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INVESTIGATING COVERT NETWORKS

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INTRODUCTION

Individuals may be involved in several kinds of secret activities. They try to hide their relationships in order to protect others and themselves from the surveillance of authorities. Thus, the possibility of reconstructing a covert network is limited by a lack of access to information.

Covert networks may be the result of both the presence of pre-existing ties, i.e. kinship or friendship, and of people's motivations that incite individuals to act cooperatively regardless of previous relations. Despite the various possible motivations that trigger the emergence of a covert network, I suggest that the presence of a coordinated action is the central aspect which is necessary for identifying a covert network. Covert networks may thus be investigated by considering people's affiliation in terms of **co-participation** and **co-membership**.

BACKGROUND

The concepts of co-participation in events and co-membership in groups, which are based on the concept of physical proximity, fall into the general category of co-occurrence of ties.

Literature on covert networks may be differentiated by considering how researchers use the concept of co-occurrence.

	conceptualization	operationalization
1st group	Co-occurrences have been used as a concept only during the conceptualisation process Network as a metaphor to identify general precondition for action	
2th group	Co-occurrences have been used as a concept during the conceptualisation process Network as a proxy for precondition of action	Co-occurrences have been used as a concept during the operationalization processes Network reduced to communication exchange
3rd group	Co-occurrences have been used in terms of a variable to identify social relations	Co-occurrence operationalised as co-membership and co-participation to events

1 st group (Erickson 1981, Klerks 1999, Raab and Milward 2003, 2006, Bouchard 2007, Enders and Su 2007, Kirby 2007): authors focus on characteristics such as centralisation/ decentralisation, resilience, hierarchy, vulnerability but since SNA is not empirically applied, speculations of authors appear to be ambiguous and controversial.

2nd group (Baker and Faulkner 1993, Natarajan 2000, 2006, Koschade 2006, Morselli 2007, Giménez-Salinas Framis 2011, Demiroz and Kapucu 2012, Varese 2012): authors study communication, and analyse configurations to focus on security and efficiency trade-off, core-periphery structure, centralisation/decentralisation, resilience. Results remain controversial and authors do not reach an agreement.

3rd group (Krebs 2002, Han 2009, Everton 2012, Crossley et al. 2012, Stevenson & Crossley 2014): authors use the co-occurrence as a social relation. They explore co-participation in events and co-membership in groups to explain network tendencies i.e. hierarchical/non-hierarchical structure, vulnerability, efficiency, and decentralisation over time. The application of SNA leads to empirical tests of hypotheses and yield some results which seem to remain ambiguous and varied.

RESEARCH OBJECTIVES

The purpose of this work is to compare a criminal network reconstructed by police wiretapping of communication exchanges (2nd group) with a terrorist network reconstructed by considering co-occurrence ties (3rd group).

The datasets refer to:

- Stolen vehicle Siren operation network (Morselli, 2009)
- Noordin Mohammad Top network (Everton, 2012)

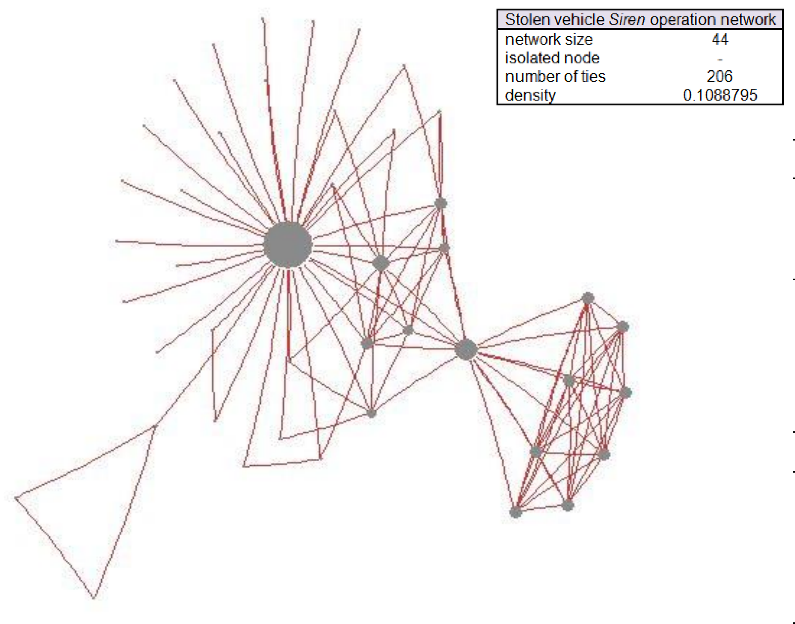
In order to see which of the two could potentially be more reliable for the reconstruction of the covert network, I have compared both of them with simulated graph configurations.

The aim of the comparison is:

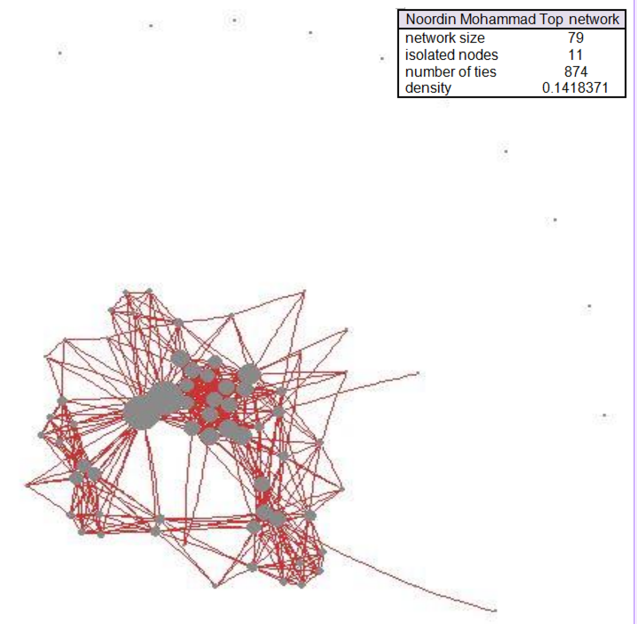
1) To evaluate how the observed and simulated configurations of ties change within these two networks. The analysis of co-participation and co-membership between individuals may better explain than communications some characteristics of the networks.

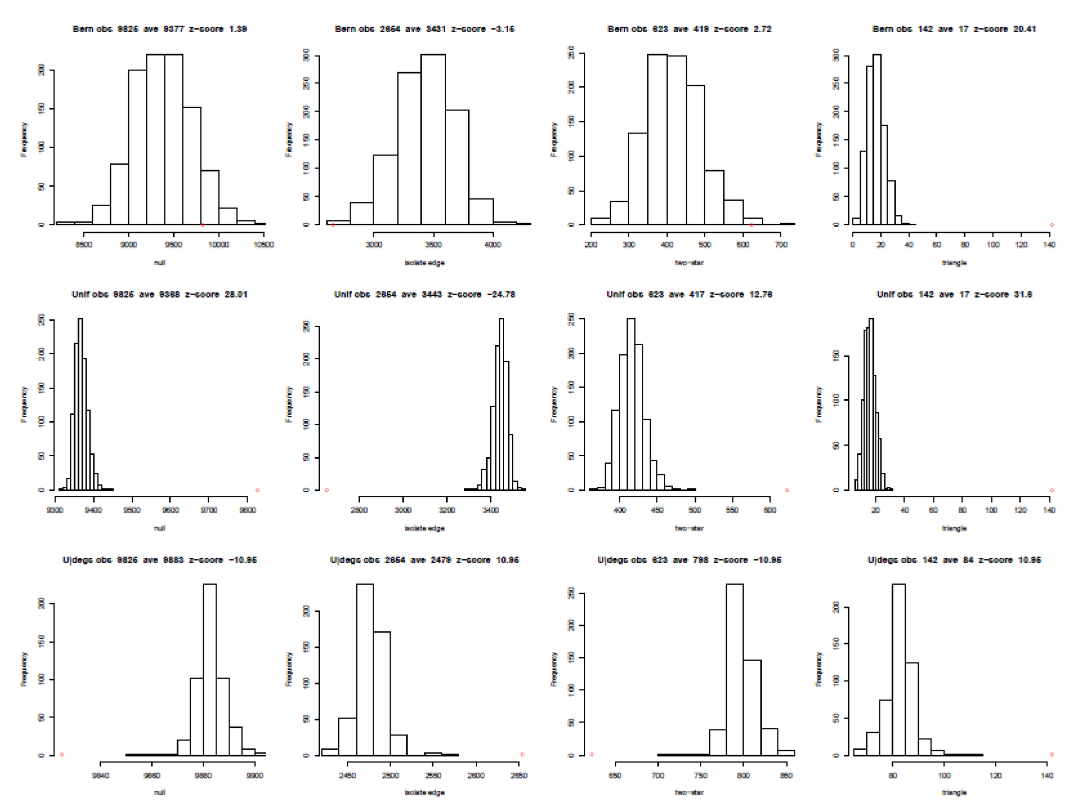
2) To analyse the level of clustering of these two networks in respect to results obtained by chance.

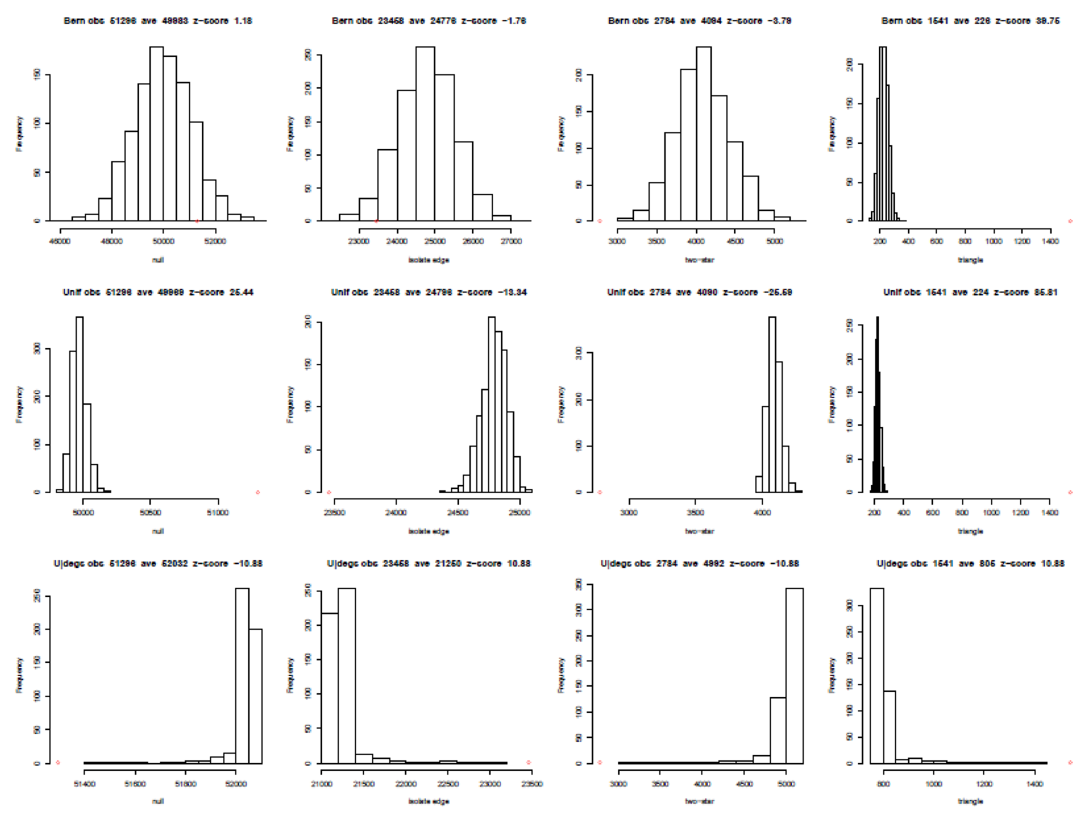
KEY FINDINGS



		U | L		Bernoulli		U | D	
	Observed	Simulated distribution	Z-score	Simulated distribution	z-score	Simulated distribution	z-score
Stolen vehicle Siren operation network							
003	9825	9368	+28,01	9377	+1,39	9888	-10,95
102	2654	3443	-24,78	3431	-3,15	2479	+10,95
201	623	417	+12,76	419	+2,72	798	-10,95
300	142	17	+31,6	17	+20,41	84	+10,95
Noordin Mohammad Top network							
003	51296	49969	+25,44	49983	+1,18	52032	-10,88
102	23458	24796	-13,34	24776	-1,76	21250	+10,88
201	2784	4090	-25,59	4094	-3,79	4992	-10,88
300	1541	1541	+85,81	226	+39,75	805	+10,88



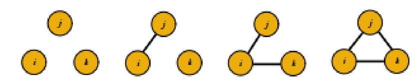




METHODOLOGY

Distributions of 1000 random graphs have been generated by using: the density conditional uniform distribution, the Bernoulli random graph distribution, and the degree conditional uniform distribution.

The graph configurations of two one-mode undirected networks has been analysed in terms of transitivity. In particular, I looked at following triad configurations: *Empty*, *One edge*, *Two-path*, and *Triangle*.



Successively, the application of the test-Z has been used to verify the distance between the triad configurations obtained for my real data and the triad values obtained by chance.

CONCLUSIONS

Simulated triad configurations seem to be different from the observed triads of the starting networks. In particular, the number of triangles in the real networks tends to be higher than what it has been expected for the simulated ones. This indicates that both the observed networks, the one constructed with communication exchanges, and the one derived by co-occurrences, are characterised by high transitivity.

Overall, since the results of triad configurations are rather similar in both communication exchanges and co-occurrences networks, more analysis is necessary in order to investigate if the co-participation and co-membership ties can improve the analysis of covert networks.

FUTURE WORK

The use of bipartite representations starting from one-mode networks may be further developed. In this way may be considered others configuration models for two-mode networks, i.e. three path, four-cycles, and parametric models. The analysis of more elaborated configurations might permit a deep evaluation of how the properties of network topologies tend to be constraint by the kind of relationship measured.

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More information

http://www.socialsciences.manchester.ac.uk/research/research-centres-and-networks/mitchell-centre/our-research/covert-networks/

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