Australian National University

THE THIRD ANNUAL AUSTRALIAN SOCIAL NETWORK ANALYSIS CONFERENCE 2018

AUSTRALIAN NATIONAL UNIVERSITY

27-28 NOVEMBER 2018

School of Sociology

ANU College of Arts & Social Sciences

This conference was organised by the Virtual Observatory for the Study of Online Networks (VOSON) Lab, in the School of Sociology, Australian National University. The VOSON Lab is advancing the Social Science of the Internet through research, tool development, teaching and training. The conference was financially supported by the ANU College of Arts & Social Sciences, and the VOSON Lab.

THE ASNAC 2018

The organising committee is:

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Francisca Borquez

Xiaolan Cai

Liliana Oyarzun Silva.

The program committee is:

Robert Ackland

Timothy Graham

Mathieu O'Neil

Mahin Raissi.

WELCOME

Welcome to ASNAC 2018

To begin I would like acknowledge and celebrate the First Australians on whose traditional lands we meet, and pay our respect to the elders past, present and emerging.

The Australian National University is delighted to welcome you to the 3rd Australian Social Network Analysis Conference – ASNAC 2018.

This conference builds on the success of the inaugural ASNAC in Melbourne in 2016 and the second conference in Sydney last year.

ASNAC is an opportunity for the Australian social network community to gather together, and with guests from overseas, to discuss research advances in the field. The conference aims to raise the profile of social network analysis in Australia by bringing together academics, students, and industry partners from Australia and beyond. Presentations and posters in the conference cover the breadth of theory, method, and application of social network analysis in contexts ranging from health and the environment to innovation and social media. This year we are excited to include tools demonstrations as part of the conference.

We are very pleased you can join us here in Canberra for what is bound to be an interesting and enjoyable two days. This is an opportunity to both share your insights and perspectives and to learn from colleagues, helping to strengthen and grow the networks of social network researchers in Australia and the Asia-Pacific region.

Finally I wish to thank the members of the ASNAC 2018 program and organising committees, in particular Francisca Borquez, our keynote speaker Professor Mark Tranmer who has travelled from the University of Glasgow, and also my colleagues in the organising committee for the Australian Network for Social Network Analysis.

Associate Professor Robert Ackland

VOSON Lab and School of Sociology
Research School of Social Sciences

WELCOME TO **#ASNAC2018**

This conference marks the third national meeting in Australia for social network analysis (SNA) researchers and practitioners.

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, and 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).

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KEYNOTE SPEAKER

Professor Mark Tranmer

Univesity of Glasgow

Abstract

Social networks: A multilevel perspective

Multilevel models are often used when complex population structure is of direct substantive interest, rather than something to be accounted for in the analysis of individual level variables and relationships. Here, interest often focuses on the extent and nature of variation in an individual outcome, given the complex population structure in which individuals are embedded. I was drawn from multilevel modelling to Social Network Analysis (SNA) several years ago; four pages of a multilevel modelling book gave a small example of their use in SNA. My interest grew from there. In SNA, the population structure is of direct substantive interest. I became interested in how multilevel models can be used with social network data; often in the context of other population levels and classifications, such as organisations or areas. In this talk, I give my take on the analysis of social network data – from the perspective of a multilevel modeller. *Multilevel* is now also used to describe social networks with connections between lower level nodes, such as people, and connections between higher level nodes, such as organisations, to which the lower level nodes are affiliated. Although multilevel networks and the multilevel analysis of networks are two different things, there are situations in which multilevel models and concepts are useful in the context of multilevel networks. I suggest some future areas of research on social networks, from a multilevel perspective.

Biography

Mark Tranmer is a Professor of Quantitative Social Science, at the School of Social & Political Science, University of Glasgow. He leads the Glasgow Quantitative Methods Group (GQMG), which promotes the interdisciplinary use of quantitative methods in research & teaching.

His methodological research focus began in multilevel modelling, including the development of an approach to combine individual and aggregate data to assess individual and area variations in social, political and health variables. Recently, he has been interested in developing multilevel approaches for assessing the way in which the attributes of a network node (e.g. educational, health, and well-being measures for a person) co-vary with the attributes of other nodes to which they are connected (e.g. through friendship). He has further extended these approaches to assess changes over time in these variations.

Another of his recent research interests is the application of the Relational Event Model (REM) to assess persistence and reciprocity of social interactions over time, as well as the use of the REM for model-based approaches to the analysis of sequences, such as the life course, and its association with the health and well-being of people in later life.

PROGRAM
TUESDAY 27 NOVEMBER
HEDLEY BULL LECTURE THEATRE 1, 130 GARRAN ROAD, ACTON

TIME	EVENT
8.30am	*Presentation slides drop off*
9.00am	*Registration*
9.30am	**Opening remarks** Robert Ackland (Conference chair) and Ann Evans (Associate Dean (Research) ANU College of Arts and Social Sciences)
9.45am	**Keynote: Social networks: A multilevel perspective** Mark Tranmer (University of Glasgow)
10.30am	*Morning tea*
11.00am	**Session 2: Theory and methods – 1** **Networked world history: Radical challenges for social network theory** Garry Robins (University of Melbourne, Swinburne University of Technology) **A comparative approach for mapping online fields** Mathieu O'Neil (University of Canberra) **Brokerage as a process: Insights from networks of interactions:** Lucia Falzon (Defence Science and Technology Group and University of Melbourne) **Mediators of structural balance** Nicholas Harrigan (Macquarie University) **Multi-level, social-ecological networks and cooperation in the commons** Michele Barnes (James Cook University)
12.30pm	*Lunch*
1.15pm	**Session 3: Policy networks, politics and advocacy** **The network structure of online petitions: Exploratory analysis of Change.org in Australia** Mahin Raissi (Australian National University) **Social network analysis for policy evaluation - AusTender procurement network case study** Patrick Drake-Brockman (Digital Transformation Agency) **Contested diffusion and international movement networks;** **The liberalisation of abortion, 1920-2007** Dong-Ju Lee (Macquarie University) **The cheerleader effect? Information flows and influence in Twitter participation during televised electoral debates** Elizabeth Tait (Royal Melbourne Institute of Technology University)

PROGRAM
TUESDAY 27 NOVEMBER
HEDLEY BULL LECTURE THEATRE 1, 130 GARRAN ROAD, ACTON

TIME	EVENT
2.45pm	*Afternoon tea*
3.15pm	**Session 4: Innovation and business -1** **Emergence of chemistry networks in Australia and Southeast Asia** John Mark Webb (Swinburne University of Technology) **Broker roles in three open innovation partnerships** Andrew Terhorst (Commonwealth Scientific and Industrial Research Organisation) **Trust and collaboration networks among scientists engaged in the innovation of public research** Bopha Roden (Swinburne University of Technology) **Commercialisation and advice-seeking in the international community of controlled radical polymerisation (CRP) scientists** Dean Lusher (Swinburne University of Technology)
4.30pm	**Session 5: Labour market and education** **Labour market** **Determinants of employee participation in workplace governance: Evidence from a worker co-operative** James Coutinho (Swinburne University of Technology) **Social capital activation and labour market outcomes** Hang Young Lee (Macquarie University) **CEO pay ratio: What role do the board interlocking network and compensation consultants play?** Andre Gygax (University of Melbourne) **Education** **What's wrong with engineering students' social networks?** Faezeh Karimi (University of Sydney)
5.30pm	**Poster session, tool demonstration and drinks** Hedley Bull Atrium **Poster session** **stellar-ml, a new python library to perform machine learning on graphs** Anna Leontjeva (CSIRO, Data61) **How the stakeholders of negative emissions communicate online: Combining hyperlink network analysis and semantic network analysis** Yuanyuan Shang (Australian National University) **Connectivity and collaboration in farmer driven projects** Amanda Scott (Southern Cross University) **Mapping the manosphere: Analysing the network structure of men's groups on Reddit** Simon Copland (Australian National University) **Tool demonstration** **Exploring roguelike games through inspiration networks** Xavier Ho (CSIRO, Data61, University of Sydney) **Polinode: A web application for the collection and analysis of network data** Andrew Pitts (Polinode) **Collecting social medial network data with VOSON Dashboard and vosonSML** Bryan Gertzel (Australian National University) **Analysing networks and text with VOSON Dashboard** Xiaolan Cai (Australian National University) **Digital observatory – Research infrastructure for social media data** Marissa Takahashi (Queensland University of Technology)

PROGRAM
WEDNESDAY 28 NOVEMBER
HEDLEY BULL LECTURE THEATRE 1, 130 GARRAN ROAD, ACTON

TIME	EVENT
8.30am	*Presentation slides drop off*
9.00am	**Session 6: Theory and methods – 2** **Network structure of global remittances** Alex Stivala (Università della svizzera Italiana and Swinburne University of Technology) **Representativeness and generalisability of inference for exponential-family random graph models from samples of networks** Pavel Krivitsky (University of Wollongong) **External exposure, boundary-spanning, and opinion leadership in remote communities: A network experiment** Petr Matous (University of Sydney) **Valuing network connections** Kim Sawyer (University of Melbourne) **Indigenous Australian Governance: An ethnographic and theoretical framework** Diane Smith (Australian National University) **Investigating community organizational networks using 2-mode (hypernetwork) sampling** Malcolm Alexander (Australian Consortium for Social and Political Research Incorporated)
10.45am	*Morning tea*
11.15am	**Session 7: Online networks and crime** **Online networks** **A social network approach to studying profanity on social networking sites** Yunya Song (Hong Kong Baptist University) **The network structure of political conversations on Twitter** Robert Ackland (Australian National University) **Comparative analysis of community versus topic structure in hyperlink networks: A case study of government portal websites** Timothy Graham (Australian National University) **Crime networks** **How 'lone' are 'lone wolf' terrorists? A comparative analysis of personal backgrounds and ego networks** David Bright (Flinders University)
12.30pm	*Lunch*

PROGRAM
WEDNESDAY 28 NOVEMBER
HEDLEY BULL LECTURE THEATRE 1, 130 GARRAN ROAD, ACTON

TIME	EVENT
1.15pm	**Session 8: Health and wellbeing** **Improving integrated services using social ecology networks** Geoff Woolcott (Southern Cross University) **The network structure of general practice in Australia** Peter Straka (University of New South Wales) **The resilient health care network: A social network study of an international collaboration** Janet Long (Macquarie University) **A multilevel network approach to evaluating collaboration in community-based obesity prevention interventions** Peng Wang (Swinburne University of Technology) **Group memberships and life satisfaction: Individual- and community-level structural social capital in nationally representative samples** Colin Gallagher (Swinburne University of Technology)
2.45pm	*Afternoon tea*
3.15pm	**Session 9: Innovation and business – 2** **Collaborative research project networks and research impact** Marissa Takahashi (Queensland University of Technology) **Moderating influence of the business environment on suppliers' contractual embeddedness and sales probability: Complex adaptive system view** Buddhika Mannaperuma (University of Melbourne) **Who collaborates with whom - business networks in Australia** Chien-Hung Chien (Australian National University and Australian Bureau of Statistics)
4.15pm	*Conference recap and closing* Malcolm Alexander, Michele Barnes, Mark Tranmer and Robert Ackland

ABSTRACTS

Session 2: Theory and methods – 1

Networked world history: Radical challenges for social network theory

Garry Robins

(University of Melbourne, Swinburne University of Technology)

Eminent historian Niall Ferguson's notable claim is that human history can be understood entirely in network terms as conflict between structured socio-political hierarchies and more random bottom-up social movements. His 2016 world history of the last 500 years draws substantially on current network theory. The arguments are broad in scope but occasionally shallow often a compelling structural explanation is missing. Nevertheless, just as his account draws on network research, it also implies radical challenges for social network theory. This presentation points to three of these challenges: 1. Networks are not strategic. Central to Ferguson's arguments, this claim undermines the idea that a networked social system (e.g. network governance) might be effective for some long term purpose. 2. The appropriate scale of network explanation and the handling of multilevel aspects. Linear scaling up of network models and theories makes for aesthetically pleasing mathematics but is too often silly social science. And there are other forms of scaling than simply the number of nodes. 3. What plausible structural process could generate conflict between networks? I present one account consistent with but absent from Ferguson's book, based on cultural norms about different types of network ties (hierarchical or not). This account dissolves the separation between influence and selection that network researchers typically hold as given. Here, networks and attributes are not co-evolutionary (as in Stochastic Actor Oriented Models), but co-constitutive; and the conceptual distinction between networks as pipes and networks as bonds evaporates. I instance how this account illuminates the first Opium War between Britain and the Qing Empire. Ferguson does not present these challenges to network theory explicitly. But we social network researchers want to claim that networks are a convincing representation of human social structure. We cannot ignore major arguments implicit in network-based histories of political social systems.

[keywords: social network theory]

A comparative approach for mapping online fields

Mathieu O'Neil

(University of Canberra)

From a field-theoretic perspective, social relations are made of both social structures or objective differential possession of capital (in the academic field 'everyone knows' that university A is more well-endowed and prestigious than university B, for example), and social interactions - researchers from those two institutions may decide to collaborate and write papers together. Objective relations of power 'exist even if there is no interaction' (de Nooy 2003). An actor's sudden entry or withdrawal might significantly change a network's metrics, and hence its shape; whereas the boundaries of a field, encoded in cultural conceptions of power and privilege, would not necessarily be affected. A field perspective is useful when attempting to account for the strategies of online actors, such as decisions to connect (or not) to innovations. However empirical studies tend to deal with very general notions such as 'the Internet', 'social media', or 'Twitter', obviating the fact that not only are there 'online spaces which develop distinctive and well-ordered cultures' (Hine 2015), but that these online spaces are frequently embedded in highly distinctive offline locales. Drawing on semantic and hyperlink analysis of Australian and Canadian bee-related websites, this presentation outlines a new approach for embedding online field theory in a contextualist comparative approach (Powers & Vera-Zambrano 2018) aiming to identify the mechanisms that unify or differentiate cases across contexts.

[keywords: field theory, bees, online networks]

Brokerage as a process: Insights from networks of interactions

Lucia Falzon

(Defence Science and Technology Group and University of Melbourne)

With Eric Quintane, John Dunn

Social network research has typically represented social relations as network ties, captured from surveys and questionnaires. However, the recent availability of electronic trace data has made time-stamped social interactions more common as sources of network data. While the concepts of social relations and social interactions are related, there is a key distinction in terms of their temporal nature interactions are almost instantaneous relative to long-term relationships; and they typically have a recorded starting point and end-point. Aggregating social interactions over longer time frames makes them more similar to social relations, but it reduces the temporal information of social interactions. This is, at best, a missed opportunity to exploit valuable information on event durations and temporal patterns, and it ignores important information on the sequential nature of interactions. Sequences of social interactions that unfold over time enable a finer-grained investigation of chains of events that constitute social processes. The measures that have been developed for capturing social positions in social networks are unable to capture the social processes occurring in social interaction data, because they remove timing and sequence information from interaction data. In this paper we present a measure of brokerage process that can be applied directly to social interaction data. The measure captures the extent to which an actor engages in tertius iungens (bringing alters together) versus tertius gaudens (keeping alters apart) in a sequence of social interactions. The measure aggregates interactions, but in a way that captures both time and sequence in order to provide information about the process of brokerage (by contrast to the position of the broker). We present an empirical application of the measure using a dataset containing email communications from all employees in a medium size organization. We find that while the position of brokerage, as captured by Burt's traditional measure of constraint and the process of brokerage are related, they are also significantly different. Our preliminary analyses also suggest a link between the process of brokerage and performance.

[keywords: social interaction networks, temporal network measures, brokerage processes]

Mediators of structural balance

Nicholas Harrigan

(Macquarie University)

With Michael Genkin, Rajalakshmi Kanagavel, and Janice Yap

Structural balance is the theory that humans have a disposition to take sides in a signed networks, motivated by the desire to reduce cognitive dissonance. While structural balance is one of the most studied theories of signed ties, empirically the evidence for the theory is mixed. We ask why have researchers found strong evidence for structural balance in some studies, but not in others? We propose that for structural balance to manifest in a network, it requires the presence of one of three mediators: visibility, consequence, and normative orientation. We use various statistical models to analyse a longitudinal dataset of signed ties of 400 university students. We test for the impact of these three mediators on the presence or absence of structural balance.

[keywords: balance theory, structural balance, signed networks, negative ties, signed graphs]

Multi-level, social-ecological networks and cooperation in the commons

Michele Barnes

(James Cook University)

Complex interdependencies between social and ecological dynamics underpin many important environmental problems. To account for this complexity, a novel interdisciplinary network modeling framework that captures the relationships within and between people and nature has recently been developed. This approach leverages cutting edge advances in multi-level exponential random graph modeling and brings together perspectives from across the natural and social sciences to identify important structural relationships between people and nature that may facilitate or constrain effective environmental governance. Here, I present results from a comparative, empirical application of this approach that assesses how social-ecological interdependencies within and between fishing communities and fisheries resources mediate outcomes in coral reefs – an iconic common-pool resource system. Drawing on comprehensive social and ecological data from five coral reef fishing communities along the Kenyan coast, I show that cross-level social-ecological closure is associated with positive and measurable ecological outcomes. These results highlight the importance of establishing and maintaining cooperative ties with direct resource competitors when faced with "take-some" social dilemmas (e.g., the 'tragedy of the commons'), and are robust even when accounting for important endogenous and exogenous mechanisms known to play a role in shaping social networks. This work provides important empirical insight to a growing body of interdisciplinary research investigating the role of social connectivity and social-ecological alignment in facilitating (or impeding) desirable outcomes in environmental governance. It also helps to advance an integrative network modeling framework that can be applied empirically across a range of contexts in both the social and ecological sciences.

[keywords: ERGM, multi-level networks, social-ecological networks, cooperation, coral reefs]

ABSTRACTS

Session 3: Policy networks, politics and advocacy

The network structure of online petitions: Exploratory analysis of Change.org in Australia

Mahin Raissi

(Australian National University)

With Darren Halpin, Ariadne Vromen, Michael Vaughan

Online petitions are an important feature of contemporary political engagement in advanced democracies. As such, they have rightly been subject to an increasing volume of scholarly analysis. Yet, there has been only limited attention paid to network analysis of the structure of interactions captured through online petition platforms. In this paper we report on a unique data set – covering a five year period and over 17,000 petitions and 3 million users – documenting the development of the Change.org platform in Australia. Australia presents an interesting case as, until very recently, there was no national government hosted online petition site. The paper provides some initial exploratory analysis of the data set using the tools of social network analysis.

[keywords: online petition, change.org, Australia, social network analysis, political engagement]

Social network analysis for policy evaluation - AusTender procurement network case study

Patrick Drake-Brockman

(Digital Transformation Agency)

Government increasingly relies on network structures to engage with the community and build self-regulatory governance, oversight and accountability mechanisms. While the use and understanding of networks within public administration is well documented, public administration academics and practitioners have only recently started to explore the use of statistical network analysis for evaluating policy decisions and outcomes. The increasing availability of high performance desktop computing and open source programming tools provides an opportunity for academics and practitioners to include these statistical analysis methods in their work. This report presents a case-study use of advanced statistical analysis to explore changes in procurement policy from 2007-2018. I demonstrate the capabilities of various data science tools from network analytics to text mining to analyse large semi-structured datasets.

[keywords: policy evaluation, ERGM]

Contested diffusion and international movement networks: The liberalisation of abortion, 1920-2007

Dong-Ju Lee

(Macquarie University)

Why certain policies diffuse rapidly and widely while others do not? Why certain policies remain contested even if they become popular in numbers? This study tackles these questions by studying the diffusion of liberal abortion policies among 198 countries during the period 1920-2007. Liberal abortion is widely diffused as two-thirds of countries allow abortion for lawful reasons, but it is still highly controversial. I focus on international influences from two advocacy movements, namely international birth control movement and international women's rights movement, and compare how these two networks with their varying levels of consensus on legalisation have led to difference consequences concerning the pace and pattern toward liberalisation. In doing so, I measure the extent to which a country is embedded in these networks by using annual scores of eigenvector centrality from country's international organisational membership data. Multi-state models analyzing three different pathways to liberalisation reveal that women's right movement has a strong and radical influence on legalizing abortion. The ambivalent birth controllers do not exert independent influence except when they are met with domestic interest groups. And a country's susceptibility to liberalisation is dependent on network position (both of ego and alter). Yet, this position-based adoption results in limited diffusion in which central liberalizers have no contagious effect on restrictive countries.

[keywords: diffusion, abortion policy, centrality, liberalisation]

The cheerleader effect? Information flows and influence in Twitter participation during televised electoral debates

Elizabeth Tait

(Royal Melbourne Institute Of Technology)

With Graeme Baxter, Simon Burnett, John Isaacs, Iain MacLeod, Sarah Pedersen

Twitter participation is becoming an established feature of televised election debates. These 'back-channel chats' are of significance as they are referred to during the course of the televised programs and reflected in media reporting thereby becoming a part of the political discourse surrounding elections. This paper will present findings from analysis of two televised debates during the 2017 UK general election. The first debate, broadcast by the BBC, was held on Sunday, 21st May. During this debate, approximately 47,000 tweets containing the programme's #LeadersDebate hashtag were captured. The second debate was broadcast by STV on 6th June and approximately 22,000 tweets were captured using the programme makers' hashtag #ScotDebates. Analysis of 'mentions' of the leaders were conducted to determine the leaders generating the most impact and visibility in the twitter debates. Sentiment analysis was also conducted to determine where leaders were mentioned in positive or negative terms. These were plotted and visualized as graphs and compared against the research team's notes from the debates and, as may be expected, peaks in mentions tended to correspond with 'flash points' during the debate. A further point of analysis which will be the focus of this paper is the work conducted to understand the network properties of the twitter discussion space. Preliminary analysis revealed that a relatively small number of participants were responsible for a large amount of the widely shared content. Social Network Analysis is being conducted to identify the most influential actors and determine whether there are clusters of influence within the online debates. A hypothesis is that some political actors have a 'cheerleader' role seeking to promote their preferred candidates during these debates. A further point of analysis will be to determine if they are aligned with the official campaign organisations. This analysis, combined with the other quantitative and thematic analysis aims to contribute insights into modelling of twitter behaviour during electoral debates.

[keywords: politics, twitter, election debates, second screen]

ABSTRACTS

Session 4: Innovation and business – 1

Emergence of chemistry networks in Australia and Southeast Asia

John Mark Webb

(Swinburne University of Technology)

With Adam Finch, Barry Noller, Thomas H Spurling

Networks have become an established feature of scientific research. This paper focuses on the group of chemists that study the organic components of botanical plants, trees and spices known as natural products chemistry. Historically, early Australian chemists within the European settler community isolated essential oils as substitutes for similar oils known in Europe. An early example. From 1788, is the isolation of oils from Eucalyptus piperita for use medicinally as a substitute for oil of peppermint. Another stimulus was the need to understand the toxicity of native plants towards newly introduced stock such as sheep and cattle. In both fields, collaboration between the chemist and the botanist was crucial. With time, these interests broadened to an extensive and sustained effort to identify the biologically active components of Australian flora. This involved a considerable number of Australian organic chemists collaborating through what became known as the Australian phytochemical survey. Post World War II, UNESCO began to encourage research activities in this field of natural products chemistry, taking advantage of the research opportunities offered by the botanical resources of individual countries, especially in the tropics. Networks thus provided opportunities for capacity building of chemical research within emerging/ developing countries. The UNESCO networks gradually brought Australian natural products chemists in contact with their counterparts in Southeast Asia We have used bibliometric data to analyse the collaborations with these networks. Co-authorship is used as the proxy for network ties, though we recognise this is an imperfect measure. We will present these results within the historical context that enabled the emergence of these networks in the field of natural products chemistry.

[keywords: science networks, natural products chemistry, Southeast Asia, regional cooperation]

Broker roles in three open innovation partnerships

Andrew Terhorst

(CSIRO)

With Peng Wang, Dean Lusher

Open innovation is a distributed innovation process that involves multiple organisations exchanging knowledge and ideas with one another. In that sense, we can conceptualise an open innovation partnership as a purpose-built knowledge network, one engineered to achieve a specific innovation outcome. Brokers play an important role in such a network. By enabling new connections, brokers allow knowledge to flow more freely between partner organisations. Moreover, brokers also translate unfamiliar or complex knowledge and facilitate the generation of new ideas. Gould & Fernandez (1989) describe five different broker roles, namely internal coordinator, external mediator, representative, gatekeeper, and liaison. Using a simple Bernoulli model, Gould & Fernandez (1989) demonstrate how one can assess the statistical significance of each role in a given network. Unfortunately, their model does not consider other social mechanisms that may affect the network structure. To address this shortcoming, we have implemented actor-brokerage terms for each broker role in an exponential random graph modelling software tool (MPNet). This modification allows one to model purely structural, actor-relation, and the five actor-brokerage effects simultaneously. To test the modified software, we modelled knowledge and idea brokerage in three open innovation partnerships. As expected, the modelling results yield a more nuanced view of brokerage in each case. Interestingly, we found that it is possible to explain the observed network structures in each open innovation partnership using a simple or parsimonious model. Not only does this facilitate convergence in exponential random graph modelling, results from a simple model are usually less difficult to interpret. Overall, we find that adding actor-brokerage effects in an exponential random graph model allows us to characterise and highlight differences between open innovation partnerships.

[keywords: ERGM, brokerage, open innovation]

Trust and collaboration networks among scientists engaged in the innovation of public research

Bopha Roden

(Swinburne University of Technology)

With Dean Lusher, Tom Spurling, Julia Brennecke, Peng Wang, Greg Simpson, Till Klein, Michael Gilding, Ian Elsum, Julien Brailly

Over the last 10-20 years, every country with public research capacity has seen a political agenda geared at transfers between business and society. Globally, interactions between publicly funded research institutions, including universities, and industry are becoming subject to measurement and management, leading to more formal, contractual exchanges based on codified rules and regulations and an increase in university-industry (U-I) linkages. Strategic collaboration between the two worlds is seen by governments and academics alike as being vital to successful innovation of public research; and in recent times, there has been an increased focus on the importance of understanding the social processes that aid in facilitating collaboration. However, U-I collaboration can be limited by differing agendas, reward structures, cultures and, in particular in this research, the level of secrecy involved at the industry level. These barriers make U-I collaboration data difficult to access and capture. This research investigates how trust, widely accepted as being critical for relationship success, and collaboration networks interplay in a community of scientists in public research organisations around the world using Controlled Radical Polymerisation (CRP), a platform technology in the field of polymer chemistry, to innovate. Using Exponential Random Graph Models (ERGMs), we seek to understand the structural effects of the trust, the collaboration networks and the multiplex relationship and interplay between these two networks. Results show differences between these networks and implications of said differences are discussed with the view to better understanding the social processes that drive the academic side of U-I collaboration and what can be done to reduce the gap between the public and the private domains.

[keywords: innovation, ERGM, U-I collaboration]

Commercialisation and advice-seeking in the international community of controlled radical polymerisation (CRP) scientists

Dean Lusher

(Swinburne University of Technology)

With Till Klein, Julia Brennecke, Peng Wang, Michael Gilding, Greg Simpson, Thomas Spurling, Bopha Roden, Ian Elsum, Julien Brailly

Around the world there is a strong government push to bring public research organisations (e.g., universities) and industry closer together to improve innovation capability and outcomes. In Australia, this is particularly true and seen as the key to unlocking Australia's prosperity in the wake of the fading minerals boom. Public research organisations (PROs) are often seen as problematic because researchers are less concerned with the commercialisation side of research, and instead focus predominantly on the invention side. Network approaches to the study of innovation often look at advice-seeking as a means of understanding knowledge transfer. Less frequently though are different types of advice-seeking investigated – such as differentiating advice about technical issues, which is considerably different from advice about business models and other business-related approaches. This project examines technical advice and business advice-seeking among an international network of PRO scientists involved in in the field of polymer science, more particularly, in the area of controlled radical polymerisation (CRP). Results demonstrate firstly, and unsurprisingly, that scientists from public research organisations are more likely to engage in technical advice seeking than business advice seeking. More interestingly though, using exponential random graph models (ERGMs) we show the structural differences between the technical advice-seeking network and the business advice-seeking of polymer chemists, and the multiplex interplay of the differing advice networks. The results show structural differences in the ways these networks operate, and the mechanisms that scientists use to source different types of advice. We present the systematic ways in which these networks align and differ, and conclude with a discussion directed at better understanding the academic side of the divide, and what might be done to bridge this divide between industry and academia.

[keywords: innovation, commercialisation, industry-academia divide, ERGM]

ABSTRACTS

Session 5: Labour market and education

Determinants of employee participation in workplace governance: Evidence from a worker co-operative

James Coutinho

(Swinburne University of Technology)

With Peng Wang

Employee participation is the participation and influence of employees in decision-making throughout a firm. It has been argued that employee participation can benefit firms by increasing the efficiency of decision-making; and by increasing the well-being, job satisfaction and productivity of employees. However, there are mixed findings on the efficiency and well-being benefits of different forms of employee participation. One reason for this is that the effectiveness of employee participation may depend on situational factors, such as the nature of the decision or characteristics of employees. This paper presents evidence from an in-depth case study of a worker co-operative (a firm that is employee-owned and democratically managed) with 143 employees in the UK retail sector. It uses a mixed-methods approach incorporating social network analysis, survey research and in-depth interviews to study the determinants of employee participation in different kinds of workplace decision. Unlike previous research, which tends to rely on self-report indicators of employee participation or on qualitative evidence, the paper uses an innovative, multivariate social network approach to capture the interpersonal nature of participation in decision-making. It finds that human capital, social capital, and contextual factors structure who is able to participate effectively in workplace governance and who is excluded from participation. While employees are generally able to participate in lower-level, day-to-day decisions and gain satisfaction from their participation, many employees are excluded from effective participation in higher-level issues such as pay and benefits, and their exclusion creates considerable disaffection with firm governance. The paper contributes to evidence on the individual, social and contextual factors that determine the effectiveness of employee participation.

[keywords: employee participation, multivariate network analysis, ERGM, workplace governance, organisational behaviour]

Social capital activation and labour market outcomes

Hang Young Lee

(Macquarie University)

This study aims to tackle one puzzling issue in social capital studies: Well-connected job seekers are not more likely to activate social capital for job attainment than those with poor connections, even though they are expected to gain more by doing so. It addresses this issue by uncovering a new venue of social capital activation: the reception of unsolicited job leads from job contacts. Using data from the U.S. Social Capital Survey, the research reveals that job seekers with more social capital activate it in a way different from those with less social capital. Rather than receiving job information and recommendations from job contacts, they are more likely to elicit invitations to apply for positions in the organisation of job contacts. The results also confirm that the invitation method would lead to more prestigious and higher levels of positions than other job search methods. This finding sheds light on nuanced network inequality processes by which initial favourable conditions develop into further advantages in the labour market.

[keywords: social capital, job search methods, labor market outcomes]

CEO pay ratio: What role do the board interlocking network and compensation consultants play?

Andre Gygax

(University of Melbourne)

With Qiuting Sun

As of January 1, 2017, under Item 402 of the Security and Exchange Commission's Regulation S-K public U.S. firms are required to disclose the median of the annual total compensation of all employees, excluding their chief executive officer (CEO), and the annual total compensation of their CEO and the ratio of the two pay numbers. According to Equilar, a specialized U.S. compensation consultant, the median pay ratio of an initial group of 356 U.S. companies was 140. Our study sets out to investigate what role the board interlocking and compensation consultant networks play in explaining the magnitude of the reported pay ratios. Economic agency theory argues that pay ratios reflect firm performance. In contrast, sociological imitation theory argues that the similarity in pay ratios reflects mimicking behavior by the firms' compensation committees in setting and designing CEOs' compensation packages. We collect and analyze all available pay ratios as of July 2018. Our investigation sheds light on what role the board interlocking network and compensation consultants play in setting the CEO's compensation relative to the median employee.

[keywords: CEO pay ratio, board interlocking network, compensation consultants, LOLOG]

What's wrong with engineering students' social networks?

Faezeh Karimi

(University of Sydney)

With Petr Matous

Previous studies highlighted a gap between the social networks of engineering students and non-engineers [1], but it is not clear why. Do engineering students avoid socializing with non-engineers or is it the other way? Engineers are often portrayed as competent and intelligent but also sometimes as socially inept [2]. Moreover, some engineers see their profession in an elite guild that not everyone can qualify into [3]. This air of exclusivity combined with the public stereotyping of engineers as socially inept may be discouraging engineering and non-engineering students to interact with each other. This study investigates the social engagement of engineering and non-engineering students in events organized by engineering and non-engineering societies. We use anonymized data on 52791 records of student affiliation in 240 student societies at one major public research university and 39791 records of participation in 1123 events that were organized by these societies over the course of the year 2016. Using k-means clustering and random graph modeling on bipartite networks of students' affiliation and participation in social events, we show that members of engineering student societies are active participants in both engineering and non-engineering social events. In contrast, members of non-engineering student societies seem less attracted to social events organized by engineers.

[keywords: engineering students, students' social interactions, k-means clustering, ERGM]

ABSTRACTS

Session 6: Theory and methods – 2

Network structure of global remittances

Alex Stivala

(Università della svizzera Italiana, Swinburne University of Technology)

Remittances are flows of money between countries due to migrants sending money back to relatives in their country of origin. As such, they form a directed and weighted network of money flows between countries, and the techniques of (social) network analysis may be applied. There has been an increased interest in the economics literature on remittances recently, due to their potential importance with respect to money laundering, tax evasion, and potential impact on national economies. However, there has been to date very limited network analysis applied to the global networks of remittances. Here we use publicly available data from the World Bank to examine the global network of remittances between countries, examining network centrality, community structure, and "small world" properties. We also describe progress towards the construction of more sophisticated network models, accounting for various geographical, demographic, and economic factors.

[keywords: remittances, migration, geography, network models]

Representativeness and generalisability of inference for exponential-family random graph models from samples of networks

Pavel Krivitsky

(University of Wollongong)

With Pietro Coletti, Niel Hens

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

[keywords: ERGM, sampling, missing information principle, multilevel models, meta-analysis]

External exposure, boundary-spanning, and opinion leadership in remote communities: A network experiment

Petr Matous

(University of Sydney)

With Peng Wang

Are boundary spanners opinion leaders in ethnically segregated remote low-income communities or are they shunned? Can external exposure create opinion leaders in such peripheral communities? To answer these questions, we invited randomly selected farmers from 16 randomly selected communities in Sumatra to three-day networking and training events outside of their villages. The substantive purpose of these events was for the farmers to learn new practices from their peers in the visited locations. Eighteen months later, we conducted a sociocentric survey of information-sharing networks in the 16 communities. These 16 networks included 380 members, of which 117 participated in our randomized intervention and 263 were in the control group. We found that participants of our randomized intervention had an average indegree that was double that of the control group (2.8 vs 1.4). We applied Exponential Random Graph Models to the 16 networks to account for endogenous network tendencies. We treated participation in the intervention and the number of boundary-spanning links of each actor as node covariates. Results from our models show that actors who participated in the intervention had higher levels of influence in their communities than the control group, and actors with more boundary spanning links were more popular sources of advice. The results suggest that network interventions do not always need to rely on opinion leaders. Under certain conditions, interventions can create opinion leaders by changing local social networks. We conclude with methodological implications for using interventions in social network research.

[keywords: network interventions, network manipulation, boundary-spanning, opinion leadership, multiple networks, remote communities, ERGM]

Valuing network connections

Kim Sawyer

(University of Melbourne)

With Andre Gygax

Network models are helpful in improving our understanding of why and how networks form and what role networks play in the diffusion of information or the influencing on actors. Our model extends existing network models by analyzing how a network tie or a group ties should be valued. We use a network influence model to build our theoretical connections valuation model. Using an options framework, we show that the value of a network tie is positively associated with the variability of the network configuration and strategic decisions taken by the connected actors.

[keywords: network, influence, valuation, options]

Indigenous Australian Governance: An ethnographic and theoretical framework

Diane Smith

(Australian National University)

From colonial settlement through to today, Indigenous governance has often been regarded by outsiders as being invisible and unknowable – a kind of 'governance nullius'. This paper presents an ethnographic and theoretical understanding of Indigenous governance in Australia as being a relational cultural field of meshed nodal networks generated out of thick pathways and layers of interdependent connections between people, places and things, operating across time (past, present and future). While there is an Indigenous preference for localism of decision-making, action and responsibility attached to specific cultural geographies, the great sophistication and advantage of such a networked governance system is that it can flexibly cope with scale local groups can be linked horizontally to other networks, and scaled-up vertically to form larger collectivises and alliances. As a consequence, the local parts of a network are able to be directly connected to many other surrounding networked polities. The paper documents the ways that nodal points of bridging and bonding rationality are used to strategically connect people ever outwards or inwards, to other networked groups. This recursive pattern of expanding connections and pathways gives rise to a distinct epistemic condition, enabling deep patterns of continuity to be reproduced at the same time as promoting opportunistic responsiveness to external factors. Today, many Indigenous groups are purposefully working to reassess and rebuild their governance arrangements, in order to develop greater legitimacy and capacity. Not surprisingly, their efforts frequently draw on relational networked solutions as a fundamental design feature of contemporary Indigenous thinking about governance. These solutions are also influentially shaped and contested by the intercultural articulation of Indigenous networked governance with the governmentality of the Australian state.

[keywords: indigenous Australia, nodal networked governance]

Investigating community organizational networks using 2-mode (hypernetwork) sampling

Malcolm Alexander

(ACSPRI)

With Liz Reimer

Communities foster an array of voluntary associations which provide an opportunity structure for community members to interact, develop their social networks and mobilize. The density, structure and other characteristics of these affiliation systems vary across communities and overtime. Miller McPherson and others have established hypernetwork (2-mode) survey techniques to estimate the characteristics of these affiliation systems from a population sample survey which collects information on the organizations to which respondents belong. The crucial piece of information, not sought in standard surveys, is the size of the organizations named by respondents and it facilitates significant measures for the affiliation systems of different communities. This paper argues that McPherson et al.'s calculations must be modified to discount respondents who do not belong to any organization and, hence, cannot contribute to organizational connections. The ratio of non-participants to community activists is itself, however, an important feature of community life and is also available from the GSS and similar surveys. This paper suggests how this modification to McPherson et al.'s calculations impacts on the benchmark measures of community organizational networks provided by their original Nebraska study and discusses the practical issues we have faced in replicating this methodology in our Australian community study.

[keywords: community networks, affiliation systems, 2-mode data, Hypernetworks]

ABSTRACTS

Session 7: Online networks and crime

A social network approach to studying profanity on social networking sites

Yunya Song

(Hong Kong Baptist University)

With Jianliang Xu, Hazel Kwon, Shiying Li

Cursing has become commonplace in technology-mediated discursive interactions, often associated with rising concerns about online incivility. This study presents a social network analysis approach to explore profanity on SINA Weibo, the equivalent of Twitter in China. We retrieved one-month Weibo posts containing either of the most frequently used 62 Chinese cursing words. Machine-learning based sentiment analysis was performed to identify the sentiments. Based on the emotion classification results, happy and angry cursing posts were selected for further analysis. Topic modeling techniques were applied to analyze the themes and subjects that draw out these cursing posts. The diffusion network for each Weibo post was constructed based on its reposts. We compared their diffusion patterns against two randomly chosen sets of angry and happy non-cursing posts. A set of their structural features were computed and compared, which include the size, depth and width of the diffusion network, and the inter-layer width. Existing findings suggest that online swearing behaviors are not purely individual acts of uttering strong emotion, but moreover contagious social practices that may heighten group polarization. However, little is known about the extent of profanity across online platforms in mainland China, and there remains a lack of empirical evidence with respect to the contagion of uncivil behaviour online. Our study fills in this gap by examining the diffusion processes of cursing posts with a focus on their diffusion features. Our aim is to understand the dynamics and societal impacts of negative discourse, aggression and hostility occurring online, and to develop cost-effective long-term solutions to online uncivil behaviour.

[keywords: diffusion, network analysis, topic modeling, automated emotion classification, online incivility]

The network structure of political conversations on Twitter

Robert Ackland

(Australian National University)

With Timothy Graham, Florian Muhle

In this paper we use exponential random graph modelling (ERGM) to examine the communications of socialbots (automated social media user accounts posing as humans) on Twitter during the first U.S. presidential debate in 2016. We collected around 6 million tweets featuring debate-related hashtags, authored by 1.4 million Twitter users over a two hour period covering the debate (and the 15 minutes before and after). The users were automatically classified (using the BotOrNot API) as either socialbots, humans or other (neither clearly bot nor human). We then constructed a Twitter reply network; we posit that reply edges are more likely to be indicative of conversation activity, compared with retweet edges. Finally, we use ERGM to test whether humans and bots exhibit statistically significant differences in network tie formation. In particular we expect that humans can identify bots and will try to avoid interacting with them and hence we test the hypothesis that bots are more likely to send reply edges to humans, compared with vice versa. We further expect that humans are more likely than bots to engage in the key social behaviour of triadic closure, and hence test the hypothesis that humans contribute more than bots to the formation of triangles in the Twitter reply network.

[keywords: twitter, political conversations, ERGM]

Comparative analysis of community versus topic structure in hyperlink networks: A case study of government portal websites

Timothy Graham

(Australian National University)

With Paul Henman, Guangnan Zhu

The hyperlink is often regarded as the 'backbone' of the web, and the study of link relationships between webpages is known as hyperlink network analysis (HNA). A hyperlink network consists of nodes (usually webpages) and directed edges that denote a hyperlink from webpage i to webpage j. Community detection algorithms such as Infomap can be employed to reveal the internal community structure of large-scale complex hyperlink networks. Whilst HNA affords a structural analysis of webpage relationships, it does not take into account semantic relationships that can be derived from webpage textual content. Do patterns of hyperlinks reflect or map to commonalities in the semantic content of the webpages? What is the relationship between semantic structure and network structure? In this paper we engage with these questions in order to understand whether, and to what extent, the community structure of hyperlink networks maps coherently to the latent semantic structure derived from collections of web text collected from webpages. To examine this, we undertake a case study of the Australian government website, www.australia.gov.au. First, we crawl the entire website and map the hyperlink relations between webpages. We then extract the textual content from the webpage HTML and utilise LDA topic modelling to infer the latent topic structure of the collection of text documents, using a novel computational approach to selecting the number of topics. Following this, we use the infomap algorithm to infer community structure of the hyperlink network and establish a method to measure how coherently the community structure maps to the topic structure. We report on preliminary results of our approach and directions for future research.

[keywords: keywords: e-government, hyperlink networks, topic models, community detection]

How 'lone' are 'lone wolf' terrorists? A comparative analysis of personal backgrounds and ego networks

David Bright

(Flinders University)

With Chad Whelan, Shandon Harris-Hogan

Terrorism is usually considered a collective, organised activity. Indeed, one of the attractions to terrorist groups may be the establishment of a collective identity, via real-world or virtual relationships. Nonetheless, over the last few years, media, law enforcement and scholarly attention has turned toward the construct of the "lone wolf" terrorist. The term has suffered from conceptual confusion and criticism, particularly with respect to the extent that such actors are radicalised and engage in terrorist attacks alone. The aims of this paper are (1) to determine the individual characteristics and backgrounds of individuals who have been identified as lone wolf terrorists; (2) to examine the extent and nature of interpersonal relationships these lone wolf actors have with others; and (3) to determine whether such interpersonal relationships provided ideological or logistic support for extremist beliefs and activities. We gather open source information on the five lone wolf terrorist attacks that have been perpetrated in Australia over the last 10 years. We employ a case study approach using an ego-network design to examine the nature of relationships such lone wolf terrorists have with others, including ideological influences and operational assistance with planned attacks. Implications for the lone wolf concept, and for counter-terrorism policy, be discussed.

[keywords: terrorism, ego networks, lone wolf]

ABSTRACTS

Session 8: Health and wellbeing

Improving integrated services using social ecology networks

Geoff Woolcott

(Southern Cross University)

With Robyn Keast, Dan Chamberlain

Universal services and targeted or specialized interventions in health and education have made an enormous contribution to overall wellbeing across society. Current service delivery, however, does not account for the complex dynamic of delivering services to people with multiple needs. As a consequence, current service structures do not provide adequate protection against inter-related risk factors and are proving extremely costly to maintain. Currently, there are few interventions that explicitly identify and appropriately consider the relevant set of important socio-cultural determinants that affect people who require a set of diverse services or that link these together into meaningful actions. The challenge has been in focusing on the person-centred approaches that are seen as an effective and sustainable next practice for integrated service delivery. This presentation outlines a social ecology network model that supports such a person-centred approach to service, through use of a multi-level, multi-dimensional system of relationships and services. The model draws on theoretic and methodological extensions of two prominent approaches; ecological systems theory and social network analysis. Considered in combination, these two seemingly disparate approaches suggested to us a powerful new way of thinking about person-centered place-based approaches as well as offering a methodologically stronger and more rigorous set of analytical tools. The model developed from this combination offers to bridge the apparent disconnect between service integration levels and client needs in such a way as to direct optimal effort to interventions at the individual level.

[keywords: social network analysis, social ecology, health, education]

The network structure of general practice in Australia

Peter Straka

(University of New South Wales)

With Bich Tran, Michael O Falster, Kirsty A Douglas, Thomas Britz, Louisa R Jorm

We have studied the organisation and characteristics of general practice in Australia, based on routinely collected Medicare claims data. The dataset comprises records for 1.7 Million Australians per year, collected over 21 years. Patient sharing behaviour among General Practitioners (GPs) reveals “Provider Practice Communities” (PPCs), which resemble GP practices and clinics. Data on GP practices is scarce in Australia, and we have established a data driven way to cluster GPs into PPCs. To be able to detect PPCs which comprise only a small number of doctors or even just a single GP, we needed to _avoid_ a projection of the bipartite network (of GPs and patients) to a unipartite network (GPs only); moreover, we needed to address the resolution limit problem for community detection in large networks. This was solved via fitting constrained hierarchical stochastic blockmodels using the Python package graph-tool. Based on the detected PPCs, we were able to study characteristics of PPCs, such as patient sharing behaviour, bulk-billing behaviour and a new measure for continuity of care. The network structure of PPCs over GPs provides a promising new way of studying unwarranted statistical variation in Australia’s healthcare system in future analyses.

[keywords: big data, community detection, blockmodel, healthcare, claims data]

The resilient health care network: A social network study of an international collaboration

Janet Long

(Macquarie University)

With Chiara Pomare, Louise A Ellis, Kate Churruca, Jeffrey Braithwaite

Resilient Health Care (RHC) is a recently introduced concept that constitutes a paradigm shift in our thinking about patient safety. RHC is the capacity of health care to flex, adjust and be responsive in differing circumstances. To date, a small international group of clinicians and researchers have produced work in this field. This project examined the collaborative relationships within the informally convened Resilient Health Care Network (RHCN). A whole network, online social network survey was administered to 85 members of the RHCN during their meeting in Vancouver 2017. The response rate was 82%. The RHCN was shown to be a coherent network with high connectivity and a high centralization score. The network was dominated by a small core group of three academics. Members had joined the RHCN in various ways, with social processes (influenced or invited to join by another member) featuring prominently. Thirty-seven people were invited to join by 23 different people. This active dissemination and recruitment illustrate the perceived value of RHC to researchers and clinicians. Only 28.9% independently decided to join the RHCN, suggesting that a higher online presence would be beneficial in raising awareness about the work of the RHCN and attracting new members. There was good evidence that members are engaging in RHCN activities (e.g., 64% had given a talk at their workplace on RHC) and being informed by the ideas presented (e.g., 82% stated that their work or clinical practice was informed by resilience ideas). This strongly suggests that the RHC ideas presented are readily understood and practical. Respondents wrote positively about the membership benefits. Leadership was considered good and respondents disagreed with the proposition that they were becoming introspective or out-of-date. Respondents identified influential members and “people who have constructively challenged my thinking about RHC.” We will repeat the study next year. Of particular interest will be changes in key players after a recent death in the group. Suggestions for improvement, drawn from respondents’ recommendations were to diversify the core group; seek administrative assistance to develop the web site; and involve a wider group of members in network projects, especially early career researchers.

[keywords: international collaboration, health service research, health systems]

A multilevel network approach to evaluating collaboration in community-based obesity prevention interventions

Peng Wang

(Swinburne University of Technology)

With Jaimie McGlashan, Kayla de la Haye, Steven Allender

Obesity is driven by complex processes at both the level of the understanding the factors contributing to obesity, and the level of prevention strategies implemented by the various stakeholders within communities. The complexity of the system makes intervention designs and prevention difficult. We use exponential random graph models (ERGM) for multilevel networks to investigate the interdependencies between community stakeholder collaboration networks and the causal loop diagram (CLD) networks representing the factors (nodes) that drives obesity, in the context of childhood obesity prevention intervention in two communities from regional Australia. At the top level, CLDs are mapped by the highly engaged stakeholder groups who design and implement the interventions. At the bottom- and the meso-level, the stakeholders were asked about their interpersonal collaborations, and the factors in the CLDs on which they have located their actions. ERGM allow us to identify patterns of stakeholder collaboration and their actions around the community's CLD. The perceived level of change identifies whether particular multi-level network structures are linked to more effective intervention outcomes. Understanding how these complex features of community collaboration networks are connected to obesity CLD systems can inform future interventions for complex public health problems that, like obesity, require deeper understanding of effective collaboration structures to advance prevention.

[keywords: ERGM, multilevel network, causal loop diagrams, collaboration networks, obesity prevention intervention]

Group memberships and life satisfaction: Individual- and community-level structural social capital in nationally representative samples

Colin Gallagher

(Swinburne University of Technology)

With James Coutinho

Life satisfaction and other forms of subjective wellbeing have long been of key interest to social researchers and policymakers, not only as a key measure of a society's welfare, but also for its association with various important individual outcomes, including health, mortality, and achievement at work. As part of this focus, life satisfaction is often investigated with respect to various forms of social participation and social capital. One particularly prominent form of structural social capital is involvement in voluntary associations (e.g., religious groups, trade unions, sports clubs, etc.), which evoke both communitarian ideas of civic participation, and structuralist ideas of network linkages and co-affiliation. Yet, while life satisfaction and group involvement have been routinely linked at the individual level, questions remain as to how living in a community or region that is generally rich in social resources carries additional benefits, over and above one's own social advantages. One possibility for the mixed findings could be that the impact of group involvement on mental health is not linear, but curvilinear, with adaptive outcomes occurring for medium-sized networks of group involvement. To test this association, we employ (conventional) multilevel models to examine data from several nationally representative large-scale general social surveys which surveyed group participation in detail. We find that, at the level of the individual, group involvement generally bears a curvilinear relationship with life satisfaction, suggesting that moderate group involvement benefits wellbeing, with very high levels of involvement acting as a burden. Moreover, this curvilinear relationship manifests itself at the regional level communities with an equal distribution of participation reporting higher levels of life satisfaction. The results indicate that when considering communities as (bipartite) networks of individuals and groups, network centralization is a burden on life satisfaction, both for the individual, and the wider community.

[keywords: social capital, group involvement]

ABSTRACTS

Session 9: Innovation and business – 2

Collaborative research project networks and research impact

Marissa Takahashi

(Queensland University of Technology)

With Marta Indulska, John Steen

Corporations invest in R&D to boost their innovation outcomes. Pursuing open innovation strategy, corporate research divisions engage in collaborative research projects (CRPs) with universities to leverage academic expertise. There is a lack of studies on the research impact outcomes of these CRPs on corporate innovation. There are even fewer studies on how the structural characteristics of CRP networks influence corporate research impact. This study addresses the question: How do the structural characteristics of CRP network influence corporate research impact? This study examines a CRP network comprising a corporate project portfolio of 96 CRPs and their associated research impact within a global software company. In contrast to academic research impact, corporate research impact (RI) is defined as the uptake of research outcomes. In this paper's research setting, RI is achieved when the CRP develops novel ideas and prototypes that the product development group considers innovative enough to invest in and further develop into commercial software product. The development of prototypes into potential product is executed as transfer projects (TP). RI is measured by the number of resulting TPs and corresponding person-day investments. From the collected CRP data, three two-mode networks were constructed: (1) CRP–TP (PT network); (2) CRP–Member (PM network) and (3) CRP–Location (PL network). This study examined the PM and PL networks and tested whether project centrality in these networks influenced the project's research impact. Analysis shows that centrality measures of projects in the PM and PL networks have significant effect on RI. Eigenvector centrality is significant in both PM and PL networks. However, eigenvector centrality is positive in the PM network and negative in the PL network. Degree centrality is positively significant in the PL network while betweenness centrality is negatively significant in the PM network. Implications of these significant positive and negative centralities are discussed.

[keywords: collaborative research project network, corporate research impact, two-mode networks, centrality]

Moderating influence of the business environment on suppliers' contractual embeddedness and sales probability: Complex adaptive system view

Buddhika Mannaperuma

(University of Melbourne)

With Prakash J. Singh, William Ho, Sherah Kurnia

Businesses that are unable to withstand the market domination and product surpluses increasingly use internet enabled alternative distribution channels. These online platforms lead to coexistence and simultaneous coevolution of both the open contractual and the real supply networks that emerged in a single complex adaptive system (CAS). The existing mere CAS applications to the supply networks are not adequate to understand how these two network evolutions vary by the business environmental conditions such as dynamism, munificence and complexity. Therefore, in light of CAS theory, social network analysis (SNA) technique and the business environment literature, this paper proposes a conceptual model to recognise how a supplier's contractual embeddedness determines its sales probability in the supply network while adapting the business environment. With the support of panel logit regression model, the empirical data from the Australian based Open Food Network from 2012 to 2016 validate the positive associations between a supplier's contractual embeddedness as informed by degree and closeness centralities and the sales probability in the supply network. Both dynamic and complex environments improve the positive association between a supplier's degree centrality and the sales probability. Though munificence increases the positive association between a supplier's closeness centrality and the sales probability, dynamism lowers this relationship. This paper first extends the CAS theory with significant system level interactions and secondly develops network diagrams using SNA to illustrate the local optimisation behaviour of network clusters and their evolutions into different network patterns such as scale free, block diagonal and centralised connected through structural holes. Third, this is the first longitudinal study to analyse how a supplier's contractual embeddedness contributes to its sales probability in the real supply network subjecting to environmental conditions.

[keywords: social network analysis, complex adaptive system, contractual embeddedness, supply network, business environment]

Who collaborates with whom - business networks in Australia

Chien-Hung Chien

(Australian National University and Australian Bureau of Statistics)

With Anton H Westveld, AH Welsh

Empirical studies have shown firms collaborate to leverage complementary strengths from perspectives on business, sharing of human resources, to advances in research and development (R&D). These collaborations can take many different forms, such as strategic alliances, R&D consortiums, trade associations, and shared directors. A key question is whether firms collaborate with similar or different firms to leverage strength. In particular, are firms with similar characteristics like size, industry or level of productivity more likely to collaborate with one another? We examine this question by using open source data, purchased data, as well as data from the Australian Bureau of Statistics (ABS). The open source data is from Intellectual Property Australia which provides information on if a firm files a patent or trademark application by itself or with another firm(s). Purchased Australian Securities Exchange data is from MorningStar DatAnalysis Premium that provides information on shared director information on the public listed companies. We integrate these datasets with the ABS data which provides information on firm characteristics to describe relationships among business networks. Based on the latent space modelling framework, we will examine the relationships among business networks and the notion of complimentary strength.

[keywords: social networks, latent class model]

ABSTRACTS

Poster session

stellar-ml, a new python library to perform machine learning on graphs

Anna Leontjeva

(CSIRO, Data 61)

With Andrew Docherty, Alex Collins, Pantelis Elinas, Kevin Jung, Yuriy Tyshetskiy

We introduce stellar-ml, a new python library to perform machine learning on graphs. The library contains state of the art methods for graph representation learning, such as graph convolutional networks and shallow random walk based approaches, as well as various modules for assembling typical machine learning workflows on graphs, from data ingestion and pre-processing to inference. The library bridges a gap between machine learning and network analytics, as it is flexible, easy to use, and supports familiar workflow patterns. In this poster we demonstrate the capabilities of stellar-ml for several common tasks in the network analytics space inferring an attribute of a node (node attribute inference), predicting an edge between nodes (link prediction), and determining if two nodes refer to the same entity (entity resolution). We also demonstrate that graph analytics is a powerful framework that can provide useful insights and improve the results of traditional machine learning models in various domains with case studies from bioinformatics, e-commerce, and social networks.

[keywords: machine learning, network analytics, python library]

How the stakeholders of negative emissions communicate online: Combining hyperlink network analysis and semantic network analysis

Yuanyuan Shang

(Australian National University)

The negative emissions component of the climate-change puzzle has fallen behind other parts, especially in the broader discourse that would motivate more encouraging policies and enable technological pursuits. This paper investigates the structural pattern of international information flow among organization, government, industry, and media, from which we also examine the different roles they play in bringing negative emissions to scaled-up practice. This study also works towards understanding how negative emission is portrayed and addressed by stakeholders online. The inter-organizational hyperlink network which contains 5769 hyperlinks is collected by VOSON, and then analysed in R. This paper studies the subnetwork which extracts the most important websites. The use of exponential random graph models (ERGM) reveals the existence of reciprocity, generalized exchange, and homophily effects in the negative emission-related hyperlink network.

[keywords: hyperlink network analysis, ERGM, negative emissions, semantic network analysis]

Connectivity and collaboration in farmer driven projects

Amanda Scott

(Southern Cross University)

With Robyn Keast, Geoff Woolcott, Rob Kivits

This study examined the increase in connectivity and collaboration between three groups of primary producers working together in three separate projects funded via an Australian federal program supporting the agricultural sector. This study sought to assess the effectiveness of the Program in achieving its objectives as they pertained to facilitating opportunities for collaboration, which in turn was designed to help primary producers realise greater returns along the supply chain. A whole network analysis approach was implemented in order to identify the patterns and levels of connectivity (core/periphery), and network function roles such as gatekeepers, facilitators and brokers that may influence the achievement of collective network objectives, and the long term sustainability of the network. Key findings revealed that network membership changed to some degree as all three projects progressed, yet healthy levels of connectivity remained across most variables, and in one project, connectivity grew significantly. New network connections appeared strategic as information necessary to progress projects was sought after. Multiplicity of ties showed redundancy and stability. All networks had a core administrative project team of 3 to 4 people illustrating the significance of a committed core team. Differentiated roles of leadership were also apparent across the networks. Overall, the initial findings uncovered the topology of the sets of relationships and level of connectivity that allowed for a clearer and more nuanced understanding of the network interaction dynamics and effects. This provides insights into how such patterns might predict action, performance and network sustainability. These results also indicate that each of the farmer group projects employed a mode of working together that appears to be relatively 'fit-for-purpose' and appropriate to the needs of the project, based on relational strengths and integrating functions. This supports the likelihood that these networks will be sustained, continuing to pursue collective goals into the future.

[keywords: connection, collaboration, sustainability project network]

Mapping the manosphere: Analysing the network structure of men's groups on Reddit

Simon Copland

(Australian National University)

Recent years have seen an emergence of a diverse range of online male communities, primarily through sites such as 4chan and Reddit. Theorists, as well as the users of these spaces themselves, describe this space as the 'manosphere' (Schmitz and Kazyak 2016). Despite increasing media and academic attention placed onto the manosphere, there is little work that examines the depth of its network structures. Coverage frequently examines the perceived worst parts of these spaces, with a focus on violent rhetoric (e.g. Massanari 2017, Salter 2018) . This paper starts to fill this gap, providing an examination of the manosphere in terms of social network structure. The paper studies three subreddits of the Manosphere on the social media and news-sharing site Reddit – r/Braincels, r/MGTOW and r/TheRedPill. The paper examines how users are connected to each other, and in what ways. It studies whether there are distinct sub-communities within these subreddits, how these sub-communities form, and how they interact with each other. This paper starts to provide a deeper analysis of the network structure of the manosphere, aiming to give us a stronger understanding of the behaviours, community connections and attachments within this online sphere.

[keywords: Manosphere; men's rights, Reddit, social media, online communities, social network analysis]

ABSTRACTS

Tool demonstrations

Exploring roguelike games through inspiration networks

Xavier Ho

(CSIRO, Data 61, University of Sydney)

The design landscape of video games is constantly shifting and changing with every new release. Roguelike games is one such kind of games that changed, with the earliest ASCII-adventure game found in the mid 70's towards higher fidelity in present day. Games mechanics evolved from procedural random generation to AI-driven enemies and obstacles. Arguably the most iconic feature of roguelikes, 'permadeath', also has become optional in some newer, 'roguelike-like' games. This gradual evolution of game mechanics created a challenge to define video games and video game genres (Garda 2013).

In this paper, we present the findings from user testing with game designers, as part of the research-through-design iteration. We have previously published a detailed description of the visual exploration tool for roguelike games (Ho et al., 2016). An online demonstration can be found at http://spaxe.github.io/roguelike-universe/. We call the network inspiration networks, where nodes are individual games, and edges are varying degrees of influence between two games. The aim of this paper is to measure the usefulness of inspiration networks; in particular, through the lens of game designers' personal experience with the roguelike genre. We asked game designers to describe their understanding of roguelike games before using the tool. Through a qualitative questionnaire, we identified descriptions relating to new insights, such as a new understanding, or perspective gained by exploring the inspiration network visually. We grouped and analysed questionnaire responses as an idea network to better define the problem space as proposed by Metcalfe (2007). In the paper discussion, we will first present the dataset and the inspiration network, a visual exploratory tool for roguelike games, and then present our findings of insights and implications gathered from game designers.

[keywords: roguelike games, inspiration network, web scraping, visual exploration; game design]

Polinode: A web application for the collection and analysis of network data

Andrew Pitts

(Polinode)

Polinode is a platform for visualising, analysing and collecting connected data. We provide a web-based platform that allows our users to interactively interrogate and understand connected data. There are two separate but related tools - Polinode Networks which allows a user to upload any type of network data and Polinode Surveys which allows a user to collect network data via an integrated relationship-based survey tool. The most popular use case for Polinode is organisational network analysis - understanding the informal relationships between people in large organisations and thereby improving the way that organisations function. In the organisational network analysis space common applications of Polinode include identifying emerging talent, finding influencers, M&A integration, improving diversity and change management. However, there an no limitations on the data that can be uploaded to Polinode or the type of data that can be collected and there have been many interesting applications outside of the traditional organisational network analysis space as well. This includes social network analysis, text mining, mapping the flow of web-traffic, family trees, massively multiplayer online game and more.

[keywords: organisational network analysis, software-as-a-service, network visualisation, relationship-based surveys]

Collecting social medial network data with VOSON Dashboard and vosonSML

Bryan Gertzel

(Australian National University)

With Rob Ackland, Tim Graham

vosonSML is an R package that provides a suite of tools for collecting networks and text data from social media. It provides easy-to-use functions for collecting data across popular platforms (Twitter, YouTube and Reddit) and generating different types of networks for analysis. vosonSML can be used directly as an R package or else via the R/Shiny web application VOSON Dashboard.

[keywords: social media data, data collection, social network analysis, network visualisation]

Analysing networks and text with VOSON Dashboard

Xiaolan Cai

(Australian National University)

With Bryan Gertzel, Rob Ackland

VOSON Dashboard is an R/Shiny web application for collecting and analysing online networks and associated text data. It builds on a number of R packages, in particular igraph (for network analysis), tm (for text mining) and vosonSML (for collecting network and text data from social media), with a graphical user interface to facilitate user experience. In addition to network visualisation and basic network- and node-level network analysis metrics, VOSON Dashboard provides basic text mining and analysis functionality (term frequency counts, word clouds, comparison clouds).

[keywords: social media data, social network analysis, network visualisation, text analysis]

Digital observatory – Research infrastructure for social media data

Marissa Takahashi

(Queensland University of Technology)

The unprecedented use of digital platforms and technologies, coupled with the emergence and growth of 'big social data' on digital media consumption and communication, have enabled ground-breaking new research approaches that support the unobtrusive observation of large-scale, population-wide activity patterns in society – often in close to real time. For example, this form of research allows observation of the changing topics in public debate, shifting preferences in cultural consumption, and the rise and fall of particular technologies and platforms. Digital Observatory at Queensland University of Technology is being developed to provide infrastructure for tracking, collecting and analysing digital data to support and enable innovative research. The demo will showcase some of these research endeavors.

[keywords: research data infrastructure, digital data, digital media data, social media platforms]

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