CONA Seminar Reading Group

Social Network Series

Session 1:

“Social Network Analysis: Foundations and Frontiers on Advantage”

Burt, R.S., Kilduff, M., Tasselli, S., 2013. Annual Review of Psychology 64, 527–547.

https://doi.org/10.1146/annurev-psych-113011-143828

We provide an overview of social network analysis focusing on network advantage as a lens that touches on much of the area. For reasons of good data and abundant research, we draw heavily on studies of people in organisations. Advantage is traced to network structure as a proxy for the distribution of variably sticky information in a population. The network around a person indicates the person’s access and control in the distribution. Advantage is a function of information breadth, timing, and arbitrage. Advantage is manifest in higher odds of proposing good ideas, more positive evaluations and recognition, higher compensation, and faster promotions. We discuss frontiers of advantage contingent on personality, cognition, embeddedness, and dynamics.

Session 2:

“Complex Contagions and the Weakness of Long Ties”

Centola, D., Macy, M., 2007. American Journal of Sociology 113, 702–734.

https://doi.org/10.1086/521848

The strength of weak ties is that they tend to be long—they connect socially distant locations, allowing information to diffuse rapidly. The authors test whether this “strength of weak ties” generalizes from simple to complex contagions. Complex contagions require social affirmation from multiple sources. Examples include the spread of high-risk social movements, avant garde fashions, and unproven technologies. Results show that as adoption thresholds increase, long ties can impede diffusion. Complex contagions depend primarily on the width of the bridges across a network, not just their length. Wide bridges are a characteristic feature of many spatial networks, which may account in part for the widely observed tendency for social movements to diffuse spatially.

“Social Networks, the Tertius Iungens Orientation, and Involvement in Innovation”

Obstfeld, D., 2005. Administrative Science Quarterly 50, 100–130.

https://doi.org/10.2189/asqu.2005.50.1.100

This study examines the microprocesses in the social networks of those involved in organizational innovation and their strategic behavioral orientation toward connecting people in their social network by either introducing disconnected individuals or facilitating new coordination between connected individuals. This tertius lungens (or "third who joins") strategic orientation, contrasts with the tertius gaudens orientation emphasized in structural holes theory, which concerns the advantage of a broker who can play people off against one another for his or her own benefit. Results of a multimethod study of networks and innovation in an engineering division of an automotive manufacturer show that a tertius lungens orientation, dense social networks, and diverse social knowledge predict involvement in innovation. Implications of the study for innovation and social networks, as well as for social skill and agency within firms are presented.

Session 3:

“Diversity and autonomy in the structuration of a multilevel organizational social network in a technology park.”

Mattar, L., Higgins, S.S.S., Neves, J.A.B., 2022. Social Networks 68, 346–355.

https://doi.org/10.1016/j.socnet.2021.08.009

In organizational settings, along with their formal rules, informal norms and social preferences drive the formation of interpersonal networks. Empirical evidence and theoretical claims maintain that individual epistemic status influences the choice of an adviser in interpersonal advice networks within an organizational environment. In the context of an industrial cluster, the interpersonal networks are affiliated with the interorganizational network of the companies. Therefore, another source of influence to be considered is the interdependency of the interorganizational level relations among the companies in which the individuals are nested. Thus, beyond the one-level perspective, which is the usual approach in organizational network

studies, this article explores how the interdependency of the interorganizational level can influence the dynamic of endogenous structuration of interpersonal relations. The object of this study is a collaboration network among companies and an advice network among directors from a Brazilian knowledge-intensive technological cluster. Through the use of the multilevel exponential random graph model (MERGM), statistical interdependent dynamics were identified between the two levels guided by the social processes of tie creation that result in similarities and distinctions between both levels of analysis. The centralization based on the activity of seeking advice guides the directors' network, and among companies there are multiple transitive and hierarchical closures with some intermediation between them. However, activity-based centralization also guides companies. From a multilevel perspective, the diversity of network processes that guide each level indicates that the cross-level interdependency between the two levels does not prevent some autonomy of the individual level from the organizational one.

"Failure in Complex Social Networks"

CENTOLA, D., 2008. The Journal of Mathematical Sociology 33, 64–68.
https://doi.org/10.1080/00222500802536988

A class of inhomogenously wired networks called "scale-free" networks have been shown to be more robust against failure than more homogenously connected exponential networks. The robustness of scale-free networks consists in their ability to remain connected even when failure occurs. The diffusion of information and disease across a network only requires a single contact between nodes, making network connectivity the crucial determinant of whether or not these "simple contagions" will spread. However, for "complex contagions," such as social movements, collective behaviors, and cultural and social norms, multiple reinforcing ties are needed to support the spread of a behavior diffusion. I show that scale-free networks are much less robust than exponential networks for the spread of complex contagions, which highlights the value of more homogenously distributed social networks for the robust transmission of collective behavior.

Session 4:

"Complex Contagion Features without Social Reinforcement in a Model of Social Information Flow"

Pond, T., Magsarjav, S., South, T., Mitchell, L., Bagrow, J.P., 2020. Entropy 22, 265.
https://doi.org/10.3390/e22030265

Contagion models are a primary lens through which we understand the spread of information over social networks. However, simple contagion models cannot reproduce the complex features observed in real-world data, leading to research on more complicated complex contagion models. A noted feature of complex contagion is social reinforcement that individuals require multiple exposures to information before they begin to spread it themselves. Here we show that the quoter model, a model of the social flow of written information over a network, displays features of complex contagion, including the weakness of long ties and that increased density inhibits rather than promotes information flow. Interestingly, the quoter model exhibits these features despite having no explicit social reinforcement mechanism, unlike complex contagion models. Our results highlight the need to complement contagion models with an information-theoretic view of information spreading to better understand how network properties affect information flow and what are the most necessary ingredients when modeling social behavior.

"Engineering social contagions: Optimal network seeding in the presence of homophily"

Aral, S., Muchnik, L., Sundararajan, A., 2013. Network Science 1, 125–153.
https://doi.org/10.1017/nws.2013.6

We use data on a real, large-scale social network of 27 million individuals interacting daily, together with the day-by-day adoption of a new mobile service product, to inform, build, and analyze data-driven simulations of the effectiveness of seeding (network targeting) strategies under different social conditions. Three main results emerge from our simulations. First, failure to consider homophily creates significant overestimation of the effectiveness of seeding strategies, casting doubt on conclusions drawn by simulation studies that do not model homophily. Second, seeding is constrained by the small fraction of potential influencers that exist in the network. We find that seeding more than 0.2% of the population is wasteful because the gain from their adoption is lower than the gain from their natural adoption (without seeding). Third, seeding is more effective in the presence of greater social influence. Stronger peer influence creates a greater than additive effect when combined with

seeding. Our findings call into question some conventional wisdom about these strategies and suggest that their overall effectiveness may be overestimated.

Session 5:

“The role of social structure in the maintenance of cooperative regimes”

Cohen, M.D., Riolo, R.L., Axelrod, R., 2001. Rationality and Society 13, 5–32. https://doi.org/10.1177/104346301013001001

We analyse the role of social structure in maintaining cooperation within a population of adaptive agents for whom cooperative behaviour may be costly in the short run. We use the example of a collection of agents playing pairwise Prisoner's Dilemma. We call sustained cooperative behaviour in such circumstances a `cooperative regime'. We show that social structure, by channelling which agents interact with which others, can sustain cooperative regimes against forces that frequently dissolve them. We show in detail the process through which structured interaction in a population creates a `shadow of the adaptive future', allowing even a small set of cooperative strategies to grow into a cooperative regime, a coherent, self-sustaining entity that is something more than the sum of the pairwise interactions among its members.

“Differences in the Mechanics of Information Diffusion Across Topics: Idioms, Political Hashtags, and Complex Contagion on Twitter”

Romero, D.M., Meeder, B., Kleinberg, J., n.d. 2011 Proceedings of the 20th International Conference on World Wide Web, 695-704

There is a widespread intuitive sense that different kinds of information spread differently on-line, but it has been difficult to evaluate this question quantitatively since it requires a setting where many different kinds of information spread in a shared environment. Here we study this issue on Twitter, analysing the ways in which tokens known as hashtags spread on a network defined by the interactions among Twitter users. We find significant variation in the ways that widely-used hashtags on different topics spread. Our results show that this variation is not attributable simply to differences in “stickiness,” the probability of adoption based on one or more exposures, but also to a quantity that could be viewed as a kind of “persistence” — the relative extent to which repeated exposures to a hashtag continue to have significant marginal effects. We find that hashtags on politically controversial topics are particularly persistent, with repeated exposures continuing to have unusually large marginal effects on adoption; this provides, to our knowledge, the first large-scale validation of the “complex contagion” principle from sociology, which posits that repeated exposures to an idea are particularly crucial when the idea is in some way controversial or contentious. Among other findings, we discover that hashtags representing the natural analogues of Twitter idioms and neologisms are particularly non-persistent, with the effect of multiple exposures decaying rapidly relative to the first exposure. We also study the subgraph structure of the initial adopters for different widely-adopted hashtags, again finding structural differences across topics. We develop simulation-based and generative models to analyse how the adoption dynamics interact with the network structure of the early adopters on which a hashtag spreads.

Session 6:

“Measuring mediation and separation brokerage orientations: A further step toward studying the social network brokerage process”

TJ Grosser, D Obstfeld, G Labianca, SP Borgatti. Academy of Management Discoveries 5 (2), 114-136

Brokerage has assumed an increasingly important role in social network research and organising more generally. Social network research has traditionally defined brokerage in structural terms as a broker who stands between two disconnected parties. Alongside this structural definition, network research has generally made assumptions about, but rarely measured, the brokerage processes engaged when individuals inhabit such network positions. More recent work argues for explicitly addressing brokerage behaviour, principally in the form of three brokerage action orientations that focus on distinct brokerage action: joining network contacts (or tertius iungens), mediating between network contacts, and separating network contacts. We advance this emerging research stream by developing measures of mediation and separation brokerage orientations. These two measures, alongside the pre-established tertius iungens measure (Obstfeld, 2005), present the opportunity to study the role of multiple brokerage orientations and social network structure together. In Studies 1, 2, and 3, we provide evidence for the convergent and discriminant validity of each measure. In Study 4, we establish criterion-related validity by demonstrating the importance of each measure on network structure and innovation outcomes. In so doing, we lay the groundwork for future research to explore how brokerage behaviour orientations influence additional organisational phenomena.

“Network-Related Personality and the Agency Question: Multirole Evidence from a Virtual World.”

Burt, R.S., 2012. American Journal of Sociology 118, 543–591. https://doi.org/10.1086/667856

The more consistent a person’s network across roles and the more relevant that consistency is for achievement, the more important agency is for understanding network effects on achievement. With network, experience, and achievement data on persons playing multiple characters in a virtual world, evidence is presented to support two conclusions: (1) About a third of network structure is consistent within persons across roles: that is, those who in one role build networks rich in access to structural holes will build similar networks in other roles; builders of closed networks also tend to build that network across roles. (2) Network consistency across roles contributes almost nothing to predicting achievement, which is instead determined by experience and the network specific to the role. The two conclusions are robust across substantively significant differences in the mix of roles combined in a multirole network (too many roles, difficult combination of roles, or roles played to overlapping audiences).

Session 7:

“Identifying information security opinion leaders in organizations: Insights from the theory of social power bases and social network analysis.”

Dang-Pham, D., Kautz, K., Hoang, A.-P., Pittayachawan, S., 2022. Computers & Security 112, 102505. https://doi.org/10.1016/j.cose.2021.102505

Organizations are increasingly prioritizing the management of information security (InfoSec) to facilitate their data-driven business. There are densely connected organizational networks in modern organizations, where both formal and informal leaders influence other employees’ InfoSec behaviors. We analyzed the organizational networks in a large organization and investigated the interactions that made employees appear as influential InfoSec opinion leaders to their colleagues. The findings indicate that influential InfoSec opinion leaders were perceived by colleagues as knowledgeable in InfoSec and capable of rewarding and sanctioning InfoSec behaviors. Other traits such as formal seniority, age, tenure, and department membership were also found to increase InfoSec leadership.

“The spontaneous emergence of conventions: An experimental study of cultural evolution.”

Centola, D., Baronchelli, A., 2015. Proceedings of the National Academy of Sciences 112, 1989–1994. https://doi.org/10.1073/pnas.1418838112

Social conventions shape every aspect of our lives, from how we greet each other to the languages we speak. Yet their origins have been a topic of theoretical speculation since the time of Aristotle. Most approaches assume that institutions are necessary to organize large populations, but the simplest explanation is that universally accepted conventions are the unintended consequence of individuals’ efforts to coordinate locally with one another. Although this hypothesis is compelling, it lacks conclusive empirical support. Here, we present results from controlled experiments demonstrating that changes in network connectivity can cause global social conventions to spontaneously emerge from local interactions, even though people have no knowledge about the population, or that they are coordinating at a global scale.

Session 8:

“Game Changer: The Topology of Creativity”

de Vaan, M., Vedres, B., Stark, D., 2015. American Journal of Sociology 120, 1144–1194. https://doi.org/10.1086/681213

This article examines the sociological factors that explain why some creative teams are able to produce game changers—cultural products that stand out as distinctive while also being critically recognized as outstanding. The authors build on work pointing to structural folding—the network property of a cohesive group whose membership overlaps with that of another cohesive group. They hypothesise that the effects of structural folding on game changing success are especially strong when overlapping groups are cognitively distant. Measuring social distance separately from cognitive distance and distinctiveness independently from critical acclaim, the authors test their hypothesis about structural folding and cognitive diversity by analysing team reassembly for 12,422 video games and the career histories of 139,727 video game developers. When combined with cognitive distance, structural folding channels and mobilises a productive tension of rules, roles, and codes that promotes successful innovation. In addition to serving as pipes and prisms, network ties are also the source of tools and tensions.

“Collaborative learning in networks”

Mason, W., Watts, D.J., 2012. Proceedings of the National Academy of Sciences 109, 764–769. https://doi.org/10.1073/pnas.1110069108

Complex problems in science, business, and engineering typically require some tradeoff between exploitation of known solutions and exploration for novel ones, where, in many cases, information about known solutions can also disseminate among individual problem solvers through formal or informal networks. Prior research on complex problem solving by collectives has found the counterintuitive result that inefficient networks, meaning networks that disseminate information relatively slowly, can perform better than efficient networks for problems that require extended exploration. In this paper, we report on a series of 256 Web-based experiments in which groups of 16 individuals collectively solved a complex problem and shared information through different communication networks. As expected, we found that collective exploration improved average success over independent exploration because good solutions could diffuse through the network. In contrast to prior work, however, we found that efficient networks outperformed inefficient networks, even in a problem space with qualitative properties thought to favor inefficient networks. We explain this result in terms of individual-level explore-exploit decisions, which we find were influenced by the network structure as well as by strategic considerations and the relative payoff between maxima. We conclude by discussing implications for real-world problem solving and possible extensions.

Organisational Design Series

Session 9:

“When Two Bosses Are Better Than One: Nearly Decomposable Systems and Organizational Adaptation.”

Levinthal, D.A., Workiewicz, M., 2018. Organization Science 29, 207–224.
https://doi.org/10.1287/orsc.2017.1177

Organizations, as is true with social systems more generally, tend to be nearly, not fully, decomposable. However, analyses of nearly decomposable systems have tended to be at a single level of analysis and have generally neglected the vertical element of nearly decomposable systems. Critical to the notion of nearly decomposable systems is the property that the details of a particular subproblem may be encapsulated and captured by more aggregate parameters and that those subproblems interact in an aggregate way. We explore these issues in reference to the role of three canonical organizational structures in facilitating adaptation in the presence of near decomposability: a traditional hierarchy in which a subordinate reports to a single boss, an autonomous form in which the subordinate does not have a direct reporting relationship, and a multiauthority structure in which the subordinate reports to multiple bosses. Despite the ubiquity and potential benefits of multiauthority structures in coordinating highly interdependent tasks, our understanding of the mechanisms that determine the performance of those structures is still relatively modest. Scholars have noted conflicting empirical findings and have called for a more rigorous approach to study these organizational forms. To help address these issues, we develop an agent-based computational model that compares the performance of these three canonical types of organizational forms in settings characterized by different degrees of complexity and near decomposability.

“Integrating distributed work: comparing task design, communication, and tacit coordination mechanisms”

Srikanth, K., Puranam, P., 2011. Strategic Management Journal 32, 849–875.
https://doi.org/10.1002/smj.908

We investigate coordination strategies in integrating distributed work. In the context of Business Process Offshoring (BPO), we analyze survey data from 126 offshored processes to understand both the sources of difficulty in integrating distributed work as well as how organizations overcome these difficulties. We find that interdependence between offshored and onshore processes can lower offshored process performance, and investing in coordination mechanisms can ameliorate the performance impact of interdependence. In particular, we outline a distinctive set of coordination mechanisms that rely on tacit coordination—and theoretically articulate and empirically show that tacit coordination mechanisms are distinct from the well-known duo of coordination strategies: building communication channels or modularizing processes to minimize the need for communication. We discuss implications for the study of coordination in organizations.

Session 10:

“The architecture of collaboration.”

Fjeldstad ØD, Snow CC, Miles RE, Lettl C (2012)Strateg Manag J 33(6):734–775

Firms increasingly face competitive pressures related to rapid and continuous adaptation to a complex, dynamic, and highly interconnected global environment. Pressing challenges include keeping pace with shorter product life cycles, incorporating multiple technologies into the design of new products, cocreating products and services with customers and partners, and leveraging the growth of scientific and technical knowledge in many sectors. In response, we observe experimentation with new organization designs that are fundamentally different from existing forms of organizing. We propose that these new designs are based on an actor-oriented architectural scheme composed of three main elements: (1) actors who have the capabilities and values to self-organize; (2) commons where the actors accumulate and share resources; and (3) protocols, processes, and infrastructures that enable multi-actor collaboration. We demonstrate the usefulness of the actor-oriented scheme by applying it to organizations drawn from four different sectors: global professional services, open source software development, computer equipment, and national defense. We discuss the implications of the actor-oriented architectural scheme for future research on organizational forms as well as for managers who are involved in designing organizations.

“Knowledge, communication, and organizational capabilities.”

Garicano, L., & Wu, Y. 2012. Organization Science, 23(5): 1382–1397.

This paper attempts to bridge a gap between organizational economics and strategy research through an analysis of knowledge and communication in organizations. We argue that organizations emerge to achieve the intensive use of the knowledge that is acquired to perform specific tasks and to integrate dispersed knowledge that is embodied in different human minds. The attributes of the tasks undertaken determine the optimal acquisition and distribution of knowledge. Depending on the codifiability of knowledge, different communication modes arise as a coordination mechanism to deepen the division of labor, leverage managerial talent, and exploit the increasing returns to knowledge. Organizational processes can be adapted through codes and culture to facilitate coordination; organizational structure can be designed to complement the limitations of human ability. We stress that organizational process and structure construct the core of organizational capital, which generates rent and sustains organizational growth. From the analysis, we draw implications for the strategic management of knowledge and human resources in organizations.

Session 11:

“Searching for Structure: Formal Organization Design as a Guide to Network Evolution”

Clement, J., Puranam, P., 2018. Management Science 64, 3879–3895.
https://doi.org/10.1287/mnsc.2017.2807

Is top-down organization design worth attempting at all, or should organizations simply let their members learn which patterns of interaction are valuable by themselves, through a bottom-up process? Our analysis of an agent-based computational model shows that weak enforcement of even a randomly selected formal structure in a top-down manner can usefully guide the bottom-up emergence of networks of intraorganizational interactions between agents. In the absence of formal structure, interactions are prone to decline within organizations, because maintaining interactions requires coordination but breaking them does not. Formal structure regenerates the network of interactions between agents, who can then learn which interactions to keep or discard. This “network regeneration effect” of formal structure offers a rationale for the importance of top-down organization design, even if the design is limited in accuracy and enforcement.

“Hierarchical leadership versus self-management in teams: Goal orientation diversity as moderator of their relative effectiveness.”

Nederveen Pieterse, A., Hollenbeck, J.R., van Knippenberg, D., Spitzmüller, M., Dimotakis, N., Karam, E.P., Sleesman, D.J., 2019. The Leadership Quarterly 30, 101343.
https://doi.org/10.1016/j.leaqua.2019.101343

Within team leadership literature much attention has been given to the role of authority differentiation (the degree to which responsibility for decision-making is vested in a limited number of team members). However, contingencies associated with its effectiveness remain largely unclear. Building on authority differentiation, substitutes for leadership, and social hierarchy literatures, we propose that teams low in authority differentiation (self-managing teams) require that team members are aligned in their goal orientations. Otherwise, goal orientation diversity leads team members to spend valuable cognitive resources on aligning team member efforts instead of information elaboration. Goal orientation homogeneity, however, serves as a substitute for leadership in these teams. By contrast, teams high in authority differentiation (hierarchical leadership teams) function more effectively with diverse goal orientations. In support of our arguments, we show experimentally that low authority differentiation is beneficial for teams homogeneous in goal orientations and detrimental for teams diverse in goal orientations.