Australian Social Network Analysis Conference (ASNAC) 2024

Queensland University of Technology, Brisbane, Australia
November 13 - 15

#ASNAC2024

info@ansna.org.au

https://www.ansna.org.au/asnac-conf-2024

QUT

Welcome

We would like to extend a warm welcome to ASNAC 2024 – our first ever conference in Meeanjin (Brisbane)!

We acknowledge the Turrbal and Yuggera peoples, the traditional custodians of the land on which we gather, and pay our respects to their Elders past, present, and emerging.

Since its inception in Melbourne in 2016, ASNAC has provided a platform for the Australian social network community to share and discuss research across diverse fields, unified by the method of social network analysis. This year, we are thrilled to host the conference in Brisbane for the first time!

Join us for two exciting days filled with presentations, and networking opportunities. Our participants include academics and students, all interested in various aspects of theory, methodology, and applications in areas such as environment, health, conflict, social media, and governance.

We are pleased this year to welcome keynotes from experts within our Australian community, including this year's Pip Pattison Award recipient and last year's inaugural Garry Robins award recipient. These awards are exciting recognition for excellence in Australian social network analysis (SNA) research. Before the conference, we will hold five pre-conference workshops. They are excellent tasters for anyone interested in SNA.

We are thrilled to present this program and eagerly anticipate the insights and perspectives that will emerge throughout the conference. We look forward to learning from our colleagues and believe that the exchanges during the conference will strengthen and expand the Australian SNA research networks.

See you in sunny Brisbane!

Dr Angela Guerrero
ASNAC 2024 Chair
School of Architecture and Built Environment

About

ANSNA

The Australian Network for Social Network Analysis (ANSNA) aims to build greater coordination and collaboration among social network researchers and practitioners in Australia and overseas. It also seeks to raise the profile of Australian social network research nationally and internationally. It is the national focal point for SNA in Australia, providing information about resources, connections, training in SNA, conferences, and more. ANSNA is endorsed by the International Network for Social Network Analysis (INSNA).

https://www.ansna.org.au

Organising Committee

Angela Guerrero (Chair, Queensland University of Technology)
Bridget McGlynn (Queensland University of Technology)
Rebecca Langdon (Queensland University of Technology)
Dan Chamberlain (La Trobe University)
Peng Wang (Swinburne University of Technology)

Awards Committee

Peng Wang (Swinburne University of Technology)
Pip Pattison (University of Sydney)
Gary Robins (University of Melbourne)

Acknowledgements

The Organising Committee thanks the QUT Resilience Centre for and the School of Architecture and Built Environment at the Faculty of Engineering for supporting this conference.

We also wish to thank our colleagues in the committee for the *Australian Network for Social Network Analysis (ANSNA)*.

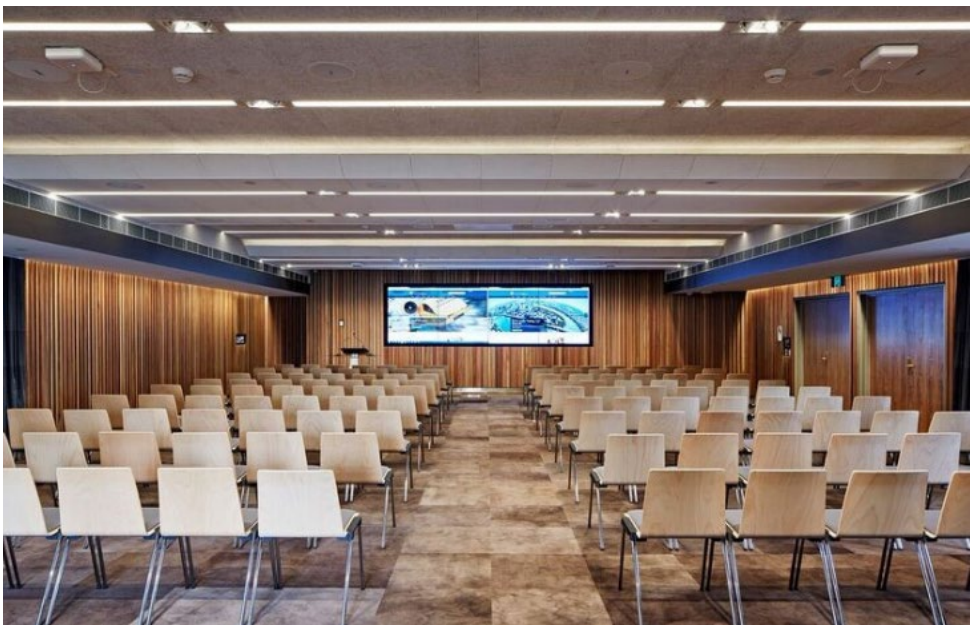
We acknowledge the Turrbal and Yuggera people, who are Traditional Custodians of the Land on which this conference takes place.

Useful Information

Venue

The conference sessions will take place in the *Owen J Wordworth Room*, located on level 12 in S Block at the QUT Garden Points campus. Please see map on page 7.

Workshop locations will be provided to registrants individually.



Getting Here

You can access the venue via the city entrance or via the Goodwill Bridge connecting the city with Southbank. South Bank and the CBD are both walking distance from QUT.

The campus has its own CityCat (ferry) stop and is a short walk from Central and South Bank train stations. South Bank is slightly closer, and you access the campus via the Goodwill Bridge by foot.

The campus is also walking distance from King George Square and Queen Street bus stations in the CBD.

Public transit is currently 50¢ fares in Queensland!

Accommodation Options:

South Bank
Rydges South Bank Brisbane
Novotel Brisbane South Bank
Courtyard by Marriott Brisbane South bank
Hotel Diana

Hostels:
YHA Brisbane City
LyLo Brisbane
Roamer Brisbane

CBD
Royal On The Park
Capri by Fraser Brisbane
Brisbane Skytower by CLLIX
Ibis Styles Brisbane Elizabeth Street

Food & Drink:

This is a catered event. Morning tea, lunch and afternoon tea are included in the registration fee.

If you registered for the conference dinner, this will take place on Thursday evening at 7 pm at Ole Restaurant in South Bank. https://olerestaurant.com.au/

For other food and drink needs there are many great options around Brisbane! Here are a few suggestions:

Coffee	*Drinks*	*Quick eats*
John Mills himself	The Ship Inn (close to campus)	Wrapture
Anytime Coffee	Felons Brewing Co.	Scugnizzi
Mi Casa Cafè	Sea Legs Brewing Co.	AJ Vietnamese Noodle House
Denim Co.	Plenty of breweries at West End!	

Activities

We have organised a walking tour of areas close to our beautiful QUT campus, including the Botanic Gardens. It will take place at 7 am on Friday the 15th November. If you are interested in participating, please contact Rebecca Langdon (r2.langdon@qut.edu.au).

For other activities here are a few suggestions!

In Meeanjin

- The Brisbane Riverwalk - there are paths that River Paths – plenty of walking
- Both the Queensland Art Gallery & Gallery of Modern Art are free and located in South Brisbane (close to South Bank).
- City Cat tour – ride the ferry from QUT all the way to UQ & back! You can stop at New Farm and visit the Powerhouse – a lovely place to have a drink.
- West End Market is on Saturday morning for those staying in town.

Gold Coast

- Access the Gold Coast with 50 ¢ fares!

  Take the Gold Coast line to Helensvale and transfer to the G-link tram. Plan your journey here: https://jp.translink.com.au/plan-your-journey/journey-planner

Minjerribah (Stradbroke Island)

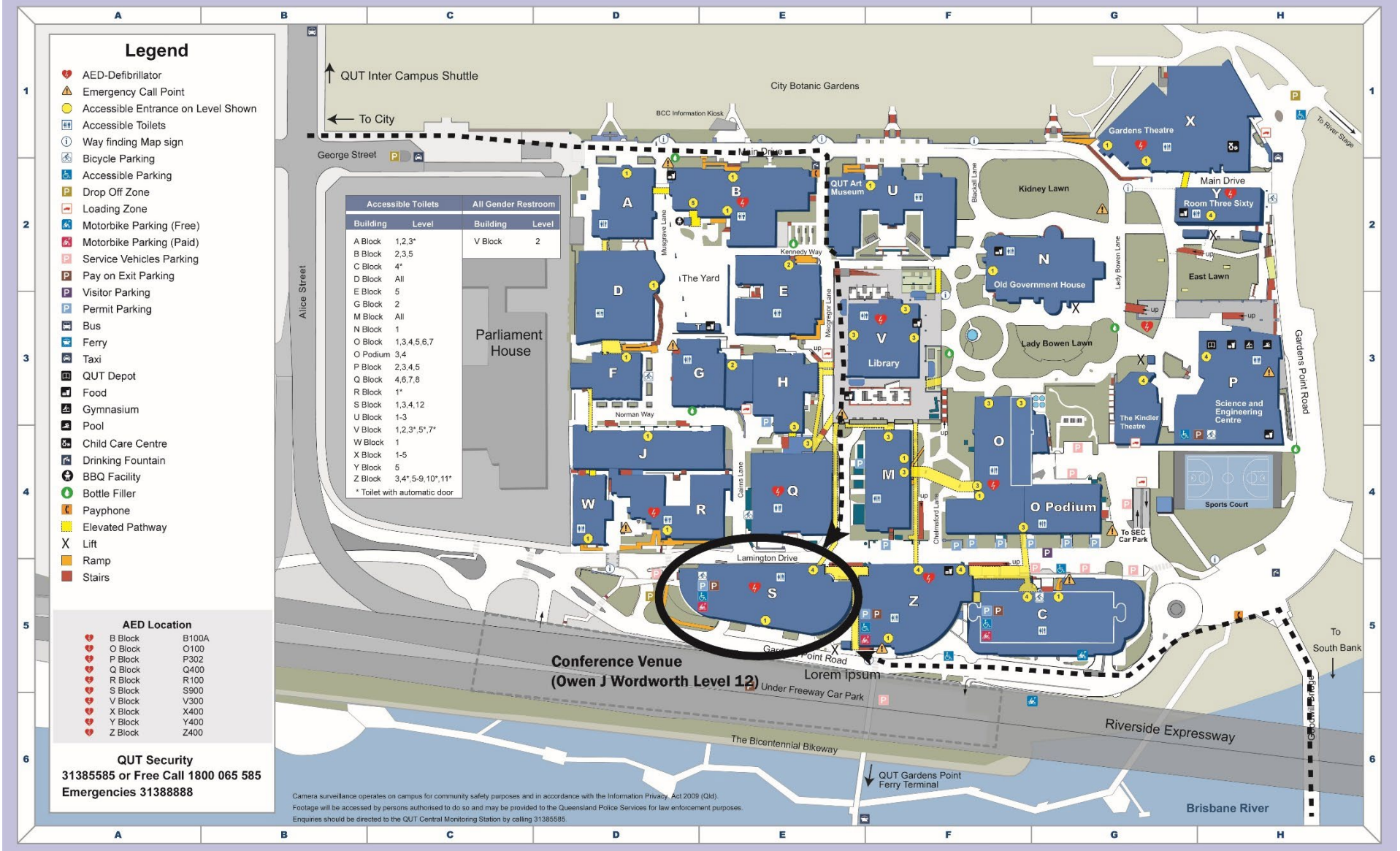
Also accessible via transit!

Take the Cleveland line train to Cleveland. From the station, walk or catch the free shuttle to the ferry terminal. Two companies run ferries:

- Stradbroke flyer timetable - $21 Return Trip adult / $15 Return Trip Tertiary
- Sealink timetable - $20 Return Trip adult / $15.5 Return Trip Tertiary (online)

Once on the island there is a bus that for a $1 all day ticket you can ride to Point Lookout.

GARDENS POINT CAMPUS



Map created by QUT Facilities Management -Infrastructure Systems & Information ; fm_records@qut.edu.au Dec. 2023

ASNAC 2024

Program

Wednesday 13 November
Workshops
(Registration required)

9.00am–12.00pm

Workshop 1: Introduction to Exponential-Family Random Graph Models (ERGMs) using Statnet

Presenter: Dr Pavel Krivitsky Location: P Block Room 638, Gardens Point Campus

This workshop provides a hands-on tutorial to using exponential-family random graph models (ERGMs) for statistical analysis of social networks, using the ergm™ package in statnet. The ergm package provides tools for the specification, estimation, assessment and simulation of ERGMs that incorporate the complex dependencies within networks. Topics covered in this workshop include:

- an overview of the ERGM framework;
- types of terms used in ERGMs
- defining and fitting models to empirical data;
- interpreting model coefficients;
- goodness-of-fit and model adequacy checking;
- simulation of networks using fitted ERG models;
- degeneracy assessment and avoidance.

Prerequisites: Familiarity with R.

9.00am–12.00pm

Workshop 2: Exponential Random Graph Modelling with MPNet

Presenter: Dr Peng Wang Location: S Block Room 637, Gardens Point Campus

In this hands-on workshop, participants will learn the fundamentals of estimating Exponential Random Graph Models (ERGMs) and Auto-Logistic Actor Attribute Models (ALAAM) with MPNet software, developed to investigate the structural features of networks and how such structure may affect individual outcomes.

The workshop will start with a brief introduction to the overall logic of estimating (single-level) ERGMs/ALAAMs before introducing the recently developed multilevel ERGMs/ALAAMs. The latter class of models enables researchers to investigate the influence of structure at one level of analysis on structure at a different level, while taking into account the complex interdependencies that exist within and between levels. For instance, interpersonal networks between managers at the micro-level might interact with alliance networks of the organizations they are nested in.

Throughout the workshop, participants will work through short exercises to get familiar with the graphical user interface and output of the MPNet software. We will discuss various case-study examples that will provide the participants with a good understanding of the possibilities that multilevel ERGMs offer for social scientists

9.00am–12.00pm

Workshop 3: Collecting and Analysing Online Networks with VOSON R tools

Presenter: Prof Robert Ackland Location: S Block Room 636, Gardens Point Campus

This workshop will introduce participants to open source R packages for online network collection and analysis, developed by the Virtual Observatory for the Study of Online Networks (VOSON) Lab (http://vosonlab.net) at the Australian National University. The workshop will include an introduction to (depending on workshop participant interest and available API access):

- vosonSML - (https://github.com/vosonlab/vosonSML) an R package providing a suite of tools for collecting and constructing networks from social media data. It provides easy-to-use functions for collecting data across popular platforms (Twitter, Reddit, YouTube, WWW hyperlinks, Mastodon) and generating different types of networks for analysis.
- VOSON Dashboard (https://github.com/vosonlab/VOSONDash) - an R/Shiny application providing a graphical user interface for collecting and analysing online networks and associated text data. It builds on a number of R packages, in particular igraph (for network analysis) and vosonSML.

Participants will be shown how to install these packages and their basic operation. Workshop materials will include R scripts, package documentation, notes on analysis of online networks, and examples of research.

2.00pm–5.00pm

Workshop 4: Advanced Exponential-Family Random Graph Modelling with Statnet

Presenter: Dr Pavel Krivitsky Location: P Block Room 638, Gardens Point Campus

This workshop will provide a tutorial of advanced usage of ergm™ and extension packages. Specific topics depend on audience interest, but may include specifying complex structural constraints, estimation tuning, representing complex effects with term operators, and observational (e.g., missing data) structure. Also included is using the new ergm.multi™ package for modelling multi-layer and multi-mode networks, as well as joint models for ensembles of networks; and an overview of `tergm` as it applies to modelling series of networks.

Prerequisites: Familiarity with R and ergm™ required. If you are new to ERGMs, the introductory workshop on ERGMs using Statnet is strongly suggested.

2.00pm–5.00pm

Workshop 5: Cross-Platform Social Network Data Capture

Presenter: Robert Fleet Location: S Block Room 637, Gardens Point Campus

This workshop offers attendees an opportunity to explore cross-platform social media data acquisition anchored by common topics. Public debates and discussions on important topics are increasingly taking place concurrently across a variety of social media platforms. This phenomenon is driven by the unique features of each platform and the intention of posters and commentators to reach different audiences by leveraging these features.

Facilitated by the Digital Observatory at Queensland University of Technology (QUT), the workshop will introduce newly developed research platforms including NewsTalk, AusReddit and Youte+. Together these platforms support data capture and data exploration for news website comments, Reddit and YouTube, respectively.

By the end of the workshop, attendees will understand how to collect and aggregate multi-platform social media data. We will demonstrate how to collect YouTube comments using Youte+, how to gather comments on Australian news articles using Newstalk, and how to collect submissions and comments from Australian subreddits using AusReddit. For NewsTalk and AusReddit, we will provide Python notebooks which use the platform APIs of these research tools, enabling participants to integrate these data platforms in their own research.

2.00pm–5.00pm

Workshop 6: Social-Technical Complex Network and its LLM Applications

Presenter: Dr Jiang Wu Location: S Block Room 636, Gardens Point Campus

This workshop delves into the intricate dynamics of Social-technical Complex Network that is inspired by the social-ecological network (Bodin, 2017), its simulation methodologies, and the innovative applications of large language models (LLMs) in understanding and predicting social-technical behaviors. The session is structured around three pivotal themes, each presented by experts in their respective fields.

In the first part, it provides a comprehensive framework for social-technical complex network, as outlined in a text book “Social Network Computing”. This foundational knowledge sets the stage for understanding the basic concepts of social-technical networks, from their visualization to the nuanced dynamics of triadic closures and the balance between strong and weak ties in the social-technical system. The exploration of homogeneity, balance, and the small-world phenomenon within these networks lays the groundwork for more advanced topics such as power laws, community structures, and diffusion processes for the social-technical coordination.

The second part shifts the focus to the simulation of complex networks, dissecting the interplay between networks and game theory related to social-technical coordination. This segment will explore the evolutionary game model that abstracts the intense competition between 'involution', cooperation, and 'lying flat' — a cultural phenomenon reflecting a conscious withdrawal from competitive pressures. The discussion will highlight the impact of social resources, involution costs, and the variance in agents' competition abilities on social-technical dynamics, revealing the complex interplay between rank-based and value-based payoff allocation methods.

The third part transitions to the application of LLMs in simulating social -technical network behaviors. This cutting-edge approach contrasts traditional models by employing LLMs to simulate social-technical strategic interactions among agents, offering a deeper understanding of the relationship between social behaviors and technical factors. The workshop will examine how diversity in agent attributes and multi-level social circles influence involution, providing macro-level insights and regulatory strategies to mitigate social-technical competition issues.

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Thursday 14 November

Owen J Wordworth Room (S Block, 12th Floor)
Queensland University of Technology, Gardens Point Campus

8.30 am	Registration Opens	
9.00 am	Welcome day 1	
9.15 am	Keynote: *The Sociology of (Personal) Social Networks: Method and Theory in Egonet Studies*	Malcolm Alexander
10:00 am	MORNING TEA	
10:30 am	Session 1: Collaboration and Governance	
	Mapping the Victorian Mental Health Service System using Network methods	Colin Gallagher (Melb)
	Interconnected Voices: Exploring Gender Dynamics in Collective Action Engagement Networks	Susilo Wibisono (UQ)
	Cyfluence - Cyberattacks for Influence	Florian Frank (Berlin)
11:30 am	Garry Robins Award Lecture: *The Spread of Success: Network Structure and Collaborative Strategies in a Major Research Funding Scheme*	Peng Wang
12:15 pm	LUNCH	
1:15 pm	Session 2: Environment	
	Strong Community Networks, Weak Sustainability Outcomes?	Petr Matous (Sydney)
	Network Dynamics and Program Evaluation in Adaptive Co-Management: Building Collaborative Networks for Ontario's Urban Forestry Initiative	Bridget McGlynn (QUT)
	Social-Ecological Network Dynamics and Sustainability Outcomes Over Time	Michele Barnes (Sydney)
	Personal Networks in Complex Practice Adoption	Angela Guerrero (QUT)
	Analysing Drivers of Division and Delay in Australian Climate and Energy Policy Discourse Online	Carly Lubicz-Zaorski (QUT)
3:00 pm	AFTERNOON TEA	
3:30 pm	Session 3: Theory and Methods I	
	Breiger's Network Duality: A Critique	Garry Robins (Melbourne)
	Navigating the Labyrinth of Involution: A Smart Network Simulation Approach to Resource Competition	Renxian Zuo (Wuhan)
	Bayesian Estimation of ERGMs with Not-at-Random Missingness in Covert Networks	Jonathan Januar (Melbourne)
4:30 pm	Session 4: Business and Innovation	
	Moving Interactions among Institutional Variables: A Weighted Correlation Network Analysis Approach	John Salazar (Sydney)
	CEO Networks and Succession in the Sport Industry	Lloyd Rothwell (UTS)
5:10 pm	Day 1 Close	
7:00 pm	CONFERENCE DINNER @ OLE Restaurant, South Bank (REGISTRATION REQUIRED)	

Friday 15 November

Gardens Club & Owen J Wordworth Room (S Block, 12th Floor)
Queensland University of Technology, Gardens Point Campus

7:00 am	WALKING TOUR (registration required)	
9:00 am	Welcome day 2	
9:10 am	Session 5: Theory and Methods II	
	The Duality of Relations and Ties	Pip Pattison (Sydney)
	Maximum Likelihood Estimation for Network Models from Ambiguous Egocentric Data	Pavel Krivitsky (UNSW)
	Error Bounds on Link Prediction in Dyad Independent Networks	Kevin Pan (UNSW)
	Discerning Media Bias Within a Network of Political Allies and Opponents: The Idealized Example of a Biased Coin	Nicholas Low (Melbourne)
10:30 am	MORNING TEA	
11:00 am	Session 6: Networks and Conflict	
	Mapping the Geospatial Dispersion of Crime Events in Co-Offending Networks using Relational Hyperevent Models	David Bright (Deakin)
	The Evolution of Armed Conflicts: The Dynamics of Relational Mechanisms in the Colombian Armed Conflict	Laura Roldan (Exeter)
	Social Network Analysis of Conflict Dynamics in Virtual Market Groups: Insights from MMORPGs	Robert Fleet (QUT)
	Milgram's Obedience to Authority (1974) and Interpersonal Power	Dan Chamberlain (La Trobe)
12:20 pm	LUNCH & POSTER SESSION	
1:20 pm	Presentation of Pip Pattison and Garry Robins Awards	
1:30 pm	Pip Pattison Award Lecture: *Online Field Theory and Social Network Analysis*	Robert Ackland
2:15 pm	Session 7: Communities and Cultures	
	Mental Health and Disrespect: A School Case Study	Dean Lusher (Swinburne)
	Observations of Negative Tie Attributes on Construction Worker Mental Health	Rebecca Langdon (QUT)
	Cultural Mentorship and Advice-Seeking Relationships in Remote Schools	Tracy Durksen (UNSW)
	The Needs-Based Resource Generator: A New Measure of Social Capital	Yoshihisa Kashima (Melbourne)
3:35 pm	AFTERNOON TEA	
4:00 pm	Session 8: Online Networks	
	Multi-Layer Network Analysis of Deliberation in an Online Discussion Platform: The Case of Reddit	Gao Tianshu (Curtin)
	Understanding Follower-Follower Dynamics in Influencer Marketing from Social Network Perspective	Thi Nguyen (Swinburne)
4:45 pm	CLOSING REMARKS & HANDOVER TO ASNAC 2025	
5:00 pm	CONFERENCE CLOSE	

Keynotes

Invited Lecture

The Sociology of (Personal) Social Networks: Method and Theory in Egonet Studies

A/Prof. Malcolm Alexander (Griffith University)

Egonet research uses name generators to identify specific, real social relationships. Qualitative methods investigate a respondent's (ego) descriptions of, and perceptions of, these immediate (ego-alter) social relations: their personal (social) networks. As qualitative protocols develop, they can move from semi-structured interview schedules to usable formats for large-scale, online survey studies. These research efforts open the potential for a sociologically sensitive "sociology of social networks" bridging the achievements of social network analysis (SNA) and the qualitative orientation and cultural concerns of contemporary sociology. SNA's standard egonet surveys generally use measures and metrics derived from socio-centric (whole network) SNA and the structural holes measures of Ron Burt. The units of observation are the personal networks of respondents, but standard analysis presents population aggregates: averages (means) and, sometimes, variance of these measures, as indicators of social network norms and activity across sample populations or subpopulations. We argue that qualitative methods, structured to explore the specific relations identified by name generator questions can provide a wealth of new information about the sociology of social networks but that we need to expand our analytic horizons to accommodate this.
In this paper we suggest some possible extensions of egonet methods. We then describe extensions used by Chamberlain (2014): an "activity generator" and the collection of "2-mode" group activity data, and the analytic problems encountered when seeking to understand this data. We first present the standard, aggregate descriptive statistics for the dataset, discuss their usefulness for analysis of egonets and what further measures might be brought into the standard array. Secondly, we look to qualitative research typologies of personal networks as a possible alternative analytic strategy and the analytic potential of qualitative comparative methods (QCA) to take the analysis of personal networks compatible with the theoretical concerns of contemporary sociology.

A/Prof Malcolm Alexander (PhD McGill 1979; Griffith University 1980-2010, ACSPRI 2005 - 2018) Retired.
Malcolm Alexander is one of Australia's leading sociologists in social network analysis (SNA) and research. In the 1990s he researched Australian business elite networks using SNA to explore issues of corporate governance and investor capitalism. In later years he extended network analysis in new directions through a focus on 2-mode network mapping and investigations of elite networks in the civic cultures of Australian cities. He published articles in sociological journals, edited of two books and has been an editorial member of the Journal of Sociology and executive member and Treasurer of The Australian Sociological Association (TASA).
His sociology courses at Griffith University took social network perspectives, research methods and social theory to undergraduate and postgraduate students. From 2005 to 2018 Malcolm ran his ACSPRI course, Introduction to Social Network Research and Analysis at every Winter and Summer School offered by that organization. He especially enjoyed keeping in touch with course participants, troubleshooting and problem solving with researchers to bring projects to completion. The course continues, now run by Dr Daniel Chamberlain. Since retiring from active teaching Malcolm has continued collaborating with social network enthusiasts and researchers. For this keynote address he will speak about "The Sociology of (Personal) Social Networks: Method and theory in egonet studies" stemming from his recent collaborations with Dan Chamberlain and Rebecca Langdon.

Garry Robins Award (2023) Lecture

The Spread of Success: Network Structure and Collaborative Strategies in a Major Research Funding Scheme

A/Prof. Peng Wang (Swinburne University of Technology)

We explore the dynamics of success in research funding through the lens of network analysis, focusing on the Swiss National Science Foundation (SNSF) database. By integrating exponential random graph models (ERGM) and autologistic actor attribute models (ALAAM), we uncover the intricate mechanisms that drive the distribution of success among researchers.

Using snowball sampling strategies for bipartite networks, we investigate the role of seed selection, seed set sizes, and snowball layers in shaping ERGM outcomes. Through simulation studies, we highlight the advantages of a two-wave sampling strategy that incorporates seeds from both individuals and groups, resulting in more accurate model specifications and reduced biases. Applying these refined strategies to the SNSF dataset, we investigate the interplay between investigators and research grants that describes the overall collaboration structure. Using ALAAM, we then assess the association between individual success in grant applications and their positions in the collaboration network with a specific emphasis on how existing investigators sustain their success through past and new collaborations, and how new investigators navigate the landscape to secure their grants. Our findings emphasize the duality of group affiliations and individual choices, where new investigators tend to form collaborations within their discipline yet face challenges in integrating with established networks. Conversely, existing investigators benefit from their stable affiliations and repeated interactions, reinforcing their position within the research community.

Dr. Peng Wang is an Associate Professor of Innovation Studies at the Centre for Transformative Innovations (CTI) at Swinburne University of Technology. His research focuses on the development and application of statistical models for social networks, particularly Exponential Random Graph Models (ERGM) for social selection processes and Auto-logistic Actor Attribute Models (ALAAM) for social influence processes. As the designer and programmer of the PNet suite of software packages for the statistical modelling of complex networks, including one-mode, two-mode, multiplex, and multilevel networks. Dr. Wang has publications in the research fields of public health, innovation management, social-ecological systems, anthropology, political networks and network intervention evaluations. Dr Wang's research has received the prestigious Freeman Award from the International Network of Social Network Analysis (INSNA) in 2022 and the Inaugural Robins Award from the Australasian Network of SNA (ANSNA) in 2023. Dr. Wang's innovative work extends beyond academia through his role as a co-founder of the Swinburne start-up SNA Toolbox, which translates cutting-edge SNA research into practical solutions for organizations across various sectors. In addition to his research, Dr. Wang is serving as the Associate Director of CTI, co-leading the Social Network Research Laboratory (SNRL). He is also a founding member of MelNet and has held leadership positions within ANSNA, including President in 2022.

Pip Pattison Award Lecture

Online Field Theory and Social Network Analysis

Prof. Rob Ackland (Australian National University)

Field theory is an analytical framework for researching competition among individuals and groups in various setting such as academic disciplines, cultural markets and protest/activism (see e.g. Fligstein & McAdam 2012). While field theory predates the Internet – Bourdieu's formulation (e.g. Bourdieu 1984) drew on Lewin's social-psychological field perspective (Lewin 1951) – it is now used to study online social fields. O'Neil & Ackland (2019) employed field theory and network analysis of websites in a study of competitive behaviour of environmental activist organisations in response to emergent environmental risks, and authors such as Lindell (2017) have explored field-theoretic approaches to analysing social media data. Together with correspondence analysis, social network analysis has been a key tool for studying fields, being used for demarcating the field, identifying actors and understanding strategic behaviour and outcomes (de Nooy 2003). This presentation will provide an overview of field theory with a focus on the role of SNA and how field theory relates to other approaches such as socio-semantic network analysis (e.g. Basov et al. 2020). I argue that given human information environments such as social media are now places of intense competition over social and political narratives, field theory can provide a useful conceptual framework to study this behaviour, but we need to be aware of the opportunities and challenges of using SNA in analysis of digital trace data.

Robert Ackland holds a PhD in economics and is a professor in the School of Sociology at the Australian National University, specialising in social network analysis, computational social science and the social science of the Internet. In the first phase of his career, Robert worked in applied economics as a senior research officer in the Bureau of Immigration Research (Commonwealth Department of Immigration) and a consultant economist in the World Bank. In 2002, Robert began researching online political networks, and this led to the establishment of the Virtual Observatory for the Study of Online Networks (VOSON) Lab (http://vosonlab.net) in 2005, under an Australian Research Council Special Research Initiative (e-Research) grant. Robert's recent research areas include network approaches to studying online political communication and deliberation, and associated problems such as echo chambers, misinformation and social bots. He has been chief investigator on five ARC grants (including as sole investigator on a Discovery Grant) and he is currently a chief investigator on a Volkswagen Foundation funded project (in the AI and the Society of the Future stream) focused on social bots and online political communication. Robert's book Web Social Science was published by Sage in 2013, and he teaches courses on online research methods and the digital economy and society. Robert is a long-term instructor for the Australian Consortium for Social and Political Research Inc. (ACSPRI), and is currently the Chair of ACSPRI.

Session Abstracts

Session 1: Collaboration and Governance

1. Mapping the Victorian Mental Health Service System using Network Methods

Colin Gallagher (University of Melbourne)
Co-authors: Pip Pattison, Garry Robins, Dan Chamberlain, James Coutinho

The reform of the Victorian mental health system set out by the 2018-2021 Royal Commission into Victoria's Mental Health System entails a radical transformation of mental health service delivery in Victoria, including in philosophy, service accessibility and availability, the integration and coordination of services, and system governance (State of Victoria, 2021). As part of their responsibilities to undertake research and disseminate knowledge to deliver the best possible outcomes for people living with mental illness, the Victorian Collaborative Centre for Mental Health and Wellbeing (Collaborative Centre) seeks to understand the current state of Victoria's mental health service system as an interconnected system of mental health service providers and to monitor and evaluate the impact of the processes that are underway to reform it.

The importance of understanding regional mental health service systems as inter-organisational networks of service providers has been recognised for some time (e.g., Morrissey, 1992; Morrissey, Calloway et al, 1995). Such networks are argued to be important in facilitating service access and coordination and hence to a more effective and client-centred model of care. However, despite a small but growing number of empirical studies of mental health and other health systems as inter-organisational networks (e.g., Brewster et al, 2019; Kwait et al, 2001; Morrissey, Calloway et al, 1995; Raab et al, 2015) and an emerging theoretical conceptualisation of what makes such networks effective (Provan & Milward, 1995; Provan & Lemaire, 2012; Smith, 2020), recent systematic reviews have concluded that the current literature is not only fragmented and inconclusive but also lacking in empirical depth.

This presentation introduces the CANVAS project (Collaborative Networks of the Victorian Mental Health Service System). This pilot project aims to develop a 2024-2025 interorganisational map of the mental health service providers and their interconnections for the purpose of service provision, with respect to two regions within Victoria. The presentation will address the overall rationale and design of the study, and its potential impact. The resulting map will provide a baseline view of the state's 2024 network of mental health service providers. This baseline view will inform an understanding of the existing state of the network, including its referral pathways and areas of effective collaboration and will also suggest opportunities for improving referral and collaborative activity. The map will serve, as well, as an initial point of comparison for the transformation of the mental health system envisaged by the Royal Commission, and the map and the methods used to construct it will allow the longitudinal development of the transformed system to be tracked and monitored and, where necessary, for further reforms to be proposed.

2. Interconnected Voices: Exploring Gender Dynamics in Collective Action Engagement Networks

Susilo Wibisono (University of Queensland)
Co-authors: Louis, Winnifred

In two studies recruiting two groups of Australians in 2021 (N = 558) and 2023 (N = 1026), we applied network analysis in order: 1) to examine the interconnections of various causes that motivated individuals to engaged in collective action, as well as the association between gender variable and collective action for the causes; 2) to examine the interconnections of the forms of action to support the cause of climate change, as well as the association between gender and the forms of action. The results consistently showed that some causes are more connected to other causes than the others. For example, climate change, which is supported by both male and female individuals is strongly linked to women's rights cause which is more supported by women than men. Gender distribution across the causes indicated consistent patterns in two studies. Some progressive causes such as women's rights, pro-LGBT rights, animal rights, and pro-choice were significantly more supported by women, while some conservative causes such as anti-LGBT rights, anti-immigration and anti-lockdown seem to be more supported by men than women. In

terms of the tactics, we revealed that highly cost tactics (e.g., hunger strikes, climbing trees, blocking roads, and sit-in) are relatively less supported than low-cost tactics. The hypothesis that men are more engaged with more highly cost tactics than women was not observed.

3. CYfluence - Cyber Attacks for Influence

Florian Frank (Cyfluence Research Center, Berlin)

Cyfluence refers to hostile campaigns aimed at disseminating information, sometimes false, across the internet to influence audiences. These campaigns employ coordinated efforts across multiple platforms, with connectivity and repetitiveness as core components. Unlike traditional influence methods, Cyfluence includes cyber-attacks such as hack-and-leak operations during elections. In recent years, Cyfluence campaigns have become more prevalent, with various stakeholders using them for political and business purposes. Advanced campaigns often combine cyber-attacks with social media manipulation. A notable example is the campaign surrounding the hacking of Hillary Clinton's email server and the subsequent hostile campaign against her. More recently, Russian Intelligence gained access to a conversation between the head of the German Air Force and several officers. Although the conversation content was arguably insignificant, the reputational damage between military allies was considerable. For stakeholders such as political parties, governmental institutions, and even private sector entities like corporations, this means defending two dimensions that were previously, and often still are, seen as unconnected. Crucial to understanding and building defensive measures are the building blocks and ecosystem, the logical time correlation, and the types of attacks.

In the presentation, I will cover the following topics (the level of details depends on the time given):
1: The Major Elements (Building Blocks)
- Cyber-attacks
- Social media outlets
- Instant messaging (IM) apps
- Websites
- World Wide Web (WWW) elements
- Dark Web activity

2: HICs General Characteristics
Some unique identifiers can help identify a hostile influence campaign. A campaign can be viewed as a coordinated effort across several building blocks. Examples of identifiers include:
- A beginning
- Repetitiveness
- High connectivity
- High level of activity
- High number of users
- Sequencing

3: The Methodology We Are Developing at the CRC to Counter These Attacks
As this is a current project, I will discuss our latest findings. Each Cyfluence campaign utilizes different building blocks according to the budget, time, and capabilities of the campaign team. All building blocks correspond with each other to enhance the effect. Therefore, when looking for a Cyfluence campaign, if we find an indication of a campaign on a certain building block, we refer to it as an IOC (Indicator of Compromise). Upon further investigation, if we find similar IOCs on other building blocks, we consider it either a very strong IOC or more likely a campaign.

Additionally, we will highlight two approaches:
- The Early Warning Approach: A proactive methodology focusing on detecting campaigns at early stages (IOCs in building blocks, etc.)
- The Incident Response Approach: After identifying a campaign and mapping its elements (building blocks), it is time to measure the campaign's virality, potential impact, and other factors. This assessment involves considering various factors, such as the velocity of the campaign's spread and the change in sentiment it creates, to decide if, how, and when to act against it. This decision-making process is consolidated into a single comprehensive gauge.

Session 2: Environment

4. Strong Community Networks, Weak Sustainability Outcomes?

Petr Matous (University of Sydney)

How farmers farm has implications for food security and environmental sustainability. How farmers farm also depends on other farmers. There is solid empirical evidence about network effects on individual farmers but not much about the role of collective network structures, which is ironic in a field that arose from the need to get beyond atomistic approaches to social reality. We cannot understand fundamental issues, like development of local farming norms (e.g. what farmers consider a normal practice in their village) if we do not understand collective network structures and processes. We have theories but empirical analysis of whole community networks has been limited to handful of cases at a time.

I have been working for a number of years with local partners in Indonesia to gather large datasets of numerous communities that could be used to statically explore collective-level network effects. This presentation helps to explain why the same sustainability programs promoting recommended farming practices may achieve the desired results in some communities and not others. It is based on two papers published in 2024 with Orjan Bodin and Abner Yalu, respectively.

The first study comes from an initial round of data gathering from this long-term engagement in Indonesia and required extensive data cleaning, which also resulted in substantial sample reduction (2.7k farmers, 30 villages, 1 practice). In the second study, the processes were improved and we have obtained more data of sufficient quality (4.5k farmers, 70 villages, 22 recommended practices). The first paper is a collective-level take on leadership in networks. The second sheds light on the role of network cohesion. In these studies, we employed conventional statistical analyses, ALAAMs, ABMs, and interpreted the results in combination with qualitative insights from the field.

We found that when a village is united in its practices, these are mostly not the recommended practices. Network characteristics associated with homogenization of practices across a village are also associated with general non-adoption of recommended practices. More links mean more similar practices and less adoption of recommended practices. More centralised village also display more similar practices, less adoption of recommended practices. On the other hand, community fragmented into separate components or modules, display more diverse practice and a higher chance of recommended practices getting traction. Village network structure explains up to third of variation in recommended practice prevalence in a village. “Complex contagion” mechanism where alters influence on farmers practice adoption behaviour is conditional on their popularity most faithfully replicated observed overall adoption patterns. These patterns prevail across various types of practices with the exceptions of practices that negatively impact other community members if not adopted, such elimination of weeds, diseases and pests.

Although tight-knit community networks are often considered socially desirable to help tackle local environmental issues, such networks can also be a barrier for environmental initiatives, especially for practices that do not have positive externalities for other community members. I will discuss how these findings parallel backlash in some Australian communities to renewable energy projects.

5. Network Dynamics and Program Evaluation in Adaptive Co-Management: Building Collaborative Networks for Ontario's Urban Forestry Initiative

Bridget McGlynn (Queensland University of Technology)
Co-authors: Angela Guerrero, Ryan Plummer, Samantha Witkowski

The Greening the Landscape Research Consortium is an initiative at the intersection of decision-making and research, aimed at enhancing the urban tree value chain in Ontario, Canada. By developing and mobilizing knowledge within a

collaborative network, the Consortium addresses established needs of regional actors involved in tree establishment and maintenance, potentially overcoming common barriers to climate change adaptation. This study investigates the performance of an innovative adaptive co-management approach, focusing on the development of communication and collaboration networks that facilitate inter-organizational learning. Monitoring and evaluation data, including social network analysis, were collected annually during the three-year pilot program, complemented by a focus group at the final annual member workshop. Preliminary descriptive statistics indicate increasing centralization of the communication network over the pilot period, with average degree remaining stable as new members contributed few additional ties compared to the densely connected Year One network. Stochastic actor-oriented models will be used to measure changes in communication and collaboration networks among member organizations throughout the pilot. Findings aim to identify factors that support multiple types of learning when fostering a new collaborative network.

6. Social-Ecological Network Dynamics and Sustainability Outcomes Over Time

Michele L Barnes (University of Sydney)
Co-authors: Henry Bartelet, Josh Cinner, Nyawira Muthiga, Tim McClanahan, Sarah Sutcliffe, Nick Graham, Örjan Bodin, Peng Wang

Sustainability outcomes are often shaped by complex social and environmental interactions, which can be captured in a network. Yet the social-ecological network research to date has been temporally static, failing to capture how dynamic changes to social-ecological relationships may affect sustainability outcomes over time. Furthermore, empirical social-ecological network approaches have largely focused on a single sustainability outcome, which masks potential synergies or trade-offs between different dimensions of sustainability. Here, we use longitudinal multilevel network models to demonstrate how key social-ecological relationships evolve over time and quantify how these changes generate trade-offs and synergies between social and economic dimensions of human wellbeing (both critical targets of sustainability projects and programs). We illustrate this using a novel panel dataset consisting of three waves of data from five coastal fishing communities in Kenya. Our results shed light on how social-ecological network dynamics evolve and underpin critical trade-offs in sustainability outcomes over time.

7. Personal Networks in Complex Practice Adoption

Angela Guerrero (Queensland University of Technology)
Co-authors: Daniel Cruz-Lopez

The Great Barrier Reef is under severe environmental stress, highlighting the need for effective land management practices to enhance water quality. Despite numerous programs aimed at encouraging these practices among farmers, the social dynamics influencing their adoption remain poorly understood. To address this gap, our study conducted Egonet interviews with 35 sugarcane growers in the Gordonvale and Babinda areas of the Mulgrave-Russell region during 2023 and 2024, representing 44% of the local farming community. Using a net-map approach combined with thematic analysis, we uncovered "narratives of adoption" that illustrate relationships with family, friends, and market agents influence adoption decisions differently. Our analysis grounded in theoretical frameworks of relational embeddedness and complex adoption explores the social processes driving practice adoption. The findings reveal how different relationships in personal networks play a role in overcoming or prolonging complex adoption barriers. This study demonstrates how qualitative approaches in egonet studies can enhance understanding of the mechanisms behind complex adoption and the influence of various relationships. These insights are crucial for designing more effective interventions and support programs that align with farmers' social contexts. By providing a deeper understanding of the relational aspects of practice adoption, this study contributes to broader efforts to preserve the Great Barrier Reef through improved agricultural practices.

8. Analysing Drivers of Division and Delay in Australian Climate and Energy Policy Discourse Online

Carly Lubicz-Zaorski (Queensland University of Technology)

On the current trajectory, the world will reach the Paris Agreement's lower limit of 1.5C warming by 2030, and Australia's catastrophic 2019-20 bushfire season will be average by 2040. Yet just 54% of Australians believe that climate change is happening and caused by humans and 15% understand it to be an extremely serious problem right now. With appreciation of risk linked to public and political support for policy, it is important to understand the drivers of this risk-perception disconnect. One way to do this is to map key actors and their alliances, claims, and communicative practices in digital political communication spaces, noting these are key sites were knowledge and 'reality' are asserted and contested.

In this presentation, I will introduce a data-driven mixed-methods pipeline consisting of social network analysis, LLM-assisted discourse analysis, and the emerging technique of practice mapping to investigate communicative dynamics at scale. Focusing on key CO2 reduction and renewable energy issues, the first step in this approach is analysing nearly 15 years of Australian Parliamentary inquiries to identify key actors, their alliances (discourse coalitions), policy stances, and claims.

This knowledge will help to inform a similar approach in hybrid communication spaces: Focusing on CO2 reduction and renewable energy-related topics in key Australian media outlets and public Facebook spaces in the lead up to Australia's 2025 federal election, claims and discourse coalitions will be analysed via two-mode networks. The final step of practice mapping helps to enhance understanding about how actors and their coalitions are engaging (or not) and information is being furthered in digital communication spaces. These insights will be interpreted in the context of Australia's political economy and longitudinal representative surveys about climate change and energy transition attitudes.

As well building issue-specific empirical knowledge across digital political communication spaces, this interdisciplinary work will extend theoretical understandings of polarisation, and destructive polarisation in particular; introduce a methodological approach that can be applied to other mediatised environmental conflicts; and provide insights to Australian policymakers and communicators to help meet the challenges faced with the current ecological and social tipping point.

Session 3: Theory and Methods I

9. Breiger's Network Duality: A Critique

Garry Robins (University of Melbourne)

It's been 50 years since the publication of Ron Breiger's seminal paper on the duality of two mode networks. The anniversary was marked by a special conference in Switzerland at which the meaning and implications of duality were examined.

Reflecting on this anniversary conference, I discuss some limitations of the duality concept. In two-mode systems, the mathematics of duality is always available â€“ almost tautologically. So as a meaningful social construct, duality needs to go beyond this simple formalism. Yet, convincing demonstrations of duality sometimes require data to be sufficiently decontextualized, to the point that crucial social meanings can be lost. The hierarchy implicit in many two-mode systems can produce a fundamental directionality that duality ignores. I provide a topical and controversial political example.

This stripping away of important aspects of the data is present even in the original Breiger paper. The canonical Southern women dataset does not stand comfortably as an example of full duality, once we consider obvious but neglected aspects of the social system under study. We could hypothesize node sets that are more 'dual' in their properties than the Southern women but then, strikingly, the mathematics of duality does not even apply.

Does this mean that duality should be abandoned as a concept? No, the paper is still seminal. It points the way forward to fifty years later, for we can now undertake a fuller examination of multi-level networked social systems in a way that recognizes the interdependencies between levels. This, I submit, is the modern take on duality. Breiger's

paper stands tall for its argument against the collapsing of levels into simpler 'flat' networks for analytical convenience; for its argument that levels should be analyzed together, not separately. This is exactly the direction that network researchers need in understanding the complex social systems of our world and the deep societal issues that they face.

10. Navigating the Labyrinth of Involution: A Smart Network Simulation Approach to Resource Competition

Renxian Zuo (Wuhan University)
Co-authors: Ding Honghao, Yang Yu, Chaocheng He, Jian Wu

"Involution" has emerged as a prominent term reflecting the intense competition for limited resources in China. To explore its underlying dynamics mechanisms and possible solutions, this study designs an intelligent agent-based network simulation model of involution based on a large language model (LLM). Contrasting with traditional models that rely on preset rules, this research utilizes an LLM to simulate strategic interactions among agents, revealing the intricate interplay between social factors and individual behaviors in the context of resource allocation. The study proposed a homogeneous node technical attributes & strategy path theory explanation framework to explore the dynamics mechanism of involution. In a fixed place with limited resources, the number of nodes, homogeneity of node technical attributes, and strategy path result in severe involution. Otherwise, it can be alleviated. The theory explanation framework and conclusions drawn offer insights and macro-level regulatory strategies for mitigating the issue of social involution. The research methodology provides a framework for exploring social psychology, complex human-computer interaction strategies, and other related fields.

11. Bayesian Estimation of ERGMs with Not-at-Random Missingness in Covert Networks

Jonathan Januar (University of Melbourne)
Co-authors: Johan Koskinen, Colin Gallagher

Missing data methods generally start with the missing at random assumption. However, this assumption may not generally be applicable to missing network data due to dependencies in the true network. In previous work, we proposed using exponential random graph models (ERGMs) as a flexible way of modelling how covert networks are observed, i.e. what processes cause network tie-variables to be missing. Using this framework, we also demonstrated that plausible missing not at random mechanisms in covert network settings can have drastic effects on the observed network depending on specification of the missingness mechanism. In pursuit of a method to address the estimation of ERGMs with missing data that are missing not at random, we incorporate the statistically modelling of missingness mechanism with the estimation of ERGMs for the covert networks using Bayesian data augmentation. The proposed inference scheme can be used to explore a variety of missingness mechanisms and evaluate the sensitivity of the estimated parameters with their corresponding missingness mechanisms.

Session 4: Business and Innovation

12. Moving Interactions among Institutional Variables: A Weighted Correlation Network Analysis Approach

John Salazar (University of Sydney)
Co-authors: Petr Matous

Correlation networks allow the identification and visualization of the relationships of systems of variables or elements, unravelling general patterns within complex systems. These networks usually leverage weighted correlation-based network analysis (WGCNA) methods to map and assess network properties and cluster structures, with multiple examples ranging from biological systems to psychological traits. However, WGCNA presents some limitations, such as its reliance on static relationships between variables disregarding moving interactions in systems of variables or elements. To address this limitation, we employ a moving-windows approach, which examines how

relationships between variables in complex systems change along different performance levels, thus providing a more nuanced understanding of their interactions.

This paper employs WGCNA with the moving-windows approach, taking as a case of study variables determining the success of infrastructure projects within a country (i.e., institutional variables). Specifically, we evaluate how the relationships between markets institutional variables change insofar as countries achieve higher performance levels (i.e., maturity) in project programs. For this purpose, we employ data from 69 markets across Latin America, the Middle East, the Asia Pacific Region, Sub-Saharan Africa, Asia, and Europe from the Inframation database.

Results indicate higher interdependencies among institutional variables at the extremes of the maturity spectrum, characterized by higher levels of connectivity and lower modularity, suggesting changes in the modules compositions as maturity progresses.

By integrating WGCNA and a moving-windows approach, this research seeks to provide deeper insights into the moving interactions of institutional interactions and their impact on PPP project performance, offering recommendations for policymakers and practitioners involved in infrastructure development and project management. We conclude with implications of the results for WGCNA and Social Network Analysis (SNA).

13. CEO Networks and Succession in the Sport Industry

Lloyd Rothwell (University of Technology Sydney)
Co-authors: Simon Darcy, Tracy Taylor

This study investigated the social networks of Australian national sport organisation (NSOs) chief executive officers (CEOs) within the context of succession. In doing so, CEOs assess the importance of their personal work-based network to their appointment and identify specific aspects of their network which they view as being advantageous to their selection. In light of the well-established lack of diversity in leadership positions in the sport industry, comparisons are made between the networks of male and female CEOs.

Thirteen CEOs participated in this research (four female, nine male) from eleven NSOs (four professional sport NSOs and seven Olympic sport NSOs). Data was collected using social network surveys and semi-structured interviews. Each ego-net was constructed and analysed using Ucinet and NetDraw. Interview data was analysed thematically using NVivo. Findings reveal CEOs perceive their work-based social networks to be of value in their appointment, as managing relationships and stakeholders effectively is an important aspect of being a CEO. As such, CEOs consider it advantageous to be embedded in relevant intraorganisational and interorganisational social networks at the time of their appointment. While insider successors have the advantage of existing networks within the NSO and their member organisations, outsider successors view their wider networks amongst related stakeholders such as government bodies and broadcasters to be beneficial to their candidature. Networks also aid in career progression through mentorship, sponsorship, and other similar functions. Ties to the Chair of the hiring organisation were essential in unlocking the succession opportunity, either through a direct tie or via a bridging network partner to help establish a trusting relationship. Differences in size, tie strength, and tie function are observed in the networks of male CEOs compared to female CEOs. Most notably, female CEOs have smaller but more intimate networks than their male counterparts.

This study makes an important and unique contribution to knowledge through an examination of CEO personal networks, which extends the work of others who have previously linked social networks to CEO succession and selection. Further, this research builds on sport management literature by adding to the small body of work examining executive succession and answers calls to empirically connect social networks to career progression in sport. The differences in the networks and networking experiences of male CEOs compared to female CEOs identified in this study adds to the gender equity literature in sport which has previously shown females are disadvantaged in these areas, and builds on the work of researchers who have noted gender-based distinctions in personal social networks.

Session 5: Theory and Methods II

14. The Duality of Relations and Ties

Philippa Pattison (University of Sydney)

Social scientists have long recognised that networks among actors of different types are crucial to understanding the social world, even though they have different views on the theoretical frameworks within which they are most fruitfully explored. An early theoretical framework for such systems of relationships among actors was that of Nadel (1957), for whom a primary focus was the 'interlocking' of the relationships among actors. Nadel adopted the term triadization to refer to the involvement of third actors in the potential interdependencies among relationships and recognized the potential presence of logical cleavages in the relational system that allowed sub-components of interdependent relations to overlap in various ways. In this paper, I return to Nadel's (1957) original insights and propose a descriptive analysis of the interdependencies and cleavages among social relations without presupposing the existence of social roles and positions. Instead, in the spirit of Boorman and White (1976), it is proposed to use relational composition and intersection and the algebraic structures to which they give rise to reflect the full suite of possibilities inherent in the concept of triadization of relationships. Following Breiger (1974), the duality or co-constitutive character of the relations in these algebras and the pairs of actors whom they link is then exploited to identify the irreducible components and the logical cleavages in the system of relations. I argue that this descriptive analysis has the potential to offer insights about the nature of relational interdependencies and hence add a useful exploratory capacity to contemporary stochastic modelling approaches.

15. Maximum Likelihood Estimation for Network Models from Ambiguous Egocentric Data

Pavel Krivitsky (University of New South Wales)

Egocentric sampling is a common approach to collecting network data in a wide variety of settings, in which a sample of actors in the network ("egos") is asked to provide information about their connections ("alters"). Some designs allow each ego's alters to be unambigously identified; in particular, they can observe if two egos had nominated the same alter and/or if an alter is also an ego. Other designs---such as those that only ask about alters' demographic information to preserve confidentiality---are more ambiguous, in that each alter described can be one of several actors in the network. It is often of interest to fit whole-network models such as exponential-family random graph models (ERGMs) to such data. This facilitates both statistical inference, to identify and test social forces affecting network formation; and simulation, to obtain realisations of networks consistent with observed data. For the unambiguous design, maximum likelihood estimation using missing data techniques is straightforward, if computationally intensive (Handcock and Gile, 2010). For the ambiguous design, it is often possible to use standard survey inference techniques to obtain estimators for an ERGM's sufficient statistics and hence obtain pseudo-maximum likelihood (PMLE) estimates (Krivitsky and Morris, 2017). In this work, we derive and implement computational techniques for maximum likelihood estimators for the ambiguous egocentric data. Simulation studies and applications are used to explore their properties and compare them to those of PMLE, as well as quantifying the information lost compared to unambiguous egocentric data.

16. Error Bounds on Link Prediction in Dyad Independent Networks

Kevin Pan (University of New South Wales)
Co-authors: Pavel Krivitsky

We consider the problem of predicting relationships (the presence or absence of a tie) in a network from partially observed data. We assume the sample is generated from a dyad independent model which is parameterised by a matrix M, such that the probability of forming a link between a pair of actors is a function of the corresponding matrix entry. The task is to recover the matrix M from the available observations (observed present, observed absent, or missing) which are generated under this model.

If we impose restrictions on the class of matrices that are allowed in the model, then estimation of M becomes tractable. In particular, we discuss the case where the parameters space is the set of low rank matrices. This low-rank structure may arise from the presence of latent variables, such that the model's intrinsic degrees of freedom are smaller than its extrinsic dimensionality. We discuss as an application, link prediction in latent space models (Hoff 2002) and provide a bound on the estimation error.

17. Discerning Media Bias within a Network of Political Allies and Opponents: The Idealized Example of a Biased Coin

Nicholas Kah Yean Low (University of Melbourne)
Co-authors: Andrew Melatos

Perceptions of the political bias of a media organization can be shaped from the supply side, via the publication of media products (e.g. daily newspaper editorials), and from the demand side, when consumers react to media products not only based on their own independent assessment but also by observing the opinions of political allies and opponents (e.g. as expressed on social media). To model the above scenario, a network of Bayesian learners is constructed, where the bias perceived by each agent follows a probability distribution. The Bayesian framework allows for the uncertainty associated with the agents opinions to be explicitly tracked. It also generalizes many Bayesian models in the literature, which typically do not include antagonistic interactions.

For tractability, the complex problem of inferring the political bias of a media organization is mapped onto the idealized problem of inferring the bias of a coin. The beliefs of each agent are updated iteratively through observations of two signals, (i) the coin toss, and (ii) 'peer pressure' from political allies and opponents. Agents strive to increase and decrease the overlap of their beliefs with their allies and opponents respectively, by moving their belief probability distribution towards (away from) their allies (opponents). Numerical simulations are performed on networks with between two and 100 agents. To ensure that the findings of the model are statistically significant, we repeat the simulations up to 1e5 times with randomized initial beliefs, coin tosses and network structures.

Numerical simulations reveal the following key findings. (i) Antagonistic interactions between opponents 'lock out' some agents from the truth, which causes them to converge onto the wrong conclusion quicker than agents that converge onto the truth. Quantifying this phenomenon, one finds that the wrong conclusion is reached first 76% of the time and ¼1e3 time steps quicker on average than the right conclusion, for randomized opponents-only networks with 100 agents. (ii) Turbulent nonconveregence, where some agents cannot 'make up their mind' and vacillate in their beliefs, occurs when the network contains a mixture of allies and opponents, not when the network contains only allies or only opponents. The prevalence of turbulent nonconvergence in randomized networks with 100 agents is consistent with the social science theory of structural balance, where turbulent nonconvergence is most common in structurally unbalanced networks, followed by weakly balanced networks (which includes opponents-only networks) and strongly balanced networks (which includes allies-only networks). (iii) The phenomenon of long-term intermittency is observed, where some agents cycle between eras of stability, where their beliefs do not change for many (more than 100) time steps, and eras of turbulence, where their beliefs change from one time step to the next. For networks with four agents, the network structures that allow for intermittency are identified.

Session 6: Networks and Conflict

18. Mapping the Geospatial Dispersion of Crime Events in Co-Offending Networks Using Relational Hyperevent Models

David Bright (Deakin University)
Co-authors: Juergen Lerner, Giles Oatley

Research on co-offending networks has become increasingly popular across the last two decades of criminological research. Across the same period there has been increasing interest in geospatial mapping and analyses of crime events and offenders. In this paper, we examine co-offending network topography using Relational Hyperevent Models in concert with geospatial analyses. The aim of the paper is to examine the relationship between co-offending and the geospatial dispersal of crime events, crime types and crime seriousness. We examine relationships between offender criminal versatility (in terms of crime types and seriousness) and the geospatial spread of crime events. To accomplish this, we use arrest data from a large Australian metropolitan city across a five-year period and compare offenders who commit only solo crimes with offenders who commit co-offences. We pose the following three research questions: (1) For solo and co-offending, what is extent of geospatial dispersion of actors past crime events

in relation to future crime events? (2) For solo and co-offending, what is the geospatial dispersion of crime types? (3) For solo and co-offending, what is the geospatial dispersion of crime event seriousness? We interpret results with reference to dominant criminological and social theory including social learning and differential association, incorporating both network and geospatial observations. We examine implications for policy and practice based on the results of the study.

19. The Evolution of Armed Conflicts: The Dynamics of Relational Mechanisms in the Colombian Armed Conflict

Laura Roldan (University of Exeter)
Co-authors: Lorien Jasny

This study investigates the dynamics of the Colombian armed conflict, one of the longest-running civil conflicts in the Western Hemisphere, using a Relational Event Model (REM). The conflict, which has persisted for over five decades, provides a complex case for analyzing how armed conflicts evolve over time, driven by a multitude of actors and underpinned by deeply entrenched socio-political and economic factors. The research focuses on understanding the microdynamics that perpetuate such conflicts, particularly examining how actions between warring groups influence subsequent interactions and the overall trajectory of the conflict.

Drawing on extensive historical data of 36,740 reported engagements from 1958 to 2021, this study categorizes the conflict into two distinct periods: the formative years (1960-1983) and the later, more complex phase (1984-2018). The REM framework allows for the analysis of interaction sequences between the primary actors guerrilla groups, paramilitary forces, and state agents identifying patterns of reciprocity and retaliation that characterize the conflict's escalation and persistence.

The findings reveal a consistent pattern of retaliatory actions throughout the conflict's duration, affirming the dynamic nature of warfare as proposed in the literature. Specifically, the turn-receiving parameter, which captures immediate reciprocation of attacks, consistently shows positive effects, indicating a prevalent retaliatory behavior among the combatants. In contrast, the turn-continuing parameter, reflecting the tendency of groups to target new actors rather than continuing with the same opponent, generally presents negative coefficients, suggesting a strategic avoidance of broadening the conflict scope.

The analysis also identifies key moments within the conflict where shifts in these dynamics occurred, often coinciding with significant historical events such as the implementation of security statutes, the rise of drug trafficking as a funding mechanism, and various peace initiatives. These shifts highlight the fluidity of conflict dynamics, where periods of intense violence are interspersed with temporary respites, only for the conflict to re-escalate as actors regroup and adapt their strategies.

This study contributes to the broader understanding of civil war dynamics by demonstrating how micro-level interactions can have significant implications for the longevity and intensity of conflicts. The application of the REM in this context provides valuable insights into the mechanisms that sustain such protracted conflicts, offering potential pathways for de-escalation and peacebuilding. However, the research also underscores the challenges inherent in conflict resolution, particularly in contexts where multiple actors with divergent interests are involved.

20. Social Network Analysis of Conflict Dynamics in Virtual Market Groups: Insights from MMORPGs

Robert Fleet (Australian National University)

This study examines the structural and behavioural dynamics of two major competing groups within a massively multiplayer online role-playing game (MMORPG) to uncover parallels with real-world illicit market groups (IMGs). Utilizing data from EVE Online, a game environment that simulates complex socio-economic interactions, we conducted an in-depth social network analysis (SNA) to explore how self-organizing groups strategise and deploy violence in resource conflicts.

The studies findings reveal distinct organisational differences between the two groups under study. Group A exhibits a more cohesive internal structure, with higher clustering coefficients and closer-knit subgroups, suggesting a balanced approach between whole-group cohesion and sub-group independence. In contrast, Group B is more diffusely structured with weaker intra-group ties but shows a higher degree of betweenness centrality, indicating the presence of key individuals who play crucial roles in communication and resource flow. The analysis of victimisation networks further shows that Group A members are more actively involved in conflict events, while Group B, despite deploying fewer resources, suffers significantly higher losses, highlighting differing strategic approaches to conflict engagement.

These findings suggest that virtual environments like MMORPGs can effectively model the organizational dynamics of IMGs, providing valuable insights into how these groups manage conflict and allocate resources. This research underscores the potential of MMORPGs as a proxy for studying real-world illicit networks, offering novel methodologies for both academic research and law enforcement strategies.

21. Milgram's Obedience to Authority (1974) and Interpersonal Power

Dan Chamberlain (La Trobe University)

Milgram's seminal and infamous work Obedience to Authority (1974) details a series of experiments in which subjects were instructed to shock another participant by an authority figure. Born out of a desire to understand how seemingly ordinary people could abet the industrial scale of genocide in the Holocaust, the study sought to understand people's willingness to follow orders to inflict pain on other people. While no electric shocks were actually administered, the high proportion of subjects who continued the experiment through to its conclusion was extremely confronting for many, speaking to the propensity for people to commit acts of evil when commanded to by a figure in authority.

Milgram's work remains relevant fifty years after publication, and the study continues to be taught, although the focus is often on the ethical issues in how it was conducted. Applying a network perspective, the experiments are interesting vignettes in the application of interpersonal power, as the experimenter exerts their power on the subject to occasion an outcome. The carefully constructed variations in experiments, such as changing the proximity between instructor and subject, or subject and participant, give considerable insight into the factors which can influence the willingness to obey orders.

What can we learn by revisiting this study? First, we can conclude that power is an experimentally testable concept, and the numerous variables that influence the exercise of power can be controlled. Second, while cultural factors have a significant role in obedience, the nature of the interpersonal relationship was not studied. It is unclear whether the subject's personal relationship with the experimenter and/or the participant would change the outcome. Lastly, despite the issues around informed consent and participant distress, well-designed studies into interpersonal power can be conducted ethically. Milgram's study was conscious of the power of the researcher in the experimental setting and careful to provide post-care to subjects who experienced distress.

Session 7: Communities and Cultures

22. Mental Health and Disrespect: A School Case Study

Dean Lusher (Swinburne University of Technology)
Co-authors: Peng Wang, Ray Swann, Bopha Roden

Significant attention has been given to the mental health of students in the wake of the COVID-19 epidemic. This presentation details the association of a particular type of negative tie – disrespect – within a school student population and its connection to mental health. We assert five propositions regarding the structure of disrespect relations between students, including how such relations may align with negative mental health outcomes. We collected data on the Year 11 students from an all-male independent school in Melbourne, Australia. We apply an ERGM to the data to determine the co-occurrence of mental health outcomes with ties of disrespect. We find support for most propositions. First, disrespect is asymmetrical and hierarchical. Second, students who are disrespected are more likely to have mental health concerns. Third, students who disrespect others are more likely to have mental health issues. Fourth, when looking at dyads of disrespected-disrespectful students, we observe a trend towards a difference in mental health scores between the disrespectful and the disrespected person. Finally, we find no evidence that disrespect begets disrespect, such that "if I am disrespected" that then "I disrespect someone else". Overall, our findings demonstrate the disrespect as a relational concept gives us substantial insights into students' social relationships and has a strong link to student mental health.

23. Observations of Negative Tie Attributes on Construction Worker Mental Health

Rebecca Langdon (Queensland University of Technology)

Construction workers have a high suicide rate and experience high levels of psychological distress compared to other industries in Australia. Distressed construction workers often have less social support available to them from their social networks, and more connections within their networks that tend to a negative influence on their wellbeing. Drawing from a sub-sample of construction workers who nominated at least one negative influence tie in their networks (N = 55 cases) were analysed. Comparing non-distressed workers with distressed workers, the distressed workers had a significantly higher proportion of negative ties within their networks, distressed workers also had less diverse networks (less variety of categories in their overall networks). When examining the attributes of the negative ties found that distressed construction workers tended to have more daily and close contact with their negative tie alter. Interestingly, distressed workers also reported a higher proportion of work colleagues as having a negative influence on their wellbeing. This indicates that work-related connections may be fostering or encouraging negative health practices that can have damaging consequences to distressed worker health and wellbeing.

24. Cultural Mentorship and Advice-Seeking Relationships in Remote Schools

Tracy Durksen (University of New South Wales)
Co-authors: Claire Golledge, Keiko Bostwick, Kevin Lowe, Annette Woods, Greg Vass

Teachers in Australia need to be supported through contextualised and research-informed professional learning that focuses on Aboriginal and Torres Strait Islander families and communities being meaningfully involved in the life of schools and decision-making. Culturally Nourishing Schooling (CNS), a collaborative whole-of-school reform project is leading the way through investigating new ways of providing equitable, quality schooling for Aboriginal students. Eight government schools in NSW were recruited to participate in CNS given their relatively high population of Aboriginal students. Through research and practice, teachers, leaders, cultural mentors and other interested community members and stakeholders engage in a suite of strategies each year. These strategies provide a framework to underpin whole-school change for a minimum of three years. Quantitative and qualitative methods are providing invaluable variable- and person-centred evidence on what supports genuine cultural inclusion in CNS schools. Since the CNS project emphasises the establishment of meaningful relationships and connections with Country and localised Indigenous knowledges, histories and experiences, we looked to social network analysis to enhance our understanding of the nature and dynamic of relationships in the network of schools. To start, we wondered how social networks in four of the participating schools enable advice-seeking relationships about the learning and school experiences of Aboriginal students. Specifically, we asked: What is the nature of educational advice-seeking relationships in remote CNS schools? We invited all teaching and non-teaching staff (158) across the four remote schools to complete one online survey. In addition to demographics and contextual details (e.g., years

living in the town; years working at the school), participants were asked “In thinking about the learning and educational experiences of Aboriginal students in the past 6 months, who have you gone to with your questions or to talk it out?” The survey response rate was 63% (100 from a possible 158 staff members). Of the 100 survey respondents, 39 (who were participants from three out of the four schools) identified at least one person and provided details on their advice-seeking relationships (e.g., role, relationship, interaction frequency, purpose, primary reason). Ucinet was used to compute and analyse the relational data. Initial findings from the 39 respondents revealed 83 nodes (people) and 101 ties. Centralisation for the network of three schools was low (.26), but results highlight within-school cultural mentors as considerable network enablers in enhancing the learning and educational experiences of Aboriginal students. Results specific to participant attribute data across all four schools will be included in this presentation. Future research will consider the nature of changing relationships within and across all CNS schools, while aiming to identify when a critical mass of staff is impacted by the CNS professional learning strategies to enact whole school change.

25. The Needs-Based Resource Generator: A New Measure of Social Capital

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Social capital can be conceptualized as a collection of resources that individuals can access through their social networks. Despite its theoretical ambiguity and complexity, it has been argued to play a significant role in maintaining social cohesion and individual well-being. The Resource Generator (RG; Van Der Gaag & Snijders, 2005) is one of the measures of social capital based on the perspectives of social network processes. It was originally developed in the Dutch context. However, it has been adopted in a variety of other national contexts (e.g., Japan, UK, US), and found to correlate with a variety of physical and mental health outcomes. In the current project, we have extended the original concept underlying the RG and developed a new measure, Needs-based Resource Generator (NBRG), based on contemporary theories of psychological needs, particularly designed for the multicultural and superdiverse context of Australia. The original RG takes the perspective of an individual as a goal-directed actor. In their goal pursuit, the actor would make use of their own capabilities and resources; however, they may also access relevant capabilities and resources through their alters in their social network. To the extent that these helpful social ties exist, the actor should be able to pursue their goals more effectively. Extending this conceptualization, the new proposed measure, NBRG, regards the satisfaction of various needs as significant goals for an individual actor. It asks the extent to which the actor has (1) positive social ties that enable them to access the resources to pursue these goals and (2) negative social ties that hinder their goal pursuit. The needs that the instrument covered include basic physical needs (e.g., clothing, food, and shelter; physical mobility) to psychological needs (e.g., family; need to belong; efficacious; autonomy) and societal needs (e.g., transport, access to the internet), which current theories of psychological needs suggest are significant (e.g., Deci & Ryan, 2000; Neel et al., 2016). In a preliminary examination of its validity, first-year psychology students at the University of Melbourne were asked to respond to this new instrument together with other related measures (the original RG, social support, emotion regulation difficulties) and a host of health and mental health outcome measures. At the time of the abstract submission deadline, the preliminary analyses suggest that the new NBRG has a good prospect a high level of internal consistency, and positively correlated with the original RG, social support, and emotion regulation difficulty measures in the expected direction. In addition, the NBRG’s positive and negative social capital scores predicted psychological well-being independently of the other related measures. The data collection is still ongoing, and further results will become available for the conference presentation. We will present further plans for developing this new measure of social capital in the Australian context.

Session 8: Online Networks

26. Multi-Layer network Analysis of Deliberation in an Online Discussion Platform: The Case of Reddit

Gao Tianshu (Curtin University)

Online discussion platforms such as Reddit have the potential to increase participation by citizens in discussion of social and political issues, contributing to opinion formation and consensus building. However, online discussion platforms are increasingly implicated in societal problems such as the spread of false information, increased polarisation, and the facilitation of online harassment and hate speech. Political scientists have highlighted that for discussion to be considered "deliberative" and hence beneficial or conducive to consensus building, certain conditions need to be met. Gonzalez-Bailon et al., 2010, proposed a framework to measure the extent of deliberation in online discussions based on the hierarchical structure of the tree network used to represent the discussion thread. Two network metrics were proposed for measuring the extent of deliberation: the number of nested layers (maximum depth) and the maximum number of comments at any layer (maximum width).

Inspired by this work, we propose a two-layer network model to describe discussions taking place on Reddit, capturing both user-to-user interaction and the structure of post threads. In our model, the hierarchical network of the discussion thread is captured by the discussion layer similarly to Gonzalez-Bailon et al. We introduce an actor layer to capture user-to-user interactions, while inter-layer links capture comment ownership by given users. Moving beyond the maximum width-maximum depth metric, we introduce two additional metrics: average width-average depth and average dyadic conversation length-dyadic conversation count. We propose that these provide a more comprehensive understanding of the discussion structure and user-to-user interactions, and hence the level of deliberation for a given post.

We collected a large dataset of Reddit posts across 72 highly-active subreddits (communities which focus on a specific topic), totaling over 20 million comments in 218,892 posts. We used the two-layer network model to analyse the deliberative potential of different subreddits, finding that subreddits that focused on sports or a particular geographical region consistently had high levels of deliberation across all three metrics; subreddits focused on politics also had high levels of deliberation, but below that of regional or sports. By examining all three metrics, we are also able to identify some subreddits, such as those focused on specific video games, which had sustained argumentation (long conversations between two users) while other subreddits, such as those focused on memes, had high representation (many users, but limited reciprocal replies). Analysis of the actor layer revealed several structural characteristics that were consistent across all subreddits. Namely, the networks are highly sparse, follow a power-law degree distribution, have small-world features, have a similar number of highly active users (who post multiple times within the data collection period), and exhibit moderate degree assortativity. We also find a correlation between the characteristics of actor layer and the level of the deliberation of the discussion threads as measured using the metrics described above.

27. Understanding Follower-Follower Dynamics in Influencer Marketing from Social Network Perspective

Thi Nguyen (Swinburne University of Technology)
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Introduction and Research Aim: Influencer marketing, a strategy that leverages social media opinion leaders to drive consumer awareness and purchase intention, has seen widespread adoption by brands (Influencer Marketing Hub, 2024). These influencers are selected for their unique assets, such as perceived trustworthiness, creativity, and the ability to engage their followers (Farrell, Campbell, and Sands, 2022, De Vries, Gensler and Leeflang, 2017). While the influencer-follower and brand-influencer relationships have been extensively studied, the connections among followers themselves have not been thoroughly explored. Traditional research in this area has predominantly focused on the relationships between influencers and their followers, or between influencers and brands. However, this research shifts the focus towards the often-overlooked follower-follower connections, which lie at the core of an influencer's network.

The aim of this research is applying SNA to explore the extent to which follower-follower connections impact influencer marketing effectiveness, thereby providing a richer understanding of the social dynamics at play. Social Network Analysis (SNA) is particularly well-suited for this task, as it allows researchers to map out and quantify the relationships within a network (Koskinen & Stenberg, 2012, Koskinen, Robins, Wang & Pattison, 2013). By applying SNA to influencer marketing, this research moves beyond the traditional metrics of reach and engagement, offering

a more sophisticated analysis that includes the structural characteristics of follower networks.

Methodology: This research uses data from Foody.vn, a leading food review platform in Vietnam (Toplist, 2022), to investigate the role of follower-follower connections in influencer marketing. Data from 123 food and beverage brands and 269,390 unique users were collected over a three-month period. The analysis focuses on how various network metrics such as outdegree, indegree, network density, and centrality affect influencer marketing effectiveness.

The application of Exponential Random Graph Models (ERGMs) (Snijders, 2002, Caimo & Friel, 2011) and the MPNet software is central to this research. ERGMs are particularly useful for modelling the complex dependencies within social networks, allowing for a detailed examination of the likelihood that certain network structures will emerge. MPNet provides the tools needed to simulate, estimate, and evaluate these models, offering insights into the role of follower-follower interactions in influencer marketing.
By using SNA methodologies, this study can identify key influencers within follower networks who may not be immediately obvious based on follower counts alone. Metrics such as betweenness centrality and eigenvector centrality help pinpoint followers who play a critical role in spreading an influencer's message, thereby enhancing the overall effectiveness of the marketing strategy.

Conclusion and Contribution: While the data analysis is still in progress, preliminary insights suggest that SNA offers unique contributions to understanding influencer marketing. For instance, network centrality measures can reveal followers who act as hubs or bridges within the network, facilitating the spread of information and engagement. These insights could enable brands to target these key individuals, optimising their marketing efforts by focusing on the most influential nodes within a follower network.

This research contributes to the field of influencer marketing by highlighting the importance of follower-follower connections and demonstrating how SNA can be used to understand these dynamics. Unlike traditional marketing analysis methods, SNA provides a detailed map of the interactions within a network, offering insights that can significantly enhance the effectiveness of influencer marketing strategies.
By focusing on the structural characteristics of follower networks, this study provides a new perspective on how influence is spread within social media environments. The findings have important implications for brands, suggesting that targeting key individuals within follower networks could lead to more effective and efficient marketing campaigns. In conclusion, SNA not only deepens our theoretical understanding of social networks but also offers practical tools for optimising influencer marketing strategies.

Poster Abstracts

1. Diversity in Invasive Species Management Networks

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Effective management of invasive species requires collaboration across a range of stakeholders. These stakeholders exhibit diverse attributes such as organisation types, operational scale, objectives, and roles within projects. Identifying the diverse attributes of stakeholders is beneficial for increasing collaboration success while minimising potential conflicts among multiple stakeholders when managing invasive species across landscapes. Despite the increasing number of studies on connections among stakeholders, there is little understanding of the diverse attributes of stakeholders involved in invasive species management. This is a notable gap because the diversity of stakeholders is one of the significant factors that can influence collaboration success. To bridge this knowledge gap, we used a social network approach to identify the attributes of stakeholders that influence their participation in collaborations using a case study of invasive wild pig (Sus scrofa) management in Queensland, Australia. Our findings suggest that even though the overall stakeholder network was diverse, the stakeholder network at the project level exhibited a lack of diversity on average, particularly regarding the scale of operation and type of organisation. In other words, stakeholders are highly likely to form ties in projects involving other stakeholders from similar types of organisations or operational scales. We suggest that targeting a greater diversity of stakeholders across types of organisations and scales of operations might enhance the success of collaborative invasive species management.

2. Networked Partisans and Perceptions of Media Bias

Yutong Bu (The University of Melbourne)
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Media bias influences society by affecting the political voting system, as the electorate primarily acquires knowledge about political parties and public policies through channels such as print, broadcast, and social media. An individual's viewpoint on media bias is influenced both by consumption of media content and by the peer pressure of their networked political allies and opponents. Modelling the perception of media bias can be approached through network analysis. In this work, we use an idealised model of the perception formation process, based on a network of political allies and opponents inferring the bias of a coin. The model uses an Bayesian probabilistic model in which the agents hold a spectrum of uncertain beliefs at a given instant in time, as opposed to deterministic models that permit an agent to hold only one belief at a time. Within the Bayesian framework, an agent's belief is represented by a probability distribution, which evolves in response to stochastic external stimuli (e.g. daily newspaper editorials) and peer pressure within the network (e.g. peer opinion exchange), leading to drift and diffusion of beliefs. We extend this model by disrupting the network with partisans: obdurate agents who refuse to change their opinion, regardless of external inputs or peer pressure.

This work demonstrates that the presence of even a single partisan can destabilise an allies-only network, stopping it from reaching asymptotic learning, and prevent agents from inferring the correct bias. The agents' beliefs vacillate indefinitely between the true bias and the partisan's belief. The dwell time -- the number of time steps over which the agents' beliefs are stable -- increases as the number of partisans in the network increases, and decreases when there is disagreement among multiple conflicting partisans. In opponents-only networks, asymptotic learning is achievable regardless of the presence of partisans. The counterintuitive behaviour of persuadable agents reaching the wrong conclusion first shown in previous work without partisans occurs in sparsely connected networks. In mixed networks of both allies and opponents, the presence of partisans results in counterintuitive outcomes, which depend sensitively on the placement of the partisans within the network, and the media signal. In a strongly-balanced triad with a partisan, intermittent behaviour is observed, where the belief of persuadable agents undergoes sudden transitions between long intervals of static and vacillating beliefs. Also, counterintuitively, in an unbalanced triad, a persuadable agent can reach asymptotic learning at the true bias if the partisan is strategically positioned, but can be led away from the true bias in the absence of partisans.

3. Strengthening Care Networks: Applying Caring Life Course Theory to Enhance Cardiac Rehabilitation through Social Network Analysis

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The Caring Life Course Theory (CLCT) offers a comprehensive framework for analyzing care dynamics across the lifespan, focusing on relationships and transitions in care. This study applies CLCT to explore cardiac rehabilitation (CR) programs, particularly in rural and socio-economically disadvantaged areas of South Australia, where CR engagement and completion rates are notably low. By examining these programs through the lens of CLCT, we aim to identify patterns and relationships that could inform targeted interventions to improve CR outcomes. This study conducts a secondary analysis of qualitative data from 15 CR programs originally collected by Beleigoli et al. (2024). The data, comprising interviews and focus groups with CR patients and clinicians, were analyzed using NVivo for thematic coding based on CLCT constructs (Pinero de Plaza, et al. 2024). We then employed Social Network Analysis (SNA) to quantify the relationships among these constructs. Key SNA metrics, including degree centrality, betweenness centrality, and clustering coefficient, were used to evaluate the prominence of each construct within the care network and identify clusters and key relational pathways within the CR context.

The SNA revealed significant insights into the structure of the CR care network. Degree centrality identified Care Network (426 ties), Care Transition (346 ties), and Care Provision (CP) (278 ties) as the most connected nodes, highlighting their central roles in the network. Betweenness centrality underscored the importance of Care Network and Capability as critical intermediaries, suggesting their roles as crucial bridges facilitating interaction and information flow across the network. Strong relational ties were observed between Care Network â†” Capability (tie strength: 73), Care Network â†” Care-from-others (73), and Capability â†” Self-care (55), indicating robust interdependencies among these constructs. Cluster analysis uncovered two primary clusters: a core cluster consisting of Care Network, Care Transition, Care Provision, and Capability, and a secondary cluster centered on Self-care, Capacity, and Care-from-others. These clusters reflect CR programs' dual focus on systemic care processes and individual capacities. Peripheral nodes, such as Care Provision Package (degree centrality: 67) and Care Biography (53), played less central but contextually important roles in providing personalized care and understanding patient histories. The integrated nature of these constructs underscores the pivotal role of Care Network and Capability in effective CR delivery. Strengthening these constructs could significantly enhance CR engagement, particularly by improving Self-care and Care-from-others. Policymakers should prioritize developing robust care networks and enhancing patient capabilities, especially in rural areas with limited resources. Training programs can leverage these insights to equip healthcare providers with the skills and knowledge to support self-care and external care provision effectively.

This study demonstrates the utility of SNA in mapping and understanding the complex interrelationships within CR programs through the CLCT framework, with a specific focus on care networks. By identifying key constructs and relationships, the findings offer actionable insights that could be utilized to strengthen care networks and improve CR engagement and outcomes, particularly for underserved populations. Future research should focus on refining these insights and developing targeted interventions that address the specific needs of these groups.

4. Discerning Media Bias Within a Network of Political Allies: An Analytic Condition for Disruption of Learning by Partisans

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An individual’s opinion of political bias in the media is shaped by influences either exogenous independent analysis of media outputs) or endogenous (peer pressure by political allies and opponents) to their social network. In Ref. [1], these opinion dynamics were idealized as a network of Bayesian learners who infer the bias of a coin, with true bias Î¸0. In Ref. [2], this model was generalized to include the peer pressure of obdurate agents (partisans), who are

not persuadable. Numerical investigations in these studies show that if all partisans are certain of a false bias, then persuadable agents in allies-only networks are disrupted from asymptotically learning Î¸0. This disruption occurs as either an asymptotic
learning of a false bias, or as an intermittent vacillation between belief in a false bias and Î¸0 (turbulent nonconvergence). In this paper, we derive an analytic condition to demarcate the boundary between asymptotic learning and turbulent nonconvergence in terms of the properties of the network.

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