

Affiliation



Center for Public Health
Systems Science

Brown School



Washington University in St. Louis

Inferring network relations from affiliation data

AFFILIATION NETWORKS



Goals

- Understand sources and structure of affiliation data
- Demonstrate how to perform 1-mode and 2-mode network analysis of affiliation data
- Explore scientific collaboration data as an example of an affiliation network



Overview

- Networks derived from special data structures
- Affiliation networks - networks of actors and/or groups based on affiliation of actors within groups, shared events
 - Corporate interlocks
 - Structure and processes of legislative/judicial bodies



Social structure through affiliations

- Sociological interest in collectivities
- Social circles - groups of people that gather around one or more organizations/events. Provide conditions for development of interpersonal connections
- Affiliations express institutional arrangements - fundamental societal structuring
- Well known example - corporate interlocks
 - A corporate interlock is formed when one person sits on more than one corporate board
 - That person serves as a bridge between two (or more) corporations - opportunity for inter-corporate communication
 - www.theyrule.net



Affiliations as indirect relations

- Previous network relations have all been direct - *e.g.*, friendship, money lending, marriage tie, etc.
- Affiliations are indirect relations - relationship is inferred from opportunity to connect by actors being involved in the same organization, event, etc.



Rationale for studying affiliation networks

- Individuals' affiliations with events provide direct linkages between the actors or the events
- Actors involvement with events provides the conditions for development of direct links between actors
- The interaction between actors and events as a social system that can be studied in and of itself.



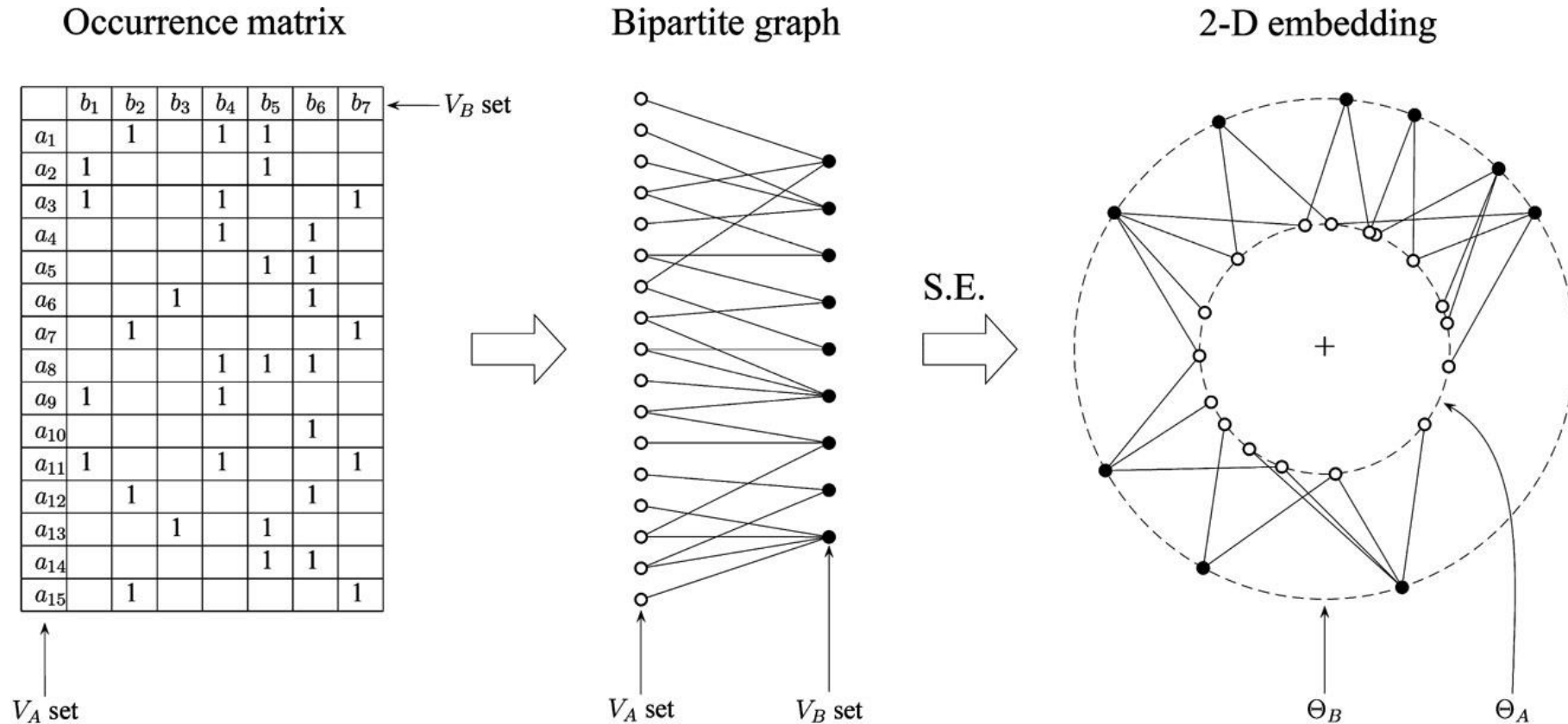
Affiliation networks as 2-mode networks

- One-mode networks - relations among one set (type) of nodes (actors)
- Two-mode networks - relations between two different sets of nodes, e.g., actors and events
- Many traditional network techniques must be adapted to be used in two-mode affiliation networks
 - For example, density must be calculated differently
 - The maximum no. of connections from an actor in a two-mode network is equal to the number of events, not the total number of nodes



Bipartite graphs

- Two-mode networks (and affiliation networks) are a special type of bipartite graph



(From Naud, et al, 2007. doi: 10.3389/neuro.11/007.2007)



2-mode network representation

Actor	Event		
	PHS-601	Network	Epi
Jenine	1	1	0
Leslie	0	1	1
Ratna	0	1	0
Stavroula	0	1	0
Nancy	1	0	0
Byron	1	0	0
Erin	0	0	1
Ryan	0	0	1



1-mode 'co-affiliation' representation

	PHS601	Network	Epi
PHS601	3	1	0
Network	1	4	1
Epi	0	1	3

	<i>J</i>	<i>L</i>	<i>R</i>	<i>S</i>	<i>N</i>	<i>B</i>	<i>E</i>	<i>R</i>
<i>J</i>	2	1	1	1	1	1	0	0
<i>L</i>	1	2	1	1	0	0	1	1
<i>R</i>	1	1	1	1	0	0	0	0
<i>S</i>	1	1	1	1	0	0	0	0
<i>N</i>	1	0	0	0	1	1	0	0
<i>B</i>	1	0	0	0	1	1	0	0
<i>E</i>	0	1	0	0	0	0	1	1
<i>R</i>	0	1	0	0	0	0	1	1

Class
co-affiliation

Student
co-affiliation

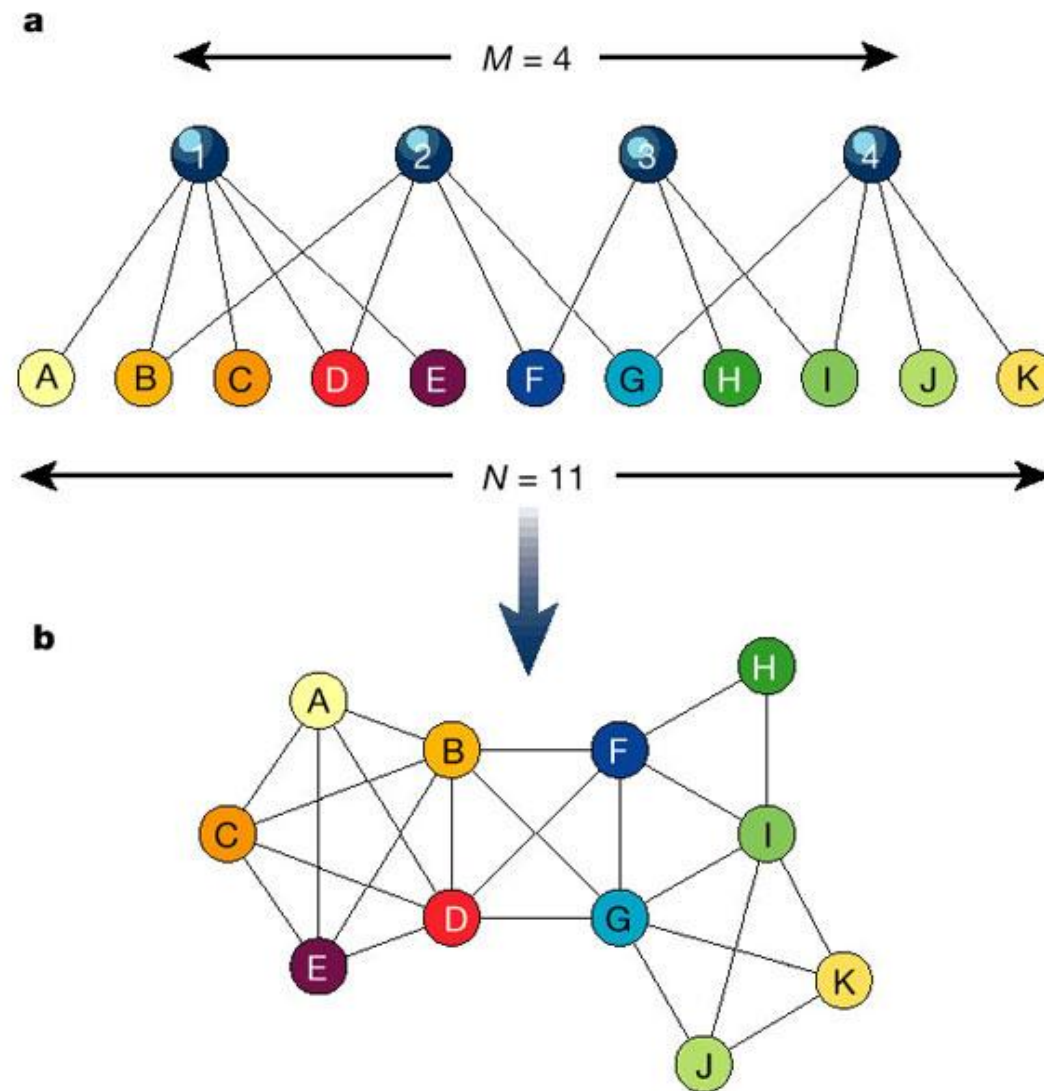


How to Analyze Affiliation Data

- Data preparation
- Analysis of 2-mode network
- Create two 1-mode *projections*
- Analyze each 1-mode network on their own, keeping in mind that the 1-mode networks represent indirect relationships



2-mode to 1-mode example

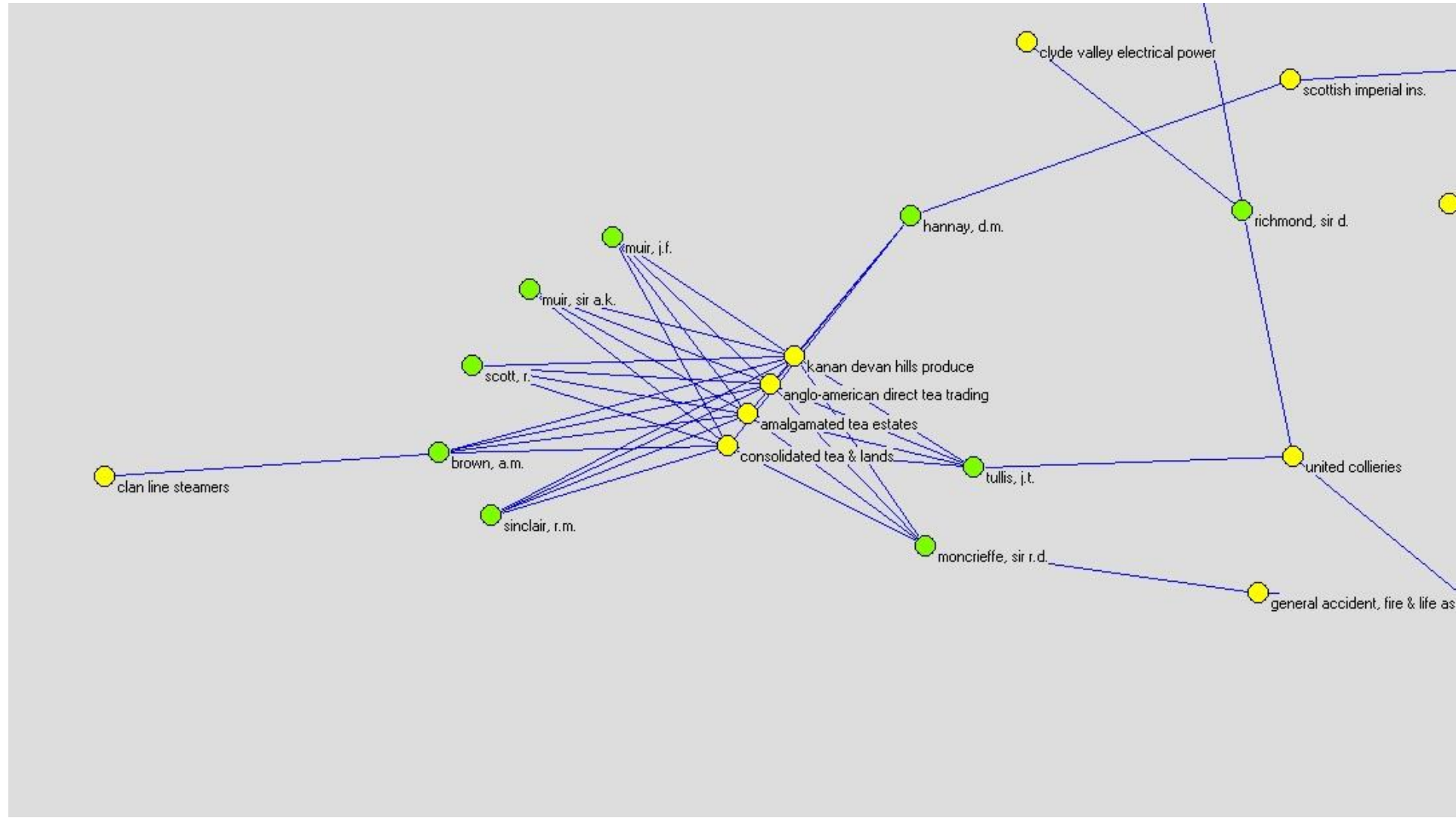


Transforming two-mode networks to one-mode networks

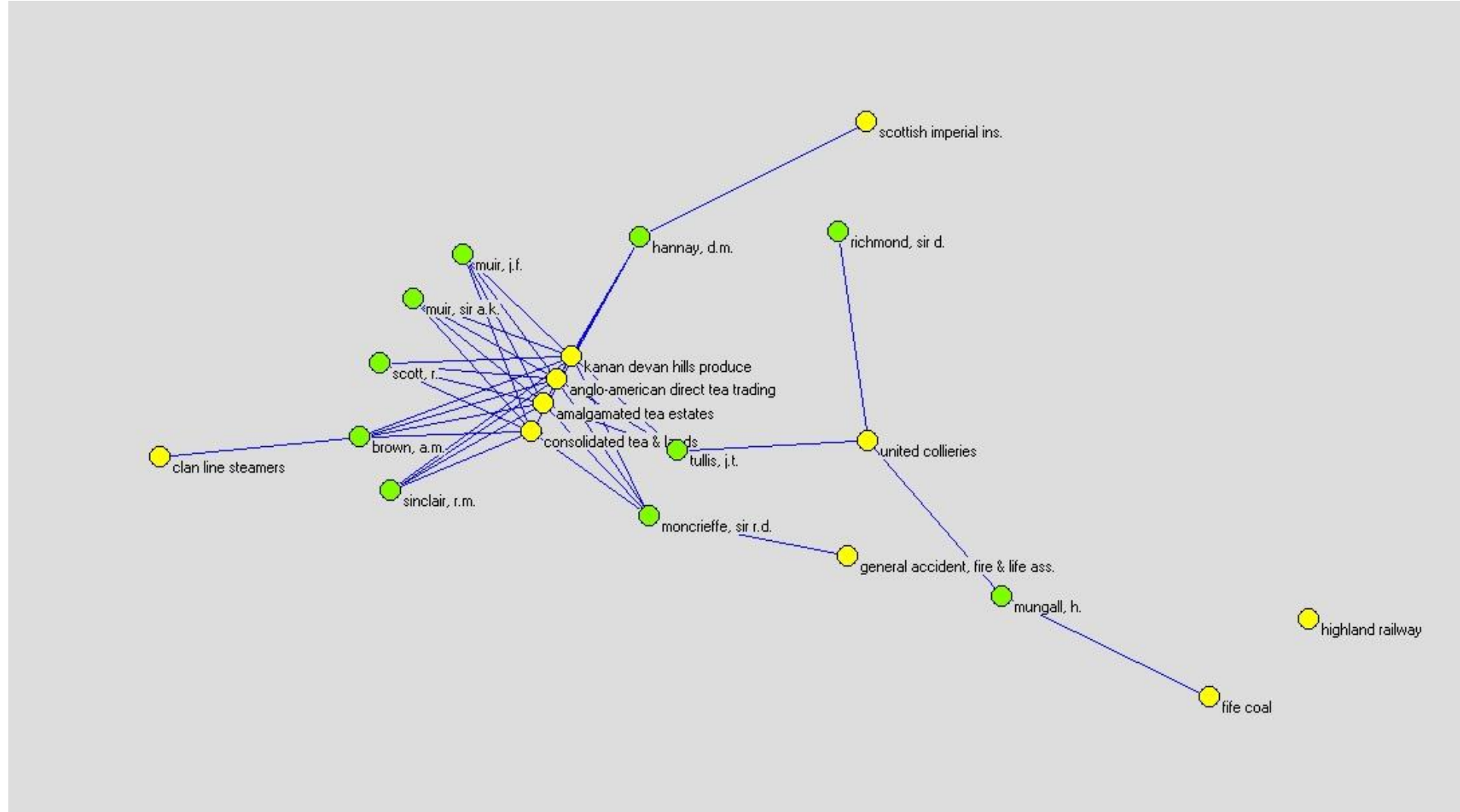
- Two possible one-mode networks
 - Network of *actors* - actors are connected if they attend the same event (belong to the same organization, etc.). Co-attendance or co-membership.
 - Network of *events* - events *interlock* if they share the same actor. Overlapping or interlocking events.
- Derived one-mode networks can be analyzed using traditional network techniques, and are usually easier to interpret than the two-mode networks.



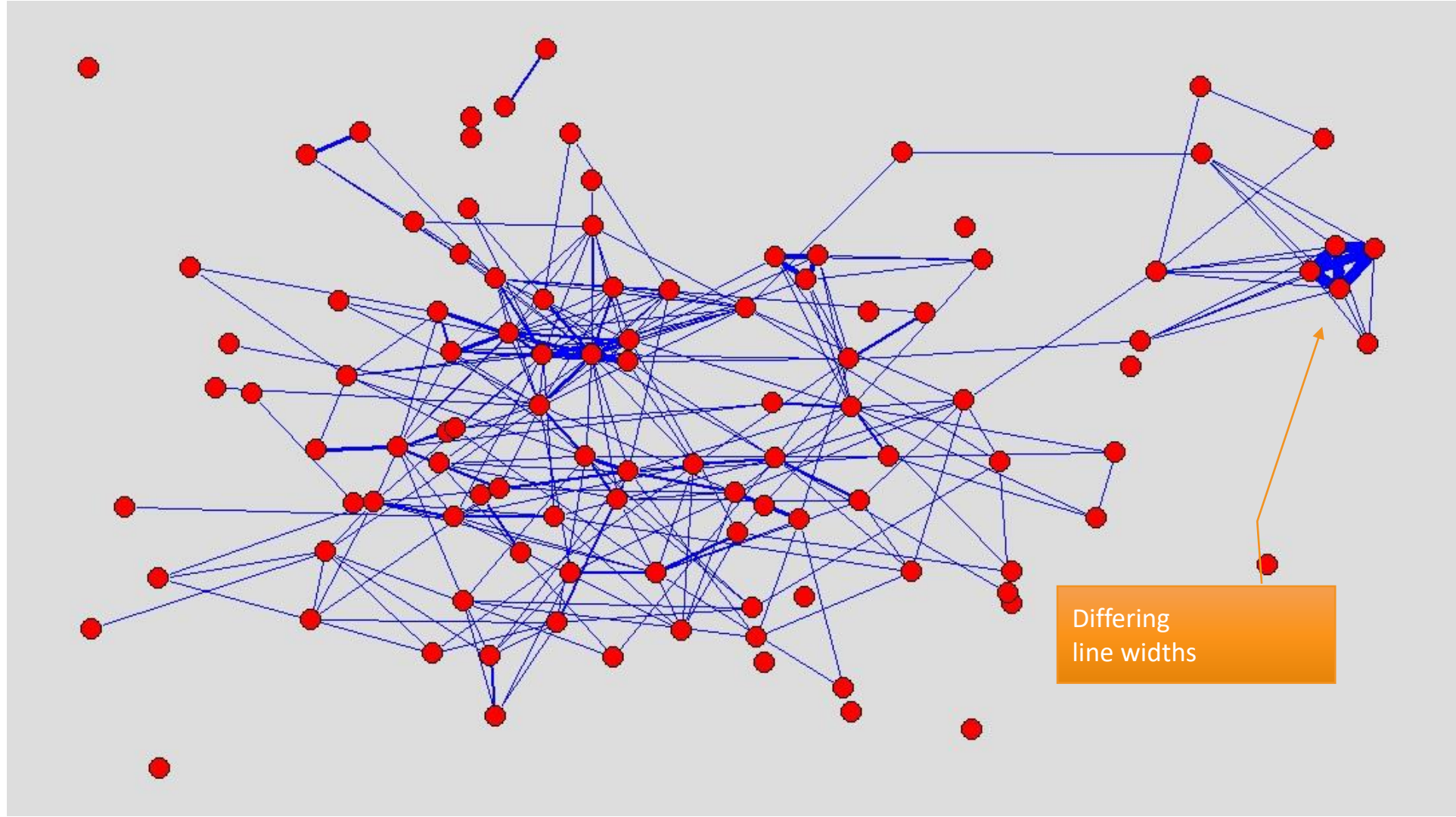
Portion of Scotland 2-mode network



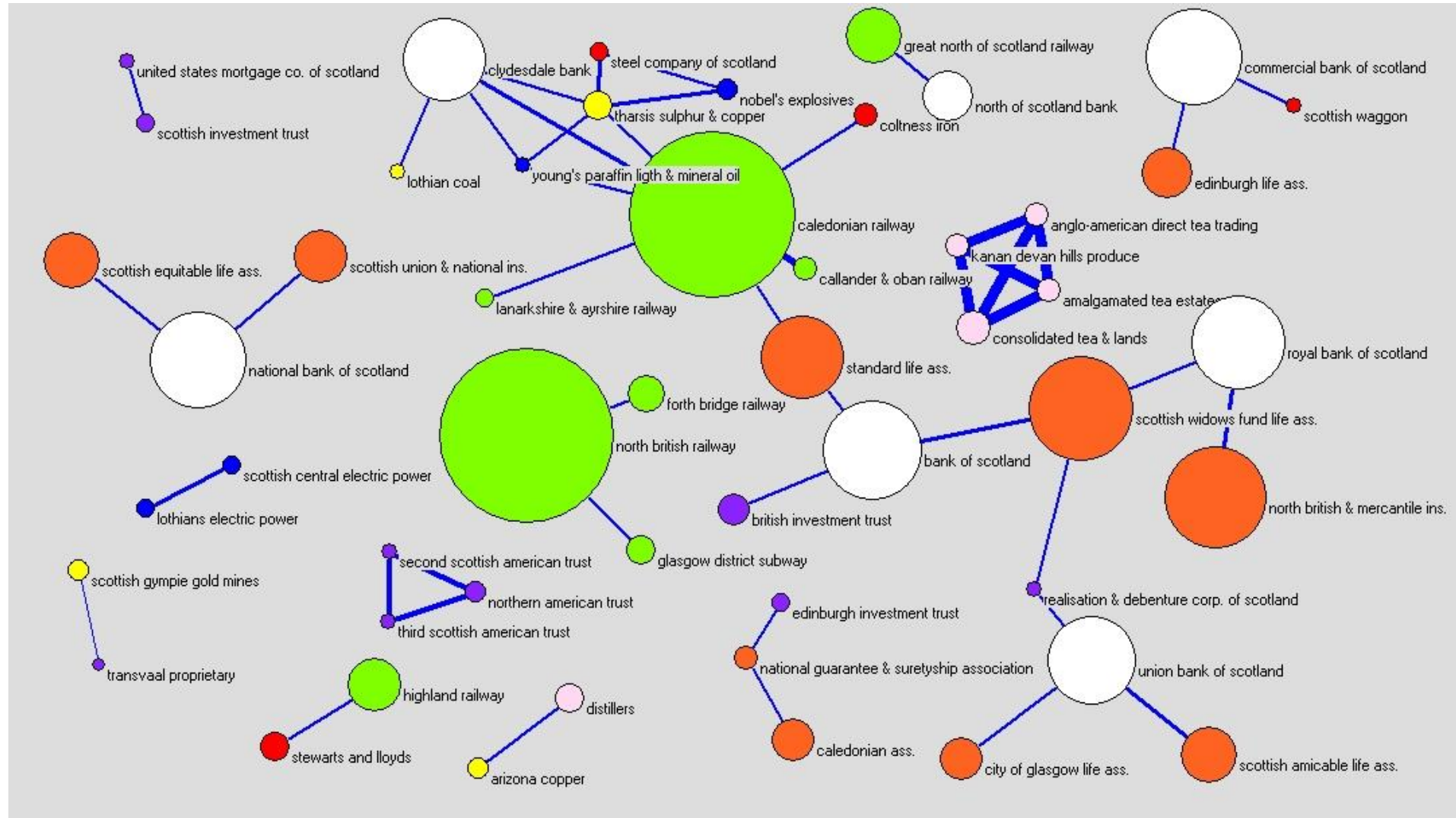
Hubs & authorities (10 each)



Firm (1-mode) network



Firm 'islands'



Example - WU ICTS Evaluation

