

Key Actors in Social Networks: Case Studies in Animal Networks

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Presentation Goals

- Introduce **Immediate Impact** Report

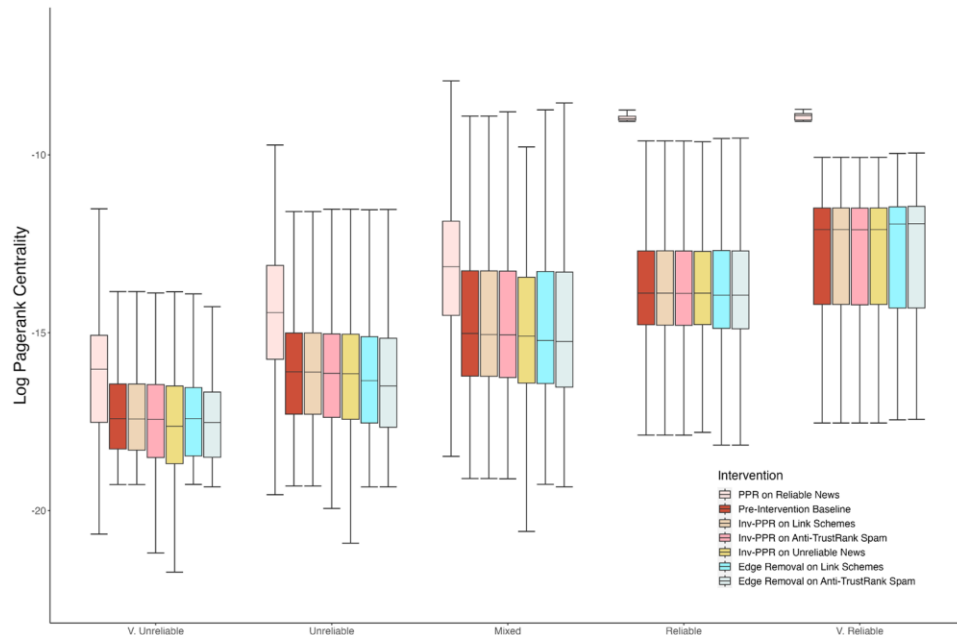
- This is a Hands-On Lecture, we will be doing:
 - Replication Analyses (random node removal/entropic change)
 - Immediate Impact (specific node removal/targeted change)
 - Battle of the Mid-Level Managers

What happens if...

- What if
 - You fire someone
 - A group of people retire
 - You arrest members of a cell
 - You use up a resource
- Some resilience researchers call this the “Bus Factor”
- There are two key questions
 - What happens immediately?
 - What will happen after the dust settles – near term?
- The **Immediate Impact** Report helps answer what happens immediately before the network restructures

Impact of strategic interventions on misinformation source rankings

- Pre- & post-intervention statistics
 - Network level
 - Node level
- Interventions:
 - Random node removal
 - Targeted node removal
 - Nodes / links addition

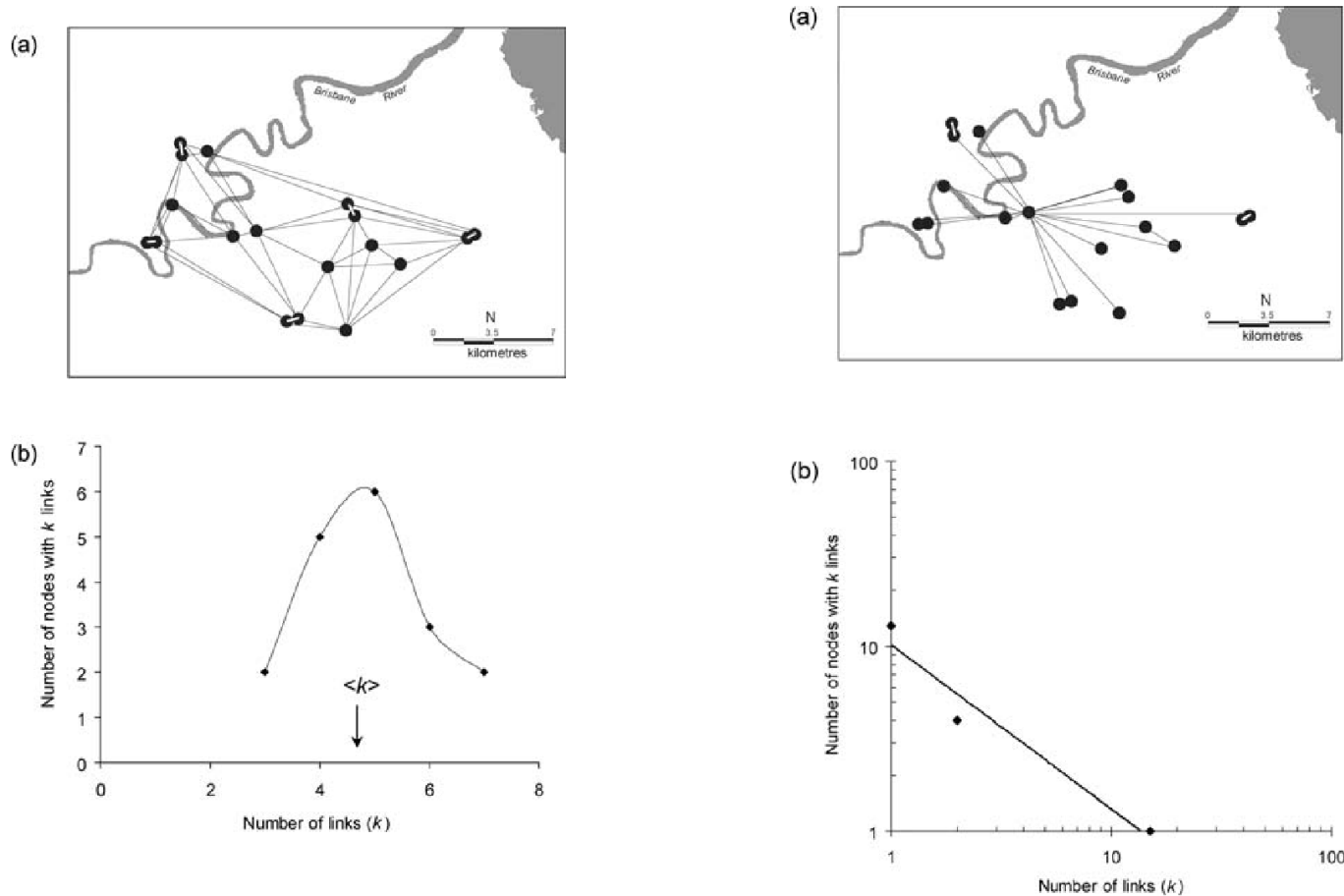


Misinformation Resilient Search Rankings with Webgraph-based Interventions

Peter Carragher, Evan M. Williams, Kathleen M. Carley

ACM Transactions on Intelligent Systems and Technology: Special Issue on Responsible Recommender Systems. 2024.

Strategic interventions for wildlife bat conservation



Rhodes, Monika, et al. "Applying network analysis to the conservation of habitat trees in urban environments: a case study from Brisbane, Australia." *Conservation Biology* (2006).

General Process

- Random node removal analysis
 - Determine number of nodes to remove
 - Run **Immediate Impact** Report with r replications
- Specific node removal analysis
 - Determine nodes of interest
 - Qualitative analyses, hunches, intuition, etc.
 - Other ORA Reports...
 - Key Entity** Report
 - Nodes of Interest** Report, etc.
 - Run **Immediate Impact** Report
 - Optional
 - Create new, post-intervention meta-network
 - Run other ORA Reports in comparison mode

Network Level Measures

Metric	Meaning
Performance as Accuracy	Likelihood the group will make mistakes
Diffusion	Information flow through the group
Clustering Coefficient	Local density around nodes, "groupiness"
Social Density	Density in the social network
Communication Congruence	The higher the more effective the group
Communication Speed	Typical communication speed
Number of Isolated Agents	Who's been entirely cut off from others
Fragmentation	Are there subgroups and level of subgroups



Indirect measures are more robust to removal

- Sampling Marmots in the Rocky Mountains
- Individually marked & monitored
- Direct measures have clearer trends
 - Degree centrality / Density
 - Stat sig difference after 10% removal
- Indirect measures are more robust to sampling
 - Betweenness centrality / Diameter
 - Stat sig difference after 70% removal



Social Network Analysis of animal behaviour: a promising tool for the study of sociality. Wey, Tina, et al. *Animal behaviour* 75.2 (2008)

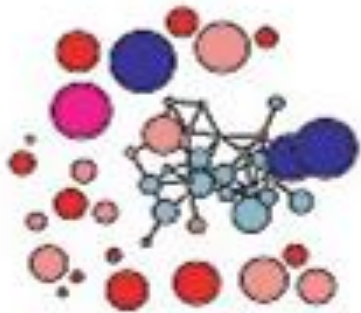
Node Level Measures

Metric	Meaning
Emergent Leader (Cognitive Demand)	Who will be calling the shots
Potentially Influential (Betweenness Centrality)	Who will work behind the scenes
Centrality (Total Degree Centrality)	Who will know what is going on

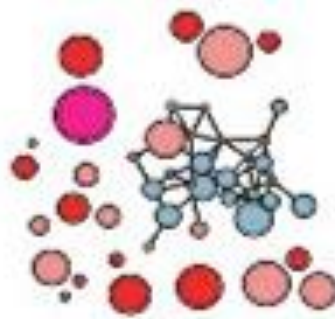


Node removal is one side of the story

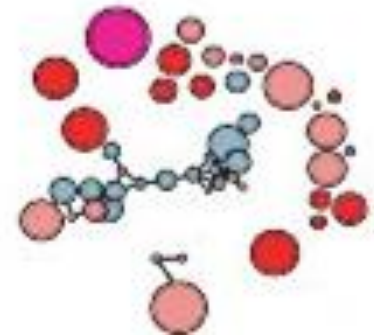
Undisturbed



Artificial



Experimental



Flack, Jessica C., et al. "Policing stabilizes construction of social niches in primates." *Nature* (2006).
No animals or software companies were harmed in the making of these slides

**Node removal does not necessarily tell
the truth...**

(unless it fits my research)

Recap

- Change analysis: impact of hypothetical change that involves removal of specific agents, tasks, resources, etc.
- Replication analysis: sensitivity to change based on random node removals / entropic change
- Quickly create new meta-networks by removing specific nodes
 - Iterative refinement of intervention strategy
 - Input to other types of analyses via other Reports
 - Once you've removed nodes save the meta-network
 - You can then run any Report comparing the old to the new