of college peers on alcohol consumption cannot be fully explained by perceptions of social norms and other cognitions. Rather, the behaviour of friends within a network additionally needs to be taken into account.

Social Network and Mental Health: the Relationship Between an On-line Social Ego-Network Structure and Antidepressant Use in Hungarian Small Settlements

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Among many factors that influence an individual's mental health, the social environment often plays a proximal or distal role in the onset and trajectory of a mental disorder and on available treatment options. This social environment can be partially captured by social network methods. In the last two decades, a small but growing body of research has tried to make a connection between properties of an individual's ego-network structure and different measures related directly or indirectly with one's mental health. The findings converge to the conclusion that rather modest association exist between the two. Importantly, there is no conclusive theory or research about the direct causality and the direction of influence between the two. It is plausible to assume that many confounding factors exist in the correlation between network structure and mental health and that the relationship is bidirectional with a feedback loop. However, understanding mechanisms behind the association – however small – could have implications for interventions and the identification of vulnerable individuals. To foster the development of more refined models of the "social network – mental health" relationship we present a research which is not constrained by typical limitations: we use not self-reported data on both network (based on contacts in the iWiW online social network site from 2004 to 2013) and mental health (a national register of antidepressant users in 2012) of a big sample of individuals (N=585528, residents of settlements with less than 20000 people, Hungary), paired by a matching procedure. Research questions pertaining to the relationship between several network properties and the probability of the antidepressant prescription as a proxy of having clinically significant manifestations of depression and anxiety related symptoms. Specifically, we look at the probability of antidepressant use as a function of the number of contacts, clustering, the ratio of ties outside the town, the ratio of ties with distance bigger than 100 km, and ego-network gender composition. Additionally, we explore these relationships for different gender and age groups. We found that all investigated network measures, except the number of ties, show an association with the antidepressant use. Some of the network metrics (clustering) show the relationship that is not in line with simple and general hypotheses currently existing in the field that are, we propose, based on implicit assumptions about the type of network data. The relationship found is non-linear and seems to be driven mostly by the subsample of female users over 40 years old. Other network metrics are related to the antidepressant prescription in a way that would be most expected by current knowledge and theory in the field, but also offer some new insights. We reflect on these findings in the light of the limitation of our dataset (prescription bias, self-selection, confounding variables, effect sizes, the network effect of treatment

information), and present a regression model of antidepressant use. Finally, we propose how our findings can guide future research and help in building an agent-based model of the interplay between social networks and mental health.

Investigating Social Structures Beyond Friendship. the Role of Social Referents and Social Networking Sites Regarding Health Behavior Among Adolescents

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The understanding that behavior should not exclusively be explained with individual predispositions but as a consequence of interdependent individual and social dynamics is gaining ground. This is the case in research interested in explaining health behavior as well as in the context of intervention efforts that try to prevent or change undesirable health behavior. Those considerations are of particular importance with regard to adolescents. On the one hand undesirable health behaviors emerge at that age (e.g. tobacco or alcohol consumption), on the other hand is peer orientation at its peak in that period of life. Several studies using network analysis show that selection and influence processes in friendship networks help to better understand individual health behavior. Recent studies point out that adolescents that are respected and perceived as popular, so called social referents, can act as relevant role models and indicators of social norms. Studies following approaches like the theory of normative social behavior also indicate that the (often distorted) perception of the prevalence of behavior among different aggregates of peers can additionally explain behavior. Some studies could further show, that the extend of distortion depends on interpersonal communication or the content that is seen on social networking sites. In view of the advancing digitalization and the new level of visibility of friends and social referents it seems necessary to investigate those social structures beyond friendship networks, to better understand the social dynamics among adolescents and ultimately their health behavior. The presentation illustrates the relevance of social referents on a theoretical level, gives an overview of the state of research and discusses ways to include those actors in future studies using social network analysis. In order to account for online networks that increase visibility of private behavior of friends and social referents, it is necessary to identify relevant structures and health related content generation on social networking sites among adolescents. Therefore, a qualitative study was conducted. 12 high scholars and first year vocational scholars and 2 focus groups with 5 and 7 participants were interviewed. The focus lied on the adolescents' use of social networking sites, their connections to others, and the way health behaviors such as tobacco or alcohol consumption are present in the content posted and seen on different platforms. The results show that the most popular social networking sites among adolescents (Instagram and Snapchat) are used differently in respect to multiple aspects. Technical differences in the way connections between users are formed (reciprocal vs. unidirectional) and varying features (time dependent visibility or mutable reach of posts) lead to differences regarding social structures, patterns of media use and content that is shared. The latter is particularly the case for more private health behavior. The

presentation gives insights in types of social structures among adolescents on the most used social networking sites and addresses the role of social referents off- and online. Implications for future research interested in social dynamics among adolescents or the role social referents and their influence on individual health behavior are discussed.

Vaccinating Everybody? Simulating Transmission Processes of the Human Papillomavirus in Sexual Contact Networks and the Impact of Prevention Programs

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Research question and background In many countries vaccination programs against the carcinogenic human papillomavirus (HPV) target girls only. HPV infections are sexually transmitted and cause cervical cancer, one of the most prevalent cancers in women. Despite the fact that men transmit infections to women, men also increasingly suffer from other HPV-associated cancers. This study asks for the long-term impact of a vaccination program which includes boys as well as girls? In contrast to other simulation-based studies, this study explicitly controls for sexual contact networks of the population. The approach required methods for the construction of dynamic networks which were developed only recently and are not yet established in epidemiological simulation studies. Methods Dynamic networks were built on the foundation of Separable Temporal Exponential Random Graph Models. The simulation of these networks was informed by empirical and theoretical literature and includes the most important mechanisms for the formation of sexual ties, i.e., disassortative sex-matching, assortative age-matching and concurrency of ties. Thus, the simulated networks resemble sexual contact structures of empirical sexual networks. Within the networked environments a Susceptible-Infected-Recovered-Susceptible (SIRS) -transmission process was simulated for three scenarios: 1) in the base scenario nobody will be vaccinated; 2) only girls will be vaccinated and 3) girls and boys will be vaccinated. Each scenario was simulated 100 times over a period of 480 time steps (30 years). For simulation the R-package EpiModel was used. Findings The sexual behavior of only few individuals, i.e., those who have more than one sex partner at the same time, is the driving force behind the emergence of a giant component in the network where most virus transmission takes place. The analysis shows that the prevalence and incidence rates of HPV much higher in the giant component than outside of it. The girls-only vaccination program reduces the HPV-prevalence in the population from 13.5% in the base scenario to 4.7%. If boys are vaccinated in addition to girls the prevalence decreases to 0.9%. In some runs of the simulation of the third scenario virus transmission even disappears entirely. The girl only vaccination leads to an average decrease of 61.9% of incident infections as compared to the base scenario. The additional vaccination of boys decreases the average incident infections by 92.9% as compared to the base scenario. Interpretation These findings lead to the conclusion that an effective vaccination program must penetrate the giant component of a sexual contact network. This is the only way to prevent a high amount of incident infections. Because immunization programs target individuals early in life (before entering sexual activity) it is not possible to predict whether they are likely to be part of the giant component. Because only relatively few individuals

are part of the giant component, a sufficiently large proportion of the population has to be immunized to prevent virus transmission cascades in it. The study indicates that a vaccination program which includes boys appears as an appropriate means to that end.

Mental Health in Adolescent Social Context: Using Social Network Analysis to Examine Patterns in Mental Wellbeing

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Background: Developmental research demonstrates that peer acceptance and friendship quality contribute to positive mental health in adolescents. Less attention has been given to the impact of poor mental health, or disordered mental health, on adolescent social relationships. Given that adolescents with diagnosable mental health disorders represent an especially vulnerable population, this study seeks to explicitly measure the extent to which mental health disorders are associated with patterns of friendship during adolescence. **Sample:** Cross-sectional social network and mental health data from adolescents within four high schools from the Peers and Levels of Stress Study (PaLS) in the United Kingdom is used (N 602). **Methods:** Mental health diagnoses are measured with a self-administered computerized version of the Diagnostic Interview Schedule for Children. Social network data are collected on grade-level friendships. Exponential random graph models are used to investigate the extent to which clinical mental health is related to patterns of social connections in adolescents. In particular, the study focuses on patterns of social isolation, and clustering of poor mental health within specific groups of adolescent peers. Network analysis using qgraph is also used to identify clusters of mental health disorders within the sample. **Implications:** In order to support adolescents with disordered mental health, it is critically important to uncover the social ramifications they may experience within a school setting. As such, the present study highlights the complex relationship between disordered mental health and adolescent social structure, thus informing the design of intervention efforts aimed at improving mental health.

Explaining the Normalization of a New Theory in the Complex Network of Organizations That Deal with Public Health in Scotland

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The nature of large organisations that deal with public health is, by definition, complex. It entails the collaboration of people belonging to very different professional sectors, to address very heterogeneous social problems. As science and understanding of human behavior evolve, new theories are introduced to explain more significant portions of reality and the causation and correlation of events. Large systems of organizations, such as the ones dealing with public health, are strongly challenged by the introduction of innovation, and the process of normalization of new theoretical and practical solutions is sometimes hard and definitely complex. A large body of literature explains how innovations normalize from a theoretical perspective, but few works tap into how this process happens at the level of the individuals involved in the networks and the relationships between them. This study focuses on the introduction of system thinking and complexity methods as a new approach to work in public health in Scotland and analyses whether and how stakeholders shift to a new state of mind normalizing the approach in order to implement it. Facing the impossibility of mapping out the complex social network of practitioners that operates with public health in Scotland at this stage, we decided to approach the problem from a different angle. We collect relevant information concerning how scholars and stakeholders approach and conceive complexity and complex system science in order to make an accurate evaluation for the introduction of these approaches in public health organisations. 20 participants were selected with a snowball sampling, which is appropriate for this study since normalization does not concern a random population, but a community of practitioners that are dealing with a particular issue in their working life, such as the population we are analyzing. The research design consists of three moments. First, collecting data through semi-structured interviews asking questions based on Normalization Process Theory. Second, a workshop where each respondent is invited to participate and work together. Third, distributing the same questionnaire again to the participants. Data collection at the moment two and three is expressed in 11 point Likert scales that are coded as n-partite networks that connect each respondent with their complete set of preferences. By projecting the individual networks and weighting them, we obtain an aggregate network that depicts the relational nature of a set of answers tapping into the same latent construct. We compare networks of preferences before and after the workshop and employ the concept of phase transition on the individual and on the aggregate scale to observe whether the new theoretical principles normalized in the observed population of stakeholders. This study offers new theoretical and methodological contributions on the understanding of complex network and the diffusion of innovation, making use of a computational approach. It also conceptualizes normalization theory in

a novel and empirical way by distinguishing from the individual and the aggregate level, in this way providing evidence on how organizations are shaped and shape themselves according to theoretical tenets and their diffusion among the actors that compose them.

Chronic Pain Communication in Elders' Social Networks

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In Europe, ageing is a major demographic fact. It commits contemporary society to finding sustainable solutions to manage the increasing care needs of elderly people with chronic pain. Faced with this situation, public authorities promote ageing in place policies, partly for economic reasons. In this context, a better understanding of elders' modes of sociability and, in particular, of their social networks could contribute to the "better being" of a vulnerable – and often silenced – population. Aims of the Study Drawing on health communication research, the aim of our study is threefold: (1) Is pain a topic within elders' communicative networks? When, how and why? (2) What are the health care system's answers to the detected gaps and needs? (3) What new institutional and educational strategies could we suggest? Research Methodology Our study addresses these issues in three steps. We are currently conducting interviews with 50 elders (more than 75 years old) with chronic pain, and are carrying out a network as well as a content analysis in order to map the elders' personal network and to identify their communication needs. Then, we intend to organize focus groups with different stakeholders (elders, relative caregivers, health professionals, decision-makers), to bring out potential clinical and institutional interventions. Finally, we plan to draw out recommendations for public and institutional policies as well as community and family support. Preliminary Results Elders' social networks include between 6 and more than 30 persons of importance. So far, the analysis has shown that the most important persons in the network usually are the next of kin and that networks feature a specialization of relationships (importance of close relatives for daily needs versus importance of friends of the same age for social companionship). In addition, our study has pinpointed several barriers and facilitators to chronic pain communication. The main obstacles are the negative evaluations surrounding troubles talk, such as the fear of threatening social relationships (boredom, annoyance). Nevertheless, particular social occasions, involving particular types of social networks, facilitate the communication of chronic pain: for instance, when somebody is catching up on the person's news (troubles talk is here a reactive rather than an initiative action), when the person is chatting with friends or acquaintances of the same age (troubles talk is here relating to life experience and social identity), and when the person sees a doctor or another health professional (troubles talk is here an expected communicative task to carry out).

The Structure of Normative Perceptions: How Young Drivers' Egocentric Friend Networks Form Normative Perceptions About Drinking and Driving

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People orient towards social norms to ensure that they act efficiently and that their actions are socially approved. But how do people know what is normative in their reference groups; how are normative perceptions acquired? The present study seeks to contribute to the understanding of normative perception formation in egocentric networks. For this purpose, it turns to young drivers' friend networks and their normative relevance regarding drinking & driving. More concretely, the study examines the impact of the friends' drinking & driving behavior on young drivers' perceived descriptive (i.e., perceived prevalence) and injunctive drinking & driving norms (i.e., perceived social approval). It furthermore explores relationship mechanisms that moderate the friends' norm-signaling impact by considering similarity and tie mechanisms. The underlying idea is that similarity between the young drivers and their friends in sociodemographics (age, gender, education) and with regard to drinking & driving (behavior, attitude) as well as the strength (duration, intimacy, frequency) and the quality (advisor nomination) of the driver-friend tie enforce the friends' norm-signaling impact. The young drivers' egocentric friend networks were assessed stepwise. First, a representative sample of N 311 young German drivers in possession of a drivers' license and aged 18 to 24 was drawn (i.e., egos). Second, every ego nominated three friends (i.e., alters). Egos and alters were interviewed in face-to-face interviews. For the present analysis, egos' and alters' self-reports on their drinking & driving behavior as well as egos' perceived descriptive and injunctive norms about drinking & driving among their friends were used. Similarity measurements were created as binary (i.e., same/not same) or as metric measurements (i.e., the amount of the difference between ego and alter; the higher the value, the less similar). Tie variables are based on egos' information about their ties. Structural equation modeling was used to model paths from alters' drinking & driving behavior to egos' descriptive and injunctive normative perceptions. As the three alters are undistinguishable (they are all friends), all paths from alters' drinking & driving behavior were set equal. To test the idea of relationship mechanisms as moderators, interaction terms were integrated into the model. The results reveal that alters' drinking & driving behavior influences ego's perceived descriptive and injunctive norms. The more frequently their three friends engage in drinking & driving, the more the young drivers believe that drinking & driving is prevalent and socially approved among their friends. The results additionally point to some relationship mechanisms that moderate the alters' norm-signaling impact: The more similar the friends and the young drivers are regarding their engagement in drinking & driving and their drinking & driving attitudes, the stronger the friends' impact on young drivers' normative perceptions.

Comparably, the social recognition of a friend as advisor strengthens the friend's impact on social approval perceptions. The presentation will elaborate on the results' meaning as well as their theoretical and practical implications for health communication. Moreover, it will discuss the present analysis strategy as an approach to normative social influences in egocentric friend networks of health behavior.

The Network of Local Coordinators in the Implementation of a Community Program to Prevent Drug Abuse

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The implementation of programs can be analyzed through (a) collaborative networks between the facilitators of the intervention, (b) networks for the exchange of information and support among the participants in the program, or (c) collaborative networks of community coalitions and stakeholders. In this study, we describe the implementation of the "Cities against Drugs" program, analyzing the networks of local coordinators in 45 cities in which the program is applied in the province of Seville. The results show a core-periphery structure, clearly influenced by geographical location. On the one hand, around the capital and its metropolitan area, there is a nucleus of local coordinators densely connected to each other, with extensive experience in the application of the program and who have a prominent role in the dissemination of models and intervention guidelines. On the other hand, in the most peripheral regions, conglomerates of local coordinators are formed close to each other. In that case are linked to the core of the network through intermediaries that exercise the role of "connectors". This structure of the network reflects the tension between the central coordination of the program and the adaptation to the peculiarities of each local context. Coordination is relevant to ensure a homogeneous application of the program, while community adjustment allows to be sensitive to the diversity of the contexts receiving the intervention. In the discussion of the results, we reflect on the contributions of network analysis in the study of the implementation of psychosocial programs. The interactions that occur between the participants or between the facilitators of a program can have a decisive role in the effectiveness of the intervention.

Intergroup Relations in Social Networks (Sessions G8, G9)

Chairs: David Kretschmer, Hanno Kruse, Lars Leszczensky, Sebastian Pink, Tobias Stark

Holding Micro-Level Network Mechanisms Accountable for Observed Macro-Level Group Segregation. the Case of Language-Delineated Student Groups in Bilingual Education

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Language barriers are an important complicator of social interaction, and can become a strong determinant of friendship group boundaries. Because a migration background tends to coincide with a mother tongue different from the host country's, migrant integration usually starts with a language course. In the school context, the more systematic approach of bilingual education has been championed as a less assimilationist, more transcultural approach to integration, which puts both language groups on equal footing in two-way immersion education, instead of demanding a language-learning investment only from one group. To what degree are such programmes successful? What are the network mechanisms contributing to this success? And how much does each mechanism contribute? In our study, we analyse longitudinal friendship data obtained from a group of bilingual schools in Berlin/Germany (Möller et al., 2017) to find answers to these questions. In the literature on friendship networks, various network mechanisms have been held accountable for observed segregation levels. The three most commonly acknowledged ones are homophily (selectively being friends with the own group), sociality (dominance of one group, withdrawal of the other), and the moderating effect of triad closure ('friends of friends being friends') which acts as an amplifier of homophily (Goodreau, Kitts & Morris, 2009). In our study, we want to investigate these and other mechanisms not only in terms of how strong the evidence for them is in a data set, but also in terms of how much of observed segregation can be allocated to their operation. For this aim, we use stochastic actor-based models for network change (Snijders, 2005) to first calibrate a mechanism-rich model to empirical data, and then modify it in counterfactual scenarios (Snijders & Steglich, 2015), and generate distributions of model-predicted segregation levels under each scenario. By systematic comparison of these scenarios, we can quantify the different mechanisms' contributions to the particular segregation measure under study.

Gender Differences in Religious Segregation of Adolescents' Friendship Networks

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Adolescents' friendship networks are segregated by religious background, with particularly high levels of segregation between Muslim and non-Muslim youth in Western immigrant societies. In this study, we investigate whether there are gender differences in religious segregation in the German context, and, if so, how they can be explained. Building on general accounts of how gender structures friendship formation, we expect that in all religious groups, religious segregation is higher among girls than among boys. Given that friendships among girls tend to be characterized by close direct interaction in small groups, we expect that a fit in terms of friends' background characteristics—such as religious affiliation—is particularly important for girls. At the same time, we expect variation by religious affiliation: Given that Muslim girls are likely to be most strongly exposed to religious norms that restrict intergroup relations, we expect particularly high levels of religious segregation among Muslim girls as well as strong gender differences among Muslims. We use sociometric data from the first two waves of the German part of the Children of Immigrants Longitudinal Survey in Four European Countries to investigate these expectations. Our analyses rely on multilevel stochastic actor-oriented models for network evolution on the basis of 149 German classroom networks. Among Muslim adolescents, we indeed find strong gender differences. Religious segregation is high among Muslim girls, but weak among Muslim boys. Follow-up analyses indicate that religious segregation among Muslim girls strongly varies according to Muslim girls' religiosity, with particularly high levels of segregation among highly religious girls. We therefore conclude that a substantial part of Muslim girls' religious segregation originates from the segregation of highly religious Muslim girls, potentially due to norms on intergroup relations associated with high religiosity. At the same time, we also find some indication that highly religious Muslim girls tend to be avoided by non-Muslim girls, which may further strengthen the religious segregation of Muslim girls. Among non-Muslim adolescents, we find religious segregation among both genders and, contrary to our expectations, some indication of stronger religious segregation among boys. Follow-up analyses reveal that this pattern results from a general aversion against Muslim boys among non-Muslim adolescents of both genders, while there is no comparable aversion against Muslim girls. Among non-Muslim girls, this aversion turns out to be particularly strong for highly religious Muslim boys, while we observe no variation according to religiosity among non-Muslim boys. In summary, our results indicate high levels of religious segregation particularly among Muslim girls, which seem to be at least partially driven by the self-segregation of highly religious Muslim girls. Muslim boys, on the other hand, hardly self-segregate but are largely avoided by non-Muslim adolescents, a tendency that cannot be fully explained

by Muslim boys' high religiosity. We conclude by elaborating on potential explanations for the aversion against Muslim boys and discuss implications of the observed patterns of segregation for social integration in the long term.

Are High Performing Roma Pupils Considered as “Acting White” in Hungarian Schools?

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Peer influence might create a challenging problem in integrated schools, where opportunities for interethnic friendship ties are enhanced, but friendship networks still remain to a large extent segregated. The “Acting White” hypothesis suggests that ethnic inequalities are maintained partly because students from a lower status group reject their fellow peers who achieve academic success; as this behaviour is perceived to be characteristic of “white” (or high-status group) students. A different strategy for educationally successful minority students has also been proposed: high-achieving minority students may develop a strategy to become “raceless” to pursue academic success. A growing body of empirical tests of the hypothesis has produced mixed evidence. Previous research, however, if considered social ties at all, concerned primarily about popularity and the maintenance of friendship relations. Another possible way of rejection is the complete denial of in-group membership of high performers. This study is the first that investigates the phenomenon of “Acting White” both in terms of maintaining friendship ties and in terms of ethnic perceptions. In addition, we also investigate whether friendship ties could pull back the academic achievement of ethnic minority group members. We examine these interrelated questions of academic achievement, friendship ties, ethnic identification, and ethnic perceptions in primary schools in Hungary; in a sample of classrooms with a large variance in their ethnic composition. We examine the co-evolution of academic achievement measured by grade point averages (GPA), friendship, ethnic identification, and Roma perception networks with multilevel stochastic actor-oriented models using longitudinal data gathered by the MTA TK “Lendület” Research Center for Educational and Network Studies (RECENS). Preliminary results suggest that in contrast to the prediction of the “Acting White” hypothesis, high achieving Roma students might be well accepted among their Roma peers in terms of friendship relations. Furthermore, high-achieving Roma students are not likely to change their ethnic identification. Roma students are not likely to change their academic achievement if they become less popular among their Roma peers or if they become less perceived as Roma.

Making Visible the Consolidation of Scientific Fields Using Inter- and Intragroup Relations

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At what point in its evolution can an emerging scientific field be considered fully consolidated? This question and related issues of field development are notoriously difficult for science studies to answer, even though the tradition of studying emerging topics reaches back decades. Our approach tackles this problem by investigating more closely the inter- and intragroup relations in networks. By applying the methods of social network analysis onto the field itself we explore the possibilities of different network indicators for the study of scientific field formation. Intergroup relations are of special significance in this regard, because showing when distinct subfields converge into one discussion using a common language might be one of the most important signs of a scientific field maturing. The field of social network analysis is especially fitting for such an endeavour because a) it is an interdisciplinary field by nature, so subfields tend to be very distinguishable, b) it is a comparatively young field, that means traces (i.e. publications) of its evolution are relatively easy to identify and retrieve, and c) its history is well documented, which gives us a method of validation for our results. Specifically, we constructed a publication set totalling over 22,000 articles covering the last 25 years of research on social networks using the Web of Science database. These publications form the links between their respective author keywords, which are a representation of a common lexicon and knowledge base. The resulting keyword-keyword networks, weighted by the number of shared publications, provide us with a good image of the field's underlying intellectual structure. Clusters in these keyword networks mirror disciplinary subfields within the field of social network analysis. Splitting our data in two timeframes provides us with the opportunity to compare the structure of the networks, their clusters, and inter- as well as intragroup relations for two phases of the field's development. A variety of quantitative indicators as well as qualitative assessments contribute in finding valid measures for field formation and consolidation. We conclude that the degree of intergroup connectedness is a particularly insightful indicator of the field's development. In this regard inter- and intragroup relations in bibliometric networks help us retrace corresponding scientific knowledge structures. Thus, we gain a better understanding of scientific field evolution. This way our study is beneficial for two communities: On the one hand it provides science studies with new means of studying emerging fields by applying methods of the study of inter- and intragroup relations in networks based in social network analysis. At the same time it helps advancing these methods and therefore advancing our understanding of the emergence of intra- and intergroup relations.

Promoting Social Cohesion in Classrooms: Examining the Effects of an Intervention on Prosocial Behavior and Civic Engagement on Friendship and Liking Networks

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The literature on social cohesion has just recently focused on the factors that explain why some individuals favor positive relationships and overcome prejudices in contexts characterized by a lack of social cohesion. It is precisely within this “micro-level” where a potential resolution for social conflicts could begin. Particularly at this level, prosocial behaviors and civic engagement can play a crucial role in the development of social cohesion. Prosocial behavior and civic engagement can improve attitudes towards people from different social groups, reduce prejudices and produce collaborative and positive interactions in classrooms. In this paper, we study the extent to which a school-based intervention on prosocial behavior and civic engagement promote social cohesion in seventh-grade classrooms. It is expected that the ProCiviCo intervention enhances not only the levels of prosocial behavior and civic engagement among Chilean adolescents, but also generate more inclusive settings in classrooms with adolescents from different social groups in terms of their sex, socioeconomic status, and ethnic background. Therefore, we examine the underlying mechanisms that explain the formation and maintenance of two positive dyadic relationships, friendship and liking, in seventh-grade classrooms in Santiago (Chile). Chilean classrooms represent a relevant case of analysis as Chile presents higher levels of socioeconomic status segregation with one of the most segregated educational systems of the world. We hypothesize that compared to control classrooms, friendship and liking relationships in intervention classrooms will, to a lesser extent, be driven by a similarity in sex, socioeconomic status, and ethnic background. Moreover, we hypothesize that compared to control classrooms, adolescents who exhibit a higher individual prosocial behavior, as well as positive attitudes towards other social classes will receive more friendship and liking nominations in intervention classrooms. To test our hypotheses, we use longitudinal social network models; specifically, the stochastic actor oriented-models (SAOM) implemented in RSiena. We used data from the ProCiviCo intervention which contains information of approximately 650 seventh graders from 16 classrooms (nine intervention and seven control classrooms) in 8 schools for four assessment points (pre-, post-, and two follow-ups) over a two-year period. We examine the effects of sex, SES, ethnic background, individual prosocial behavior, and attitude towards others social classes on the formation and maintenance of friendship networks (“with whom I usually hang out during recess?”) and liking networks (“with whom I would like to hang out during recess?”), controlling for structural networks effects (e.g., reciprocity, transitivity). Preliminary results

indicate that in intervention compared to control classrooms, friendships relationships are to a lesser extent driven by same-sex dynamics, and that students from different socioeconomic status and ethnic background receive a similar number of friendships nominations. These findings suggest the ability of interventions on affecting children's peer relationships and on increasing the social cohesion in classrooms.

Geography and Intergenerational Network Contacts

Gerald Mollenhorst

Utrecht University, Netherlands

It is an established research finding that the social composition of personal networks tends to be disproportionately homogeneous, amongst others in terms of age. Who has – besides family ties – personal relationships that cross generations? Low levels, or even a lack of intergenerational network contacts, however, may imply a (strict) social division of generations, with various negative consequences, including lower levels of social capital and little solidarity. In this contribution, I aim to describe and explain variations (between individuals and places) in the level of extrafamilial intergenerational network contacts in the Netherlands, with a particular focus on geographical and contextual factors, including regional differences, urban-rural differences and social and physical meeting contexts. I will use data from the Survey on the Social Networks of the Dutch.

Ego and Personal Networks (Session D9)

Chair: Michal Bojanowski

How Personal Networks Shape Scientific Communities?

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The objective of the communication is to understand how personal networks impact the dynamics of scientific communities and their relational configurations. We will use scientific publications as indicators of scientific activity and bibliographic references as a way to obtain information on the relationships between authors. We will present a study based on the study of 103 publications in biology (27), mathematic (24), economics (35) and sociology (17); 56 interviews with their main author; the 3405 relationships between the 56 authors and the authors cited in their references; the 103 networks composed by the 18 718 authors of the articles that cite at least 3 same references as the articles under study (2 years before or after its year of publication), whose the 56 authors interviewed described their level of perception or knowledge. After explaining their construction, we will present the main characteristics of the 103 personal networks and their structural forms. We will propose a typology reflecting their diversity, particularly in terms of their structural dynamics, showing how they fit into particular social conditions. We will interpret these scientific dynamics like social movements, associated to institutional, material and scientific context.

Unpacking Burt's Constraint Measure

Martin Everett

The University of Manchester, United Kingdom

We explore Burts constraint measure and give examples of when it can reach a maximum and minimum value. In addition we look at some approximation methods that require less information.

Making Haste Slowly: Interaction Pacing and Group Dynamics During Entrepreneurial Networking Events

Balint Dioszegi¹, Anna Tel Wal¹, Valentina Tartari²

¹ Imperial College Business School, United Kingdom

² Copenhagen Business School, Denmark

Forging stable and valuable connections is key to entrepreneurs' success, making networking events an important vehicle for the accumulation of social capital. Yet it is unclear how entrepreneurs manage the tradeoff between diversity and bandwidth during such events. While moving from one stranger to the next at a quick pace may allow for a rapid accumulation of potentially valuable ties, a slower-paced approach building on transitive ties may lead to a more positive impression on others, and thereby more stable - if less numerous - ties. The ability to skillfully manage this delicate balance is likely to have a significant effect on the kinds of networks entrepreneurs build. To better understand the mechanisms at play, we plan to observe emergent networking behavior and group dynamics during an entrepreneurial networking event, utilizing sociometric badges to track movement and social dynamics in high detail. In addition, we plan to collect social network data (both before and after the event), as well as data on the kinds of impressions that participants made on others. Through this research, we hope to deepen our understanding of the microfoundations of networking behavior, as well as of the ramifications of these behaviors for social capital creation and maintenance.

Local Brokerage and Access to Unique Information

Michal Bojanowski

Kozminski University, Poland

The theory of structural holes (Burt, 1995) is an important social mechanism explaining network positions and their associated benefits in many social settings. One of the implications of the theory is about efficient access to information and resources. Namely, actors bridging structural holes, i.e. brokers, by connecting otherwise disconnected segments of a social network have access to information that circulates over the network while simultaneously maintaining relatively small number of ties. For example, scientists often maintain non-redundant collaboration ties because they are associated with academically-relevant resources unavailable in other collaborations. A closer look at implications of structural holes mechanism using tools of information theory and a computational experiment allows us to compare local properties of a simple model of network information diffusion with structural features related to Burtian notions of brokerage and redundancy. We argue and demonstrate that (1) above mentioned node-level implication can be supplemented with two others formulated on tie and triad level respectively. In particular, that the notion of 'tie redundancy' should be in fact considered as an essentially triadic property. Further, (2) each of the three implications is associated with a viable empirical strategy of testing whether (aspects of) structural holes mechanism is at work in a given network.

EUSN 2019 - Workshop 12 Sep 2019

Venues / Rooms



Workshop No	Workshop Givers	Workshop Title	Time	Room Address / Number
			9:00 - 12:00 / 13:00 - 16:00	University of Zurich Rämistrasse 59 8006 Zurich
				University of Zurich Schönbergstrasse 1 8006 Zurich
				ETH Zürich Main Building Rämistrasse 101 8092 Zurich
F-1	Michael Heaney	Estimating Exponential Random Graph Models using R	Full	RAA-E-08
F-2	Elisa Bellotti and Bettina Hollstein	Mixed Methods Research in Social Networks	Full	RAA-E-27
F-3	András Vörös, Per Block, Zsófia Boda, Isabel Raabe	Introduction to dynamic social network analysis with Stochastic Actor-oriented Models	Full	RAA-E-29
F-4	Filip Agneessens	Social Network Analysis Workshop: How do I answer my research question?	Full	RAA-E-12
F-5	Philip Leifeld	Discourse Network Analysis with DNA and rDNA	Full	RAA-E-21
F-6	Haiko Lietz and Marcos Oliveira	Introduction to Python's graph-tool	Full	SOF-E07
F-7	Michał Bojanowski	Using R and igraph for Social Network Analysis	Full	SOF E15
M-1	Nynke Niezink	Analyzing the dynamics of networks and continuous behavior with RSiena	Morning	HG E 21
M-2	Giona Casiraghi and Laurence Brandenberger	Introduction to Network Regression Models for multi-edge/weighted networks using the ghypernet-package in R	Morning	HG E 22
M-3	Christian Steglich	Studying the micro-macro link with stochastic actor-based models and RSiena	Morning	HG E 23
A-1	Matthw Smith and Yasaman Sarabi	Tidy Networks: the tidyverse and tidygraph for social network analysis in R	Afternoon	HG E 21
A-3	Juergen Lerner and Alessandro Lomi	Relational event modeling with eventnet	Afternoon	HG E 22
A-5	Tom Snijders and Johan Koskinen	Analysing multilevel network dynamics using RSiena	Afternoon	HG E 23
M-4 / A4	Christoph Stadtfeld, James Hollway, Marion Hoffman, Alvaro Uzaheta and Mirko Reul	Goldfish: Estimating Network Event Models	Morning/Afternoon	HG E 33.1
M-5 / A-2	Martina Morris, Michal Bojanowski and Pavel Krivitsky	Introduction to Egocentric Network Data Analysis with ERGMs and TERGMs using statnet	Morning/Afternoon	HG E 33.3

Workshops EUSN 2019 – 12 Sep 2019

Locations / Buildings / Rooms

The workshops will take place at the ETH Zurich, Centre Campus and at the University of Zurich, City Campus (in two side buildings).

Full-day workshops: **University of Zurich, City Campus**
Building RAA, Rämistrasse 59, Zurich
Building SOF, Schönbergstrasse 1, Zurich

Half-day workshops: **ETH Zurich, Centre Campus**
Main Building, Rämistrasse 101, Zurich
(= EUSN Conference Venue)



ETH Main Building

Room no:
HG E 21 / HG E 22 / HG E 23
HG E 33.1 / HG E 33.3

University of Zurich, Main Building (no workshop location)

University of Zurich, Building SOF

Room no:
SOF-E-07 / SOF-E-13 / SOF-E-15

University of Zurich, Building RAA

Room no:
RAA-E-08 / RAA-E-12 / RAA-E-21 / RAA-E-27
RAA-E-29

Contact Conference / Workshop Coordinator

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- About 320 of Zurich's 1200 water fountains are fed by a separate spring water network of a length of 150 km
- Most of the water stems from spring tapings that have been built since the 15th century in the hills around Zurich.
- The separate spring water network is important for the emergency water supply of the city.
- The other fountains are connected to the normal water supply network and – just like the city's households – are fed with a mix of lake water (70%), spring water (15%), and groundwater (15%).
- Source : Quellenstadt Zürich

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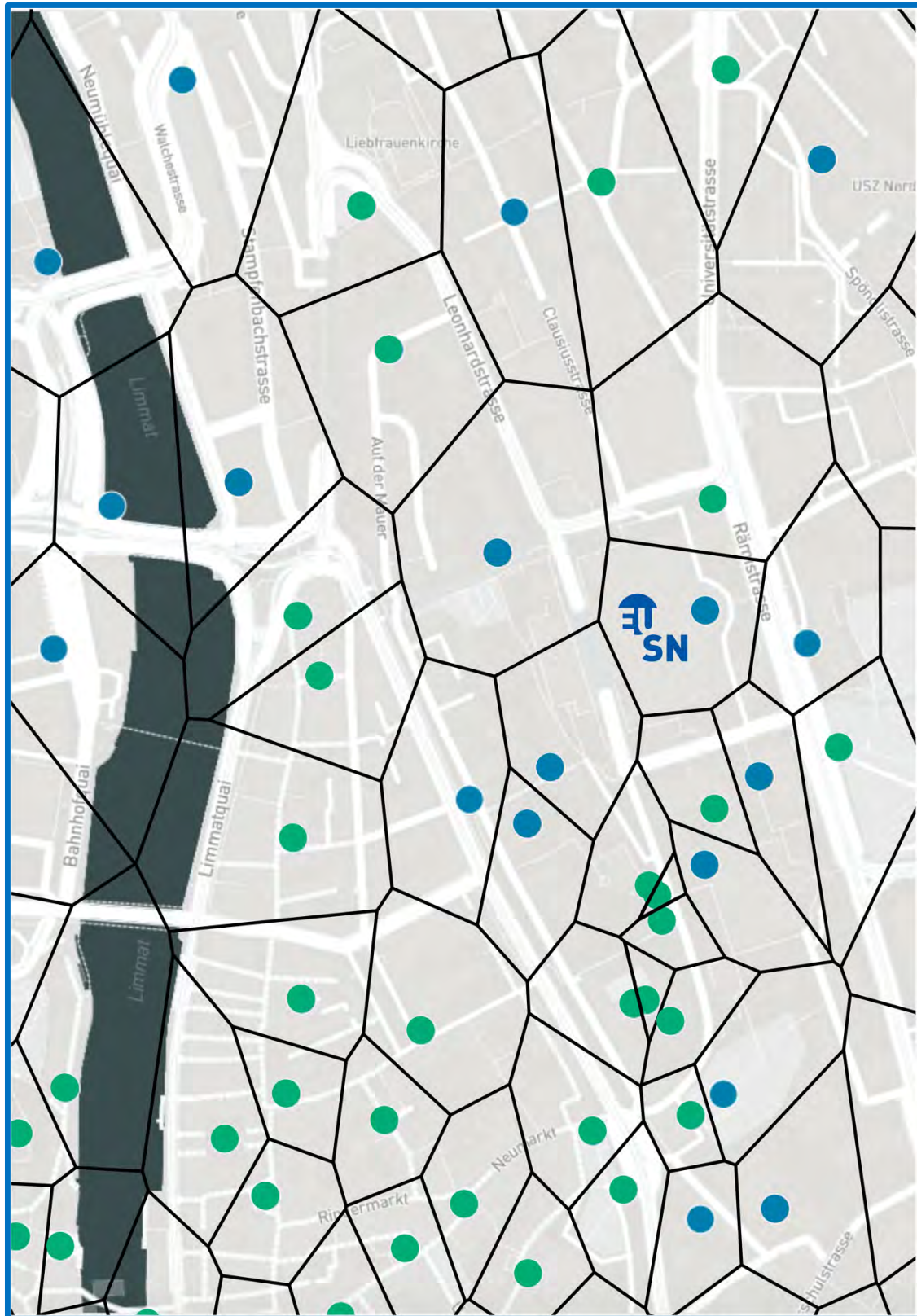
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- Water-fountains.org is an Open-Data-based Web application where you can find and discover drinking fountains.
- Contact them if you would like to add your city to the application (water-fountains@my-d.org).
- Currently you can find water fountains in Zurich, Geneva, Basel, Lucerne and New York. Fountains can be sorted according to whether water is potable, whether there is wheelchair access, whether there is a pet bowl, etc.



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