Social Network Analysis

Introduction

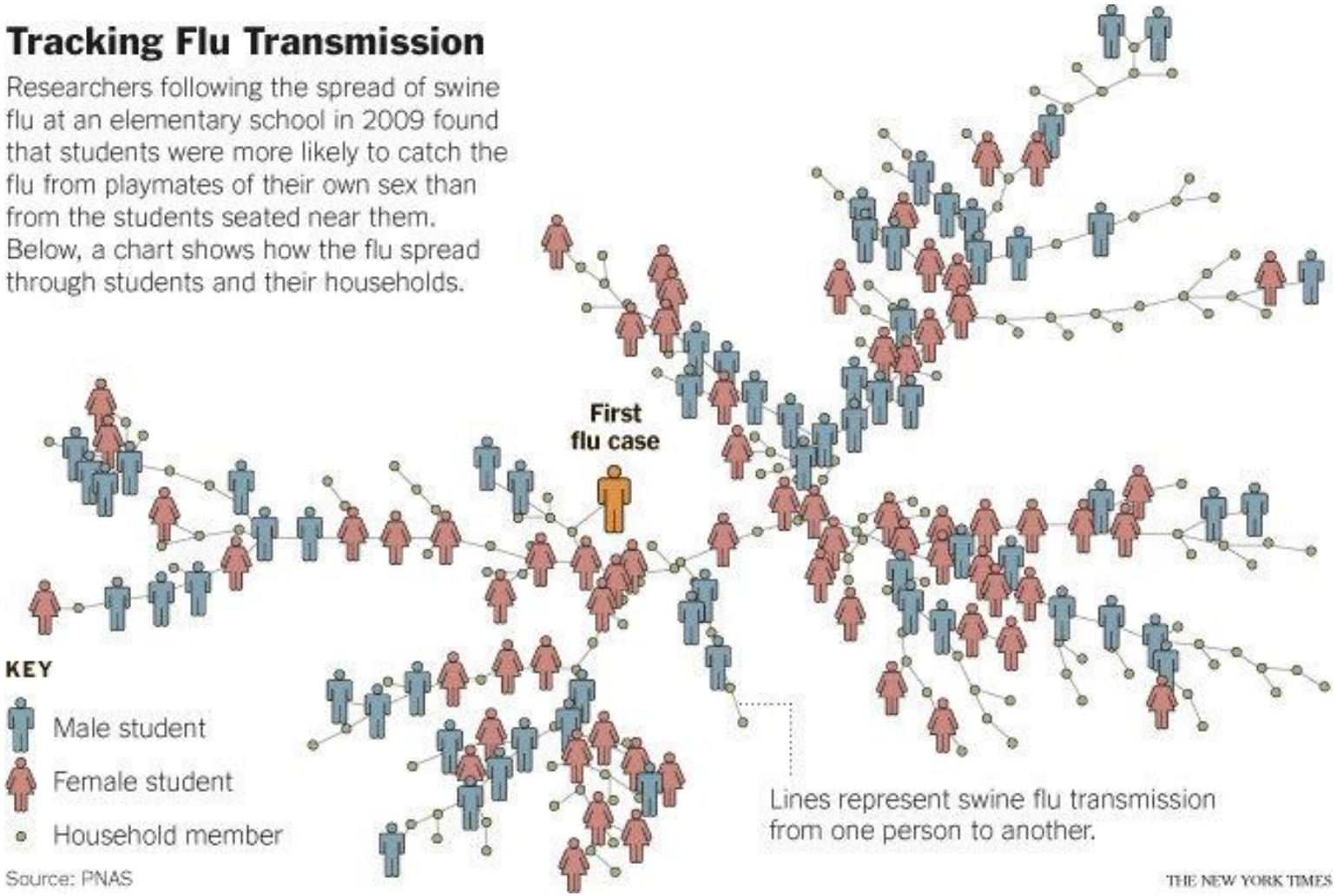
Published literature in “social network analysis”

Web of Science

Scopus

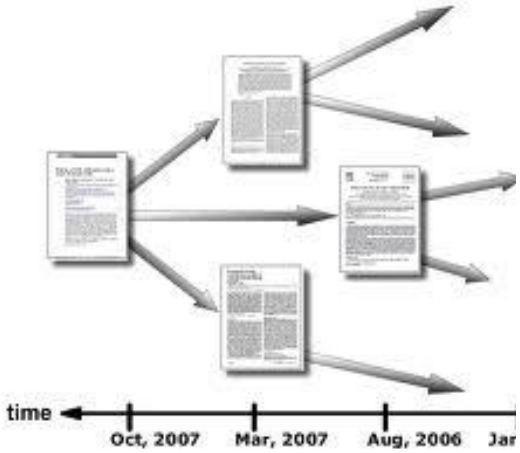
Network

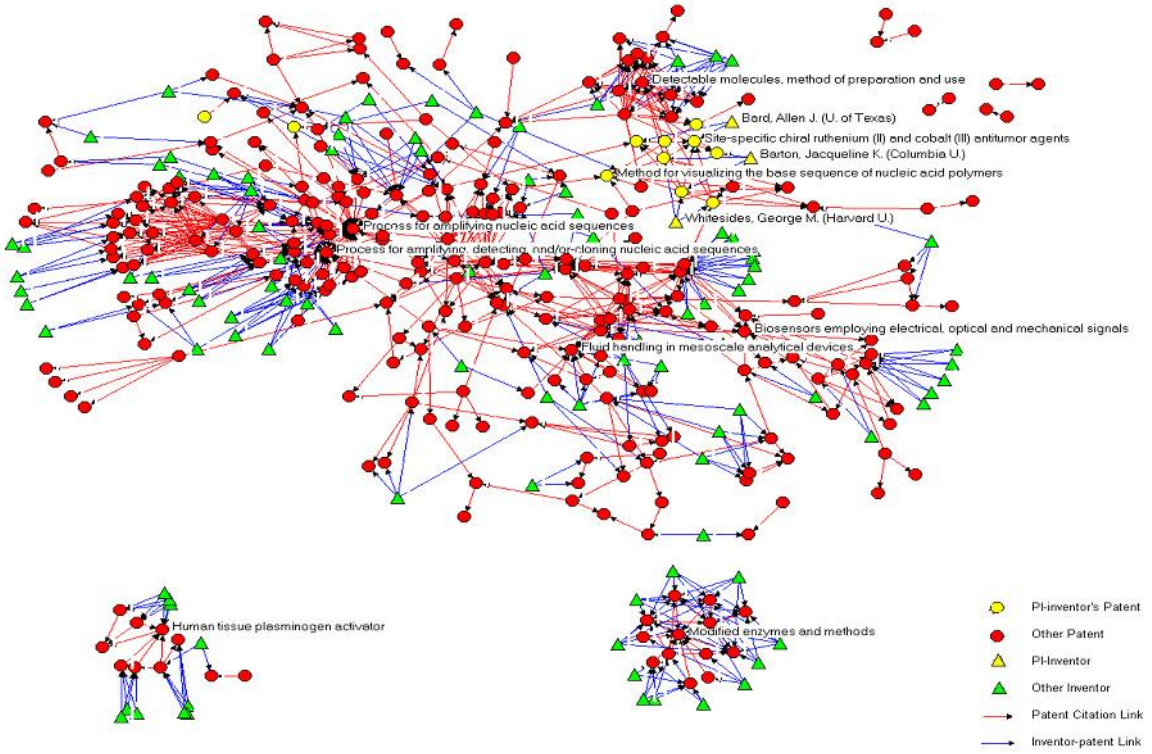
A group or system of interconnected people or things



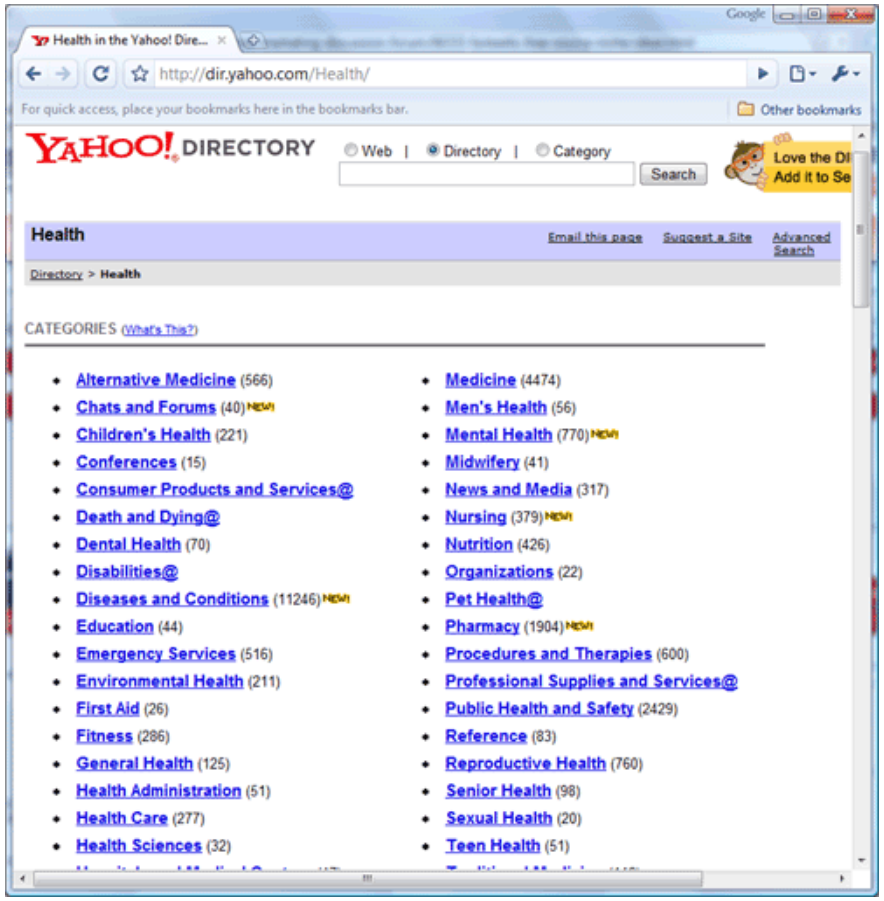
What are the variables involved in this model?

Citation network

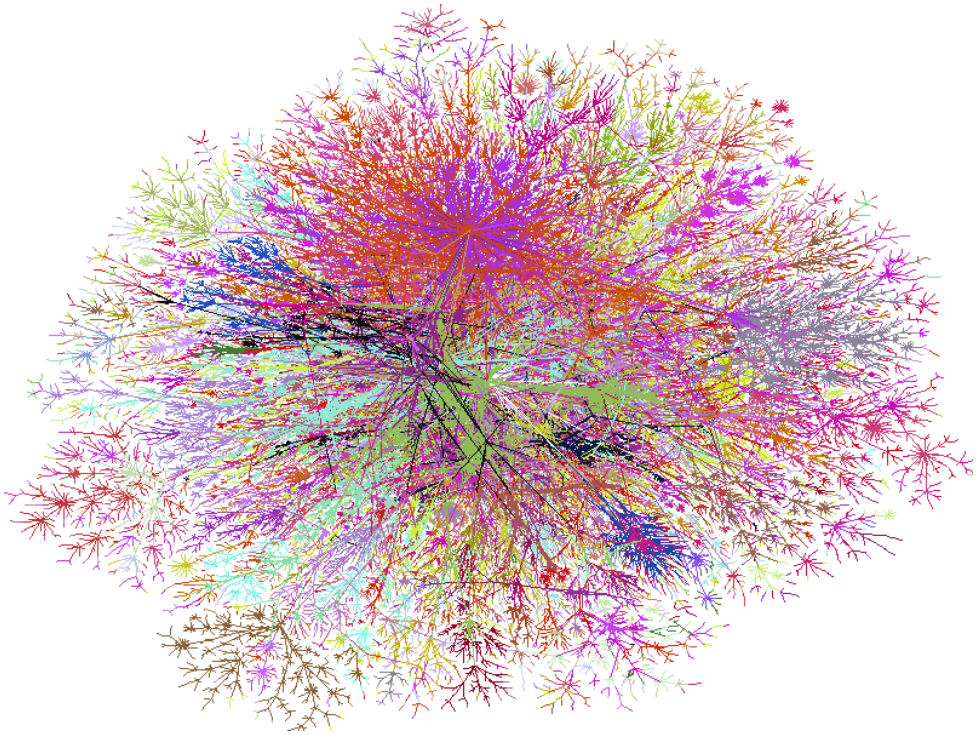




Network as an organizational principle

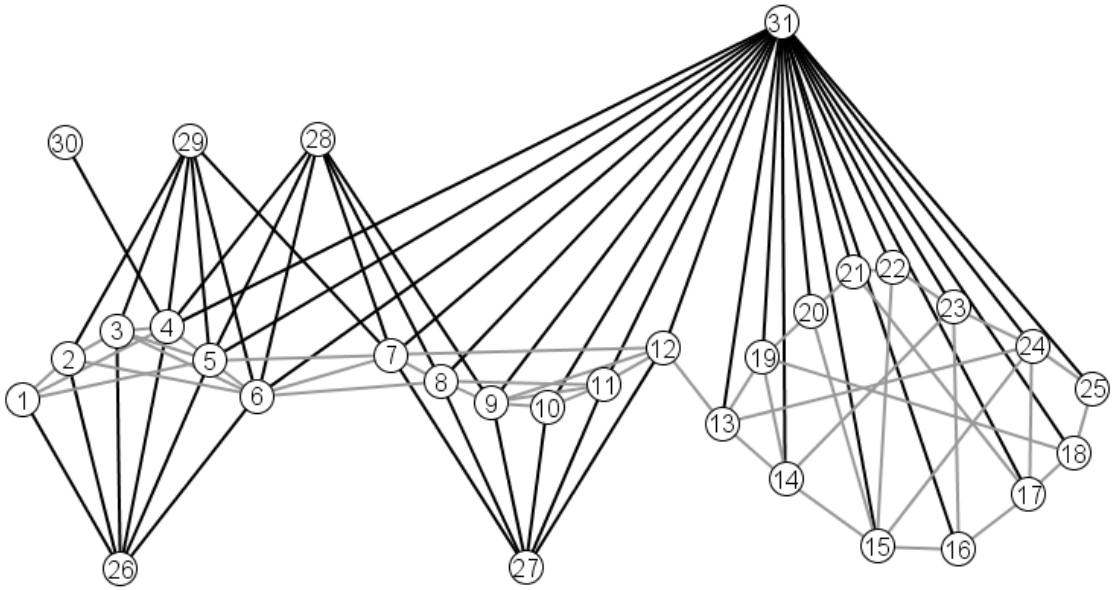


[Music taste similarity]



Recommendation network

Customer who bought this also bought



For #26, who would you suggest to be her Facebook friends?
If using Jaccard coefficient

Source: Bruce Hoppe "Introduction to Network Mathematics"

SNA, definition

- Social network analysis [SNA] is the mapping and measuring of ***relationships*** and flows between people, groups, organizations, computers or other information/knowledge processing ***entities***.
- The nodes in the network are (NOT always) the people and groups while the links show relationships or flows between the nodes.
- SNA provides both a visual and a mathematical analysis of complex human systems.

Doctors based in a Northeastern U.S. community who have prescribed, or are potential customers for, an oncology drug.

Each circle represents one doctor.

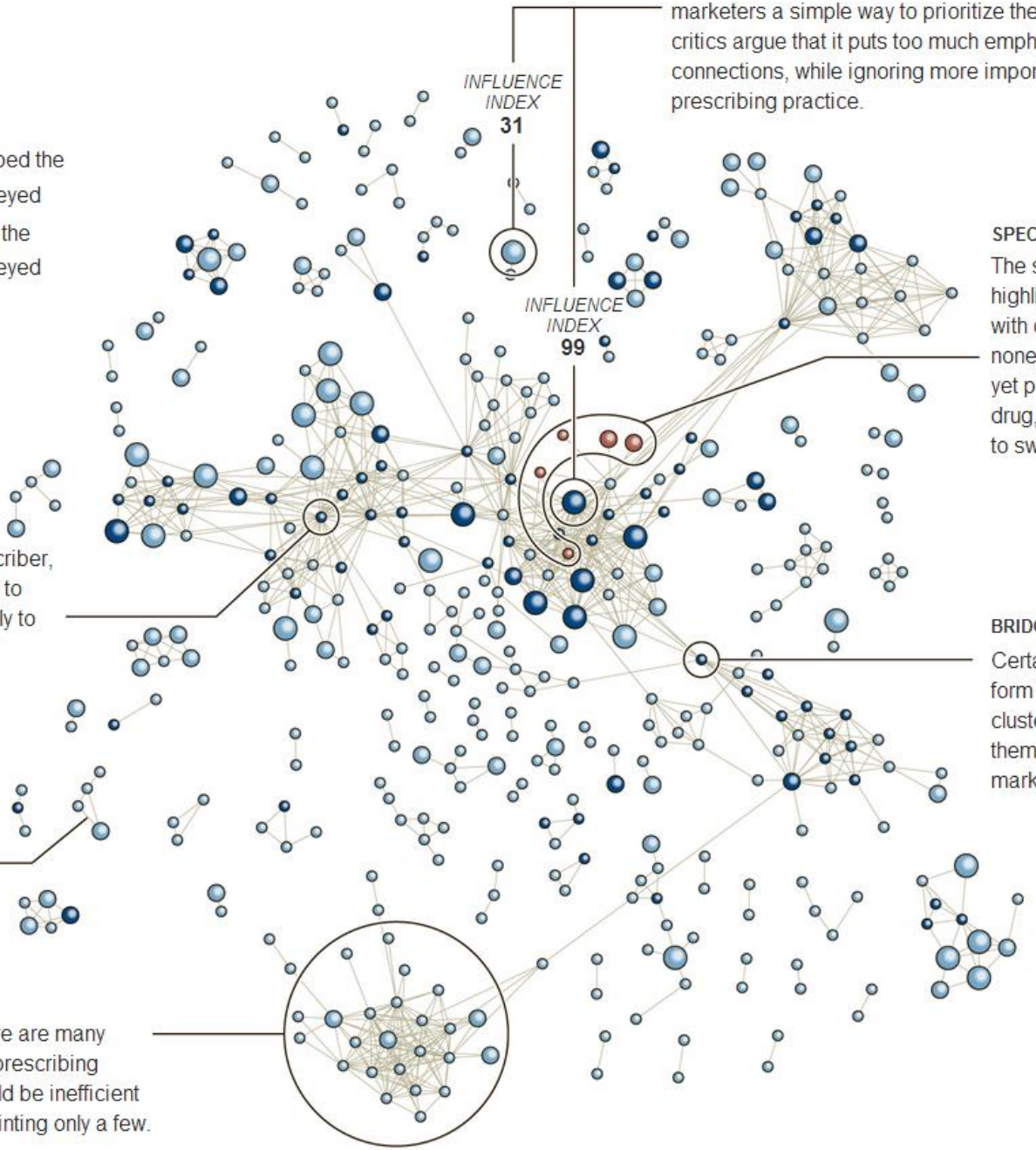
RELEVANT SPECIALISTS

OTHER DOCTORS

- Has not prescribed the drug being surveyed
- Has prescribed the drug being surveyed

PRESCRIBING VOLUME FOR ANY ONCOLOGY DRUG

Low Medium High



INFLUENCE INDEX

The software can assign each doctor an "influence index" based on his or her connectedness to others. This gives marketers a simple way to prioritize their potential targets, but critics argue that it puts too much emphasis on social connections, while ignoring more important values like proper prescribing practice.

SPECIALISTS

The software allows users to highlight relevant specialists with color. In this example, none of the specialists have yet prescribed the featured drug, so marketers may try to sway them.

BRIDGES

Certain physicians seem to form key links between clusters. That could make them good targets for marketers.

POSITIONING

Although currently a low-volume prescriber, this doctor is in a key central position to sway others. Marketers would be likely to single him out.

CONNECTIONS

mean that doctors share more than a certain number of relevant patients in common — patients whose condition could make them potential users of the drug being surveyed.

PRIORITIZING

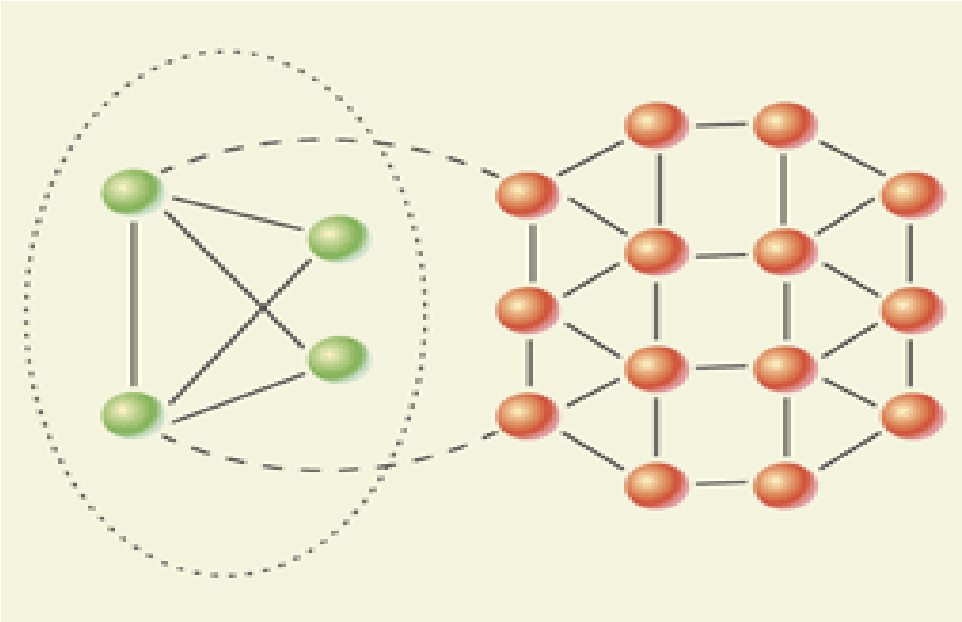
In a complex cluster like this one, there are many interrelated physicians, all at similar prescribing levels. A marketer may decide it would be inefficient to prioritize all of them, instead pinpointing only a few.

What does SNA do?

- Identify subsets of networks – Derive meaningful subgroups
  - Cohesive
  - Structural equivalent
- Identify actors who occupy strategic positions
  - Bridge and boundary spanners
- Identify dynamic – flow of information, influences, diseases etc.
- Identify structures – Display and analyze the **forest** given data on **trees**
  - E.g. Visualizing knowledge domain
  - Open or close ego network etc.
-

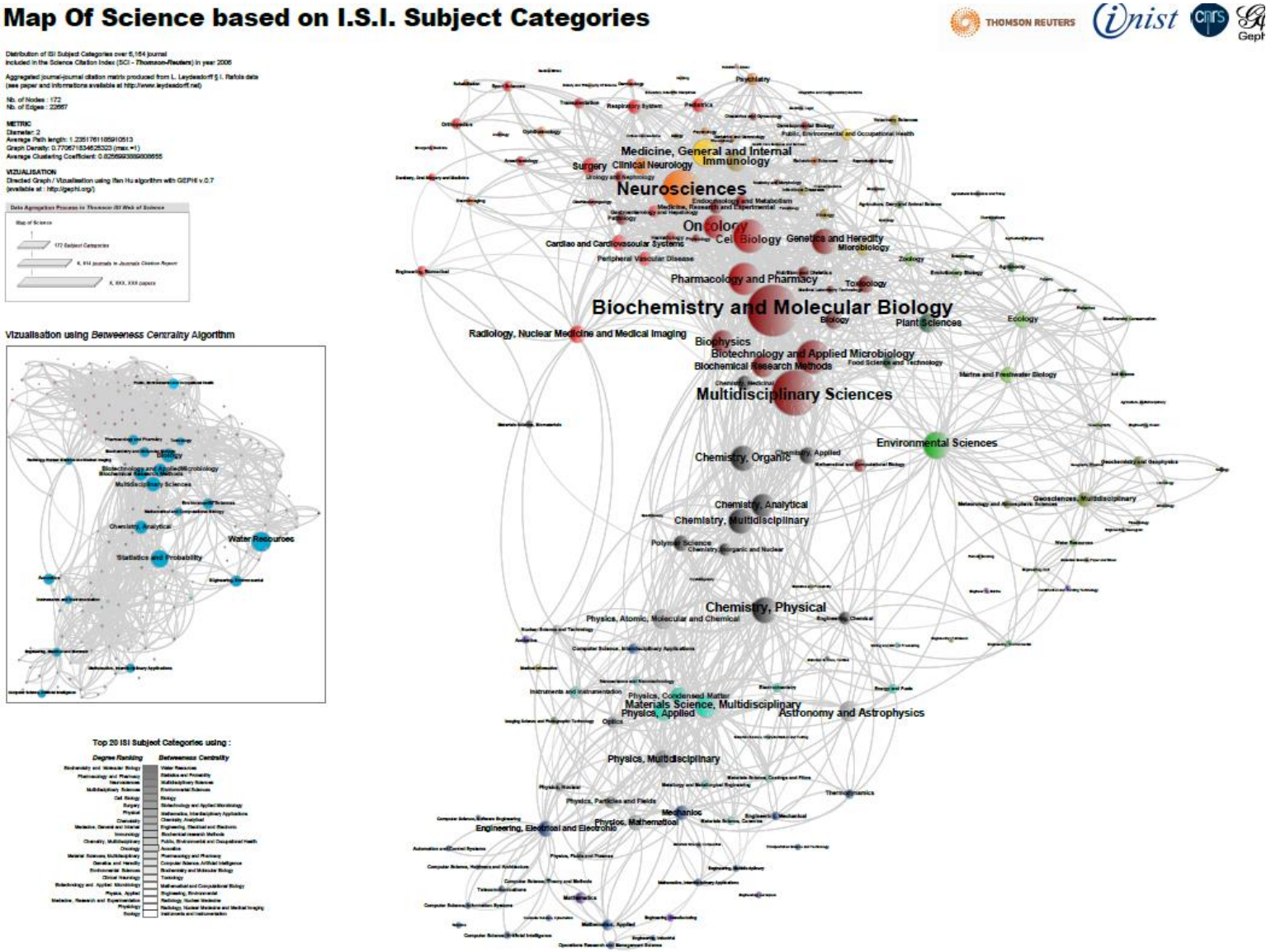
Identify subsets of networks : the link structure of the Web

- Within community link density



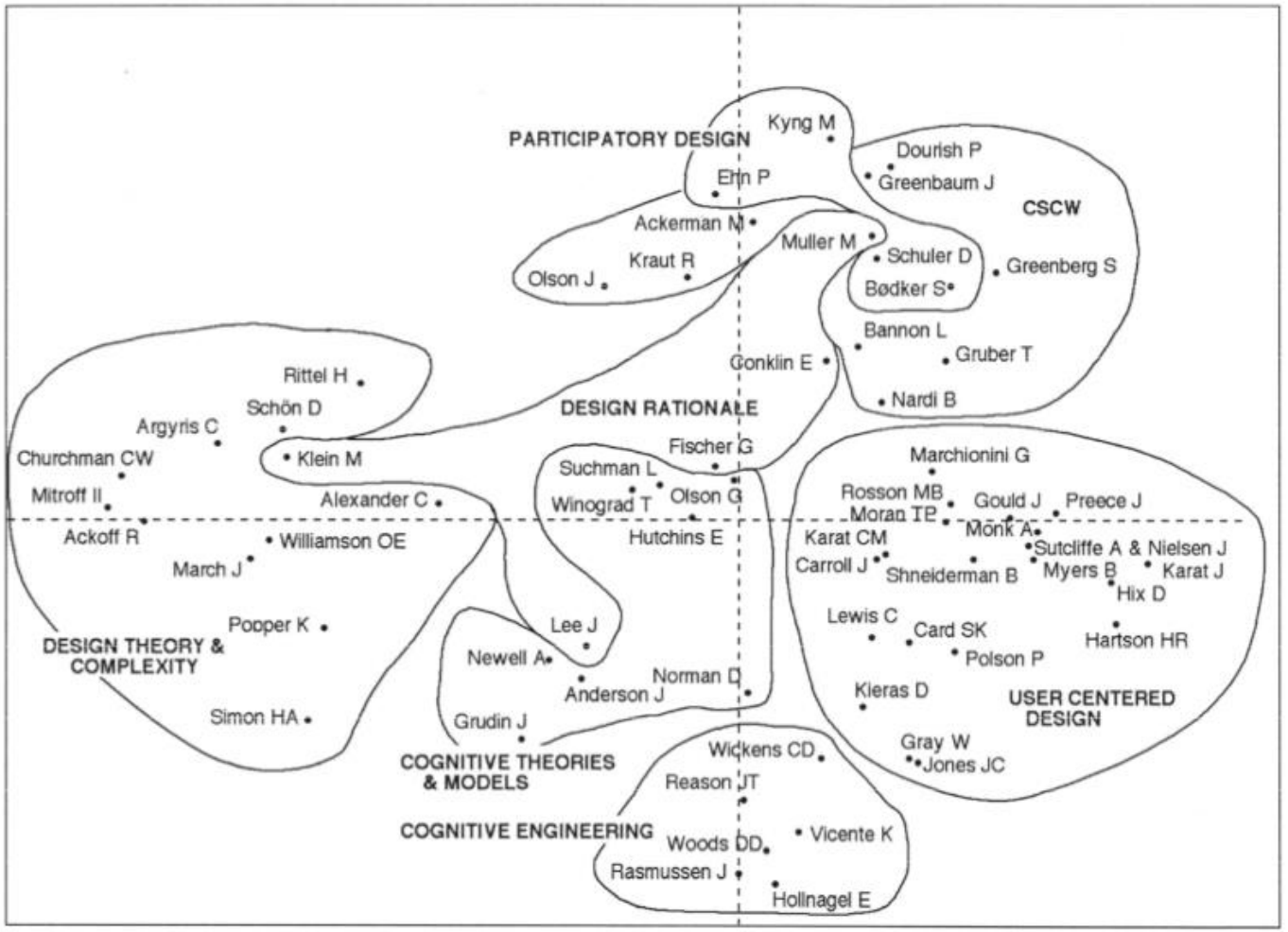
Source: Kleinberg and Lawrence (2001). The Structure of the Web. *Science*.

Mapping Science

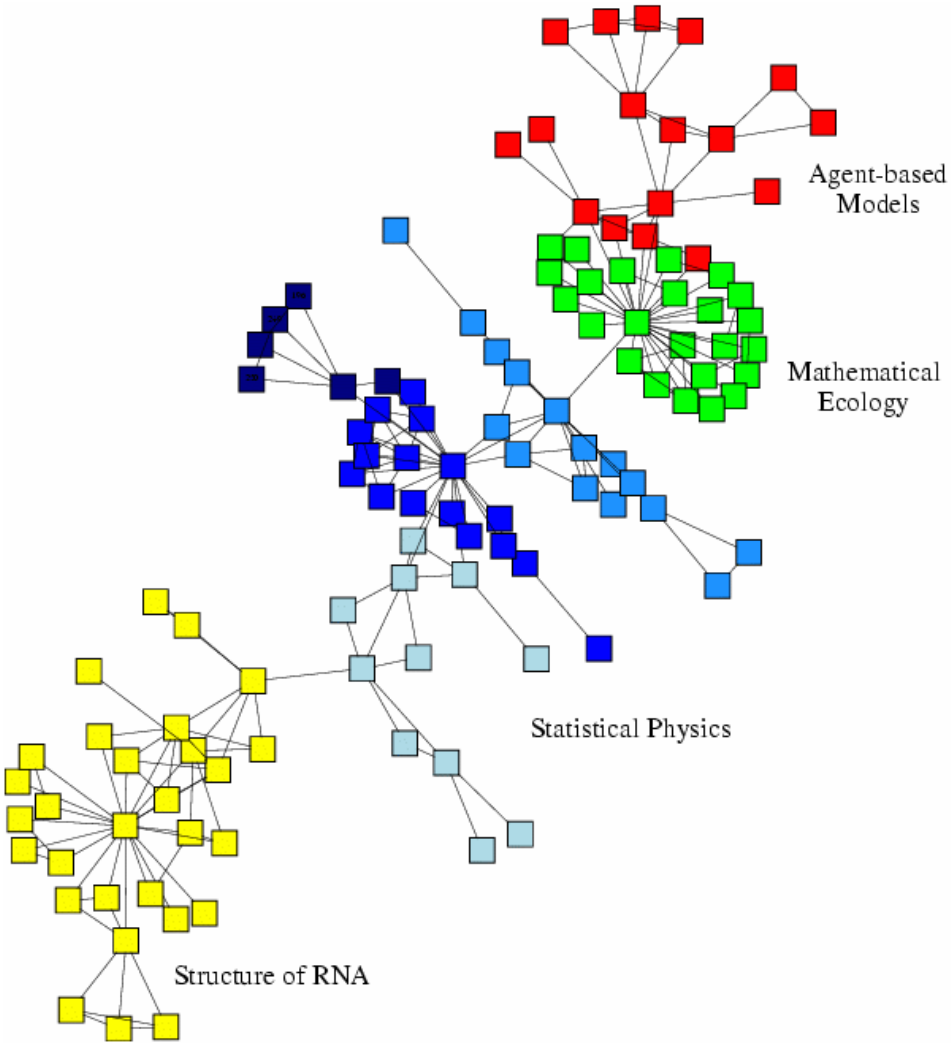


Term co-occurrence network

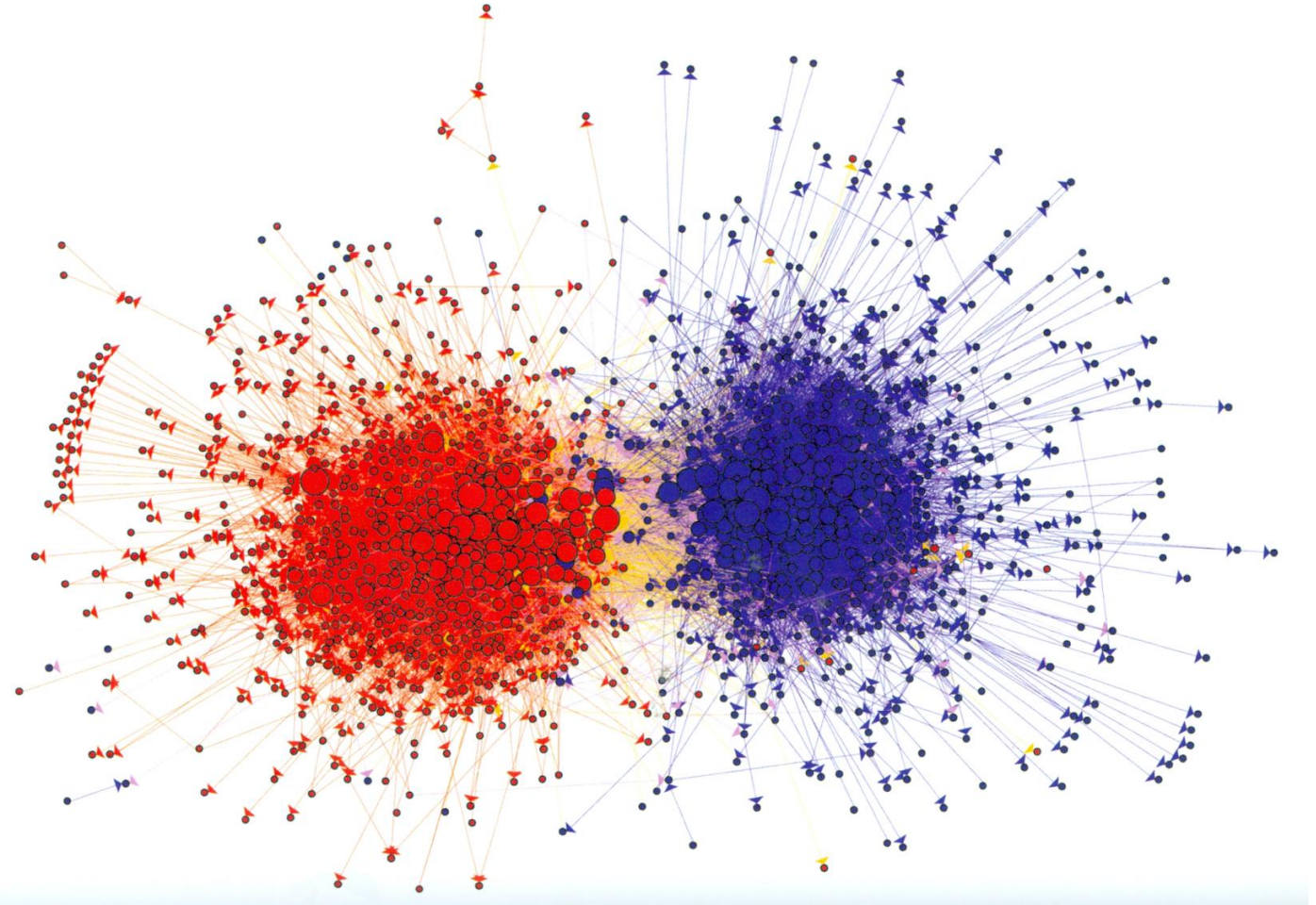
Author co-citation network: visualizing literature in HCI



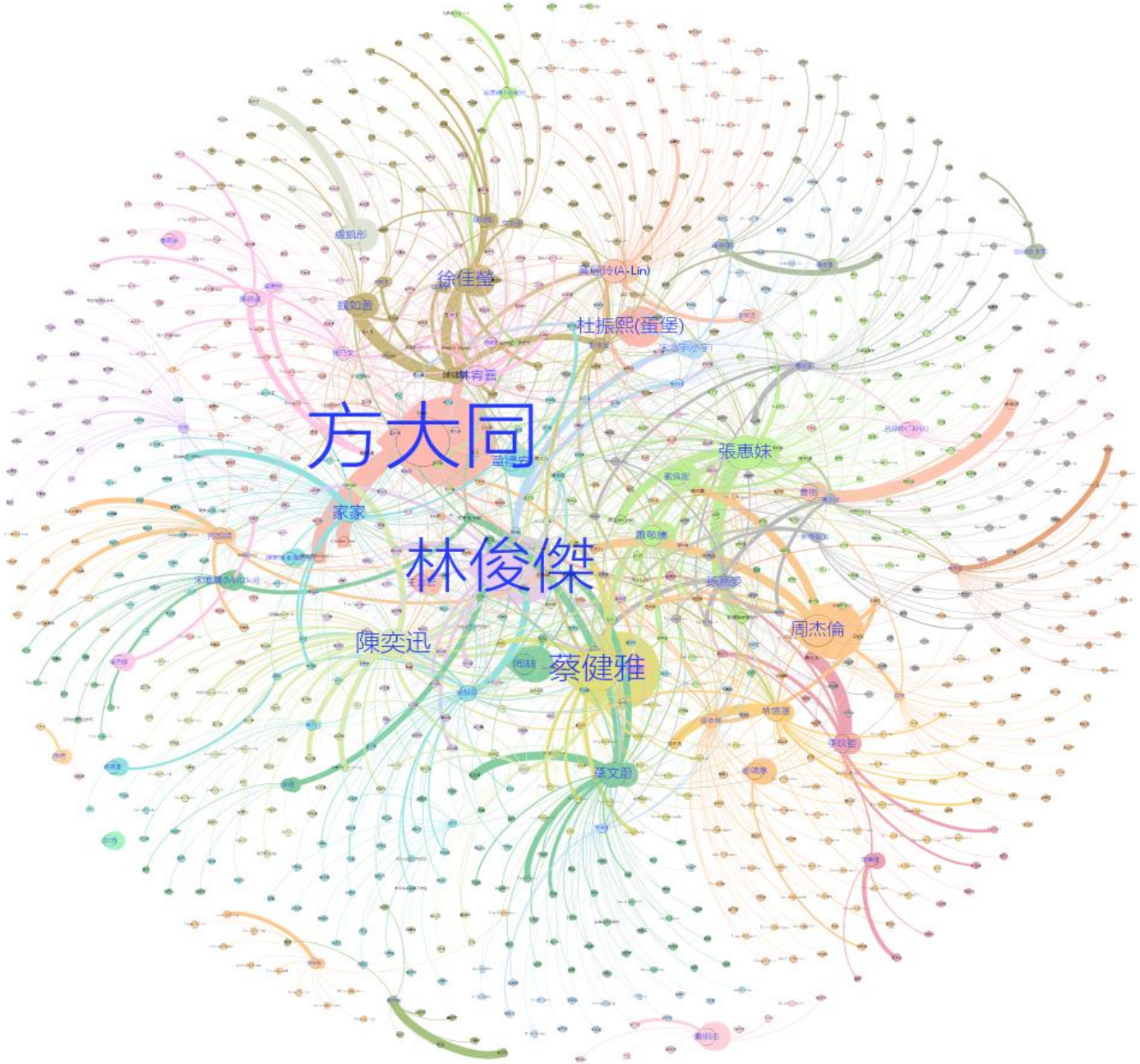
Scientific collaboration network



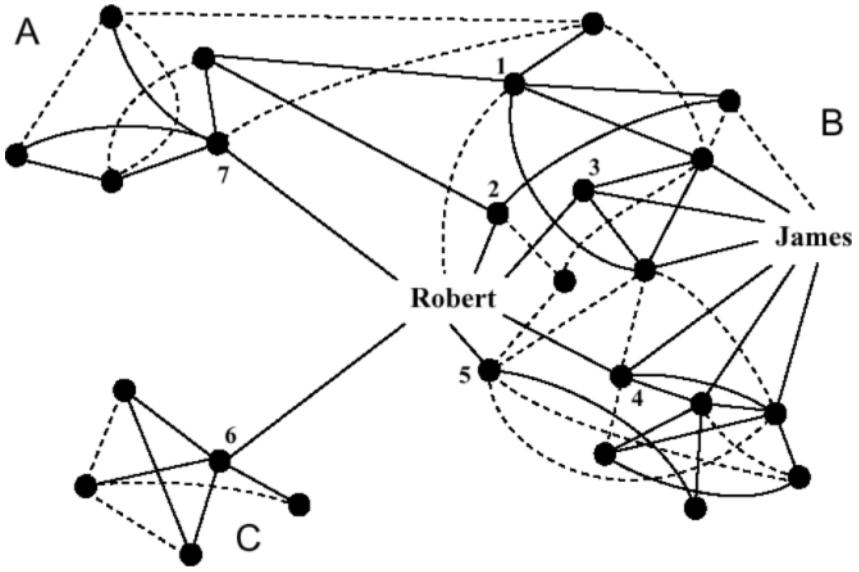
Analysis of Web documents



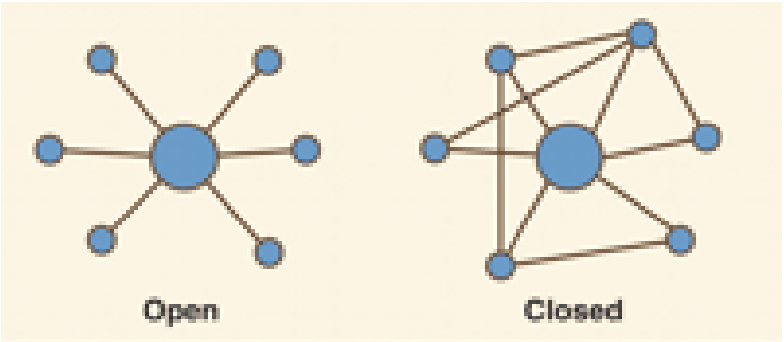
Music collaboration network Centrality and collaborative patterns



Identify actors who occupy strategic positions



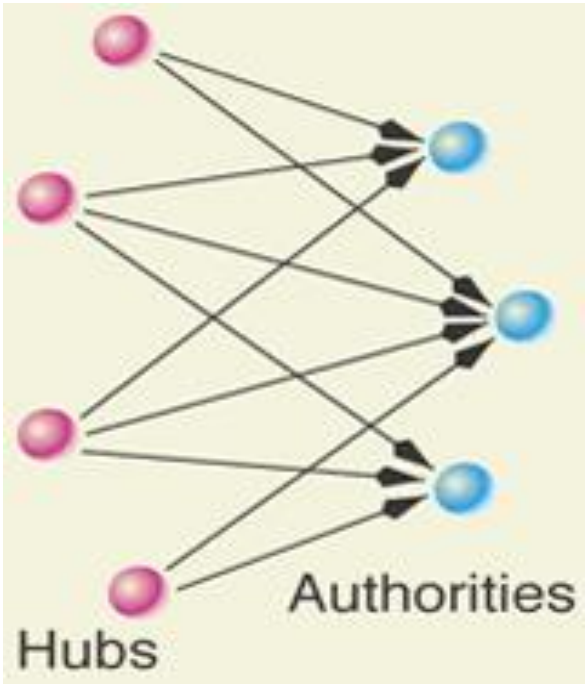
Source: Burt (2000)



Social capital and social network

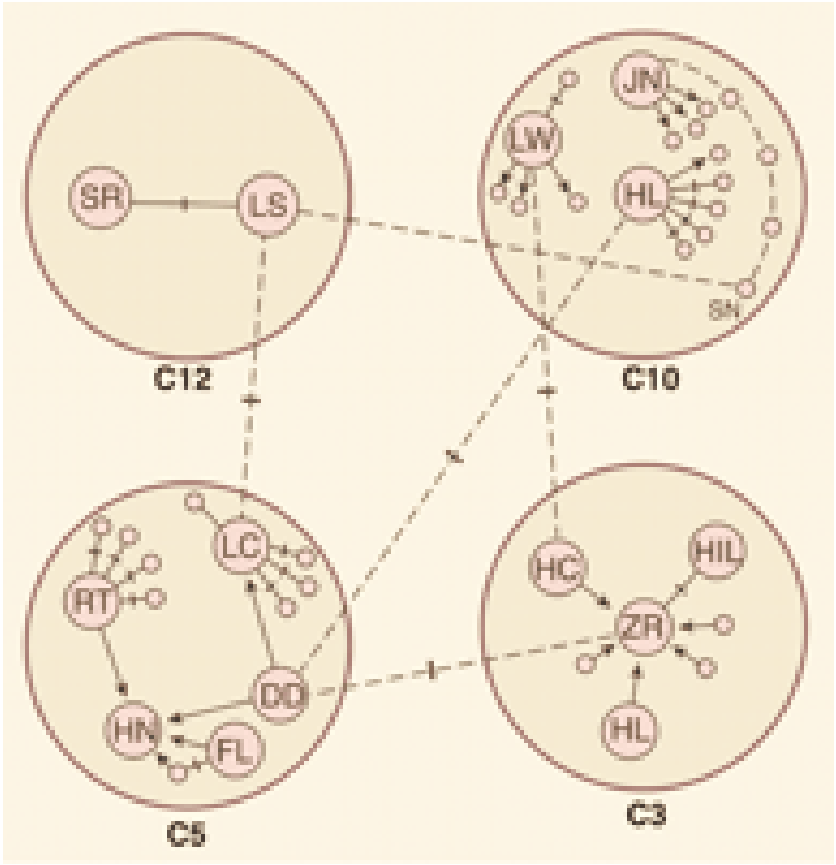
Identify actors who occupy strategic positions: the link structure of the Web

- Hubs and authorities



Source: Kleinberg and Lawrence (2001). The Structure of the Web. *Science*.

Trace social influence



Moreno's Network of runaways

Nondirected lines between a pair of individual represent feelings of mutual attraction.
Direct lines represent one-way feelings of attraction.

Resources in the network

Who introduced the couple?

	Close relationships		More-distant relationships					
Type of relationship	Family member	Friend	Coworker	Classmate	Neighbor	Self-introduction	Other introduction	Number of subjects
Marriages	15%	35%	6%	6%	1%	32%	2%	1,287
Cohabitations	12%	40%	4%	1%	1%	36%	3%	319
Partnerships	8%	36%	6%	4%	1%	42%	1%	920
Short-term partnerships	3%	37%	3%	4%	2%	47%	2%	251

Note: Numbers do not add to 100 percent because of rounding.

68 % introduced by others, 32 self-introduction

Network topologies

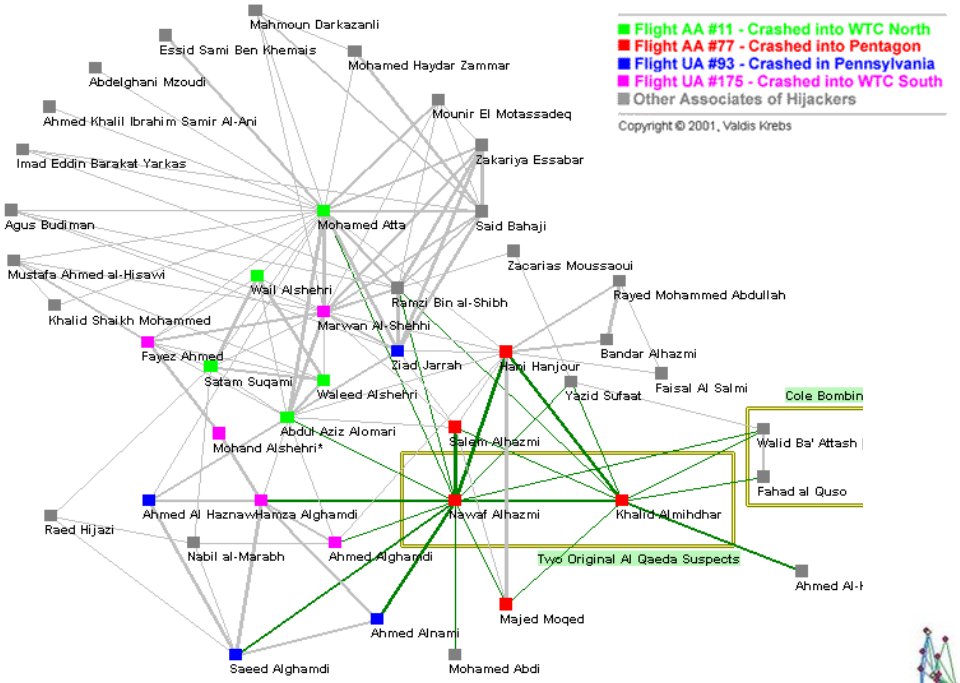
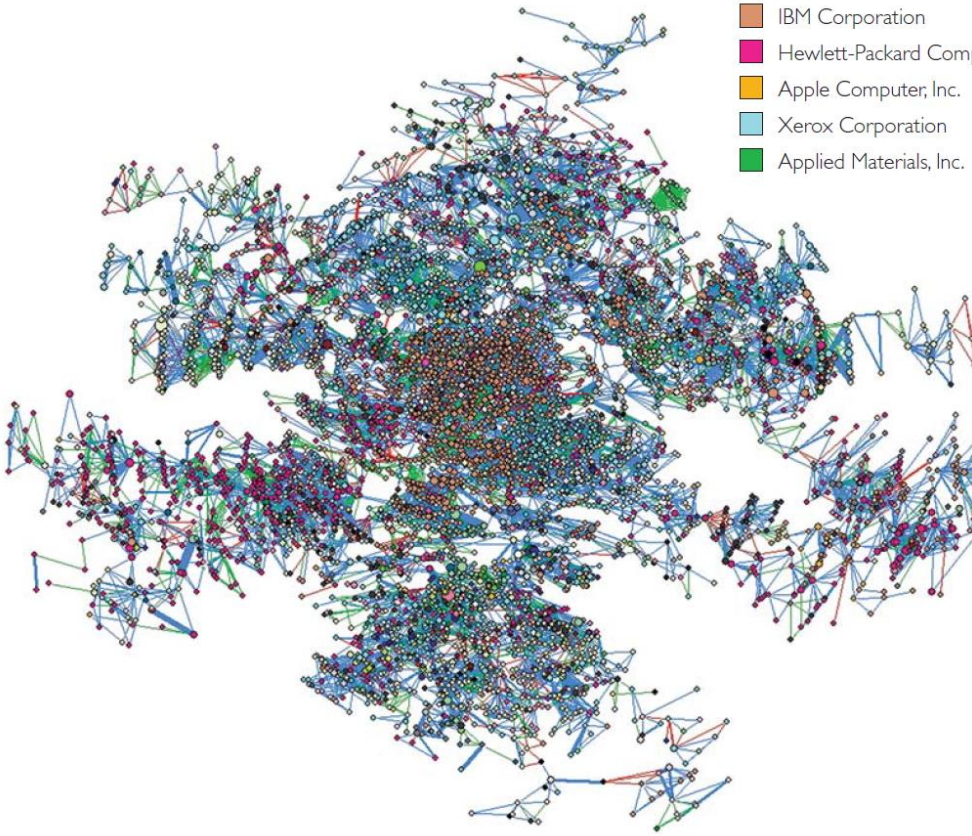
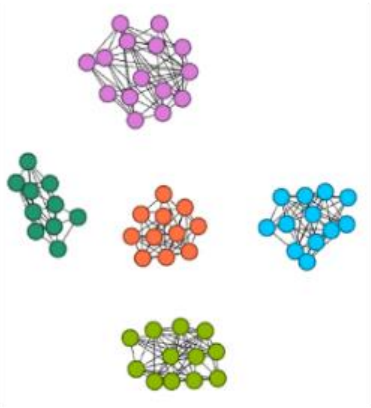


Figure 3 - All Nodes within 2 steps / degrees of original suspects

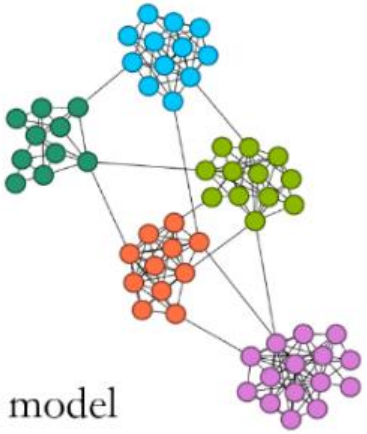


Network typology and scholarly collaboration

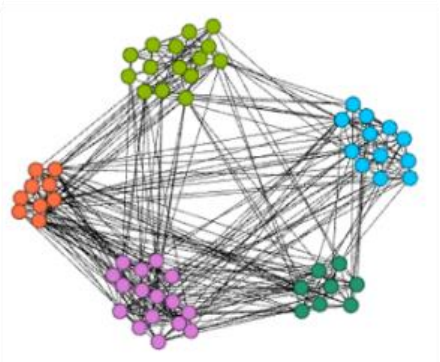
Plural-worlds



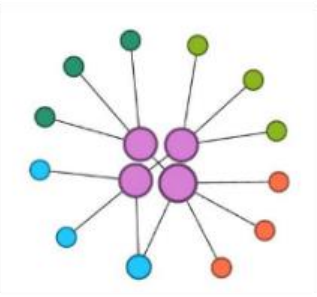
Small-world



Structural cohesion



Star production model

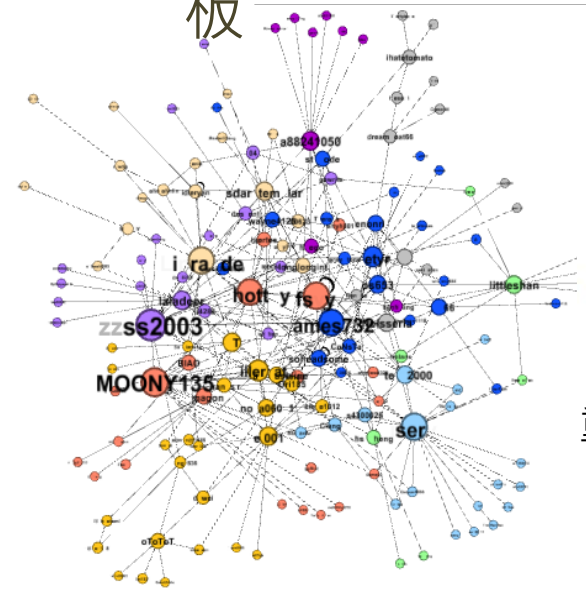


社會網絡分析指標與網絡型態

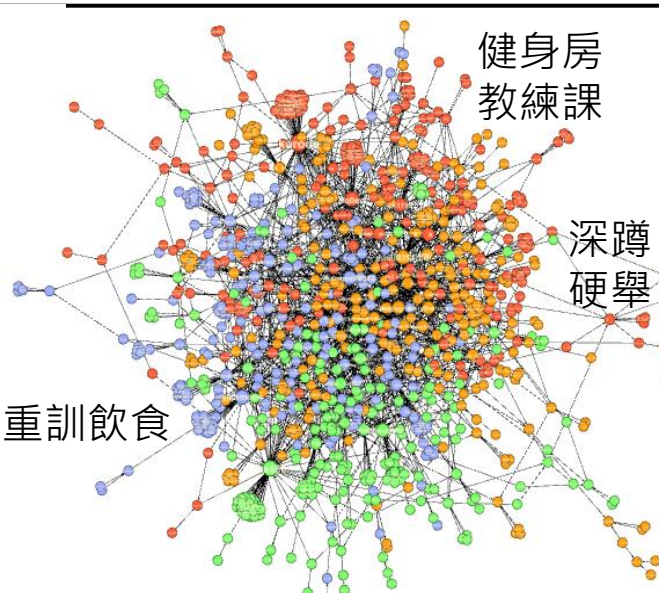
3.分群分析

- 網絡分群能力：狗板>C++板>健身板

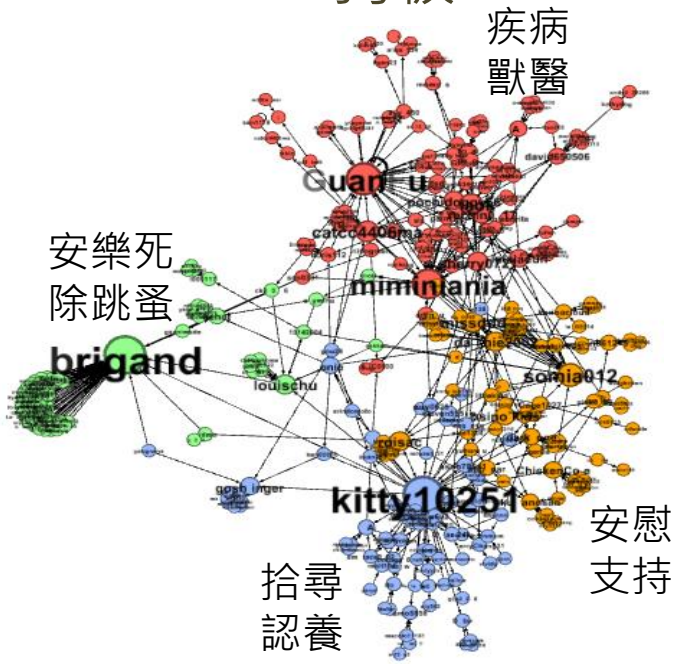
C++板



健身板



狗板



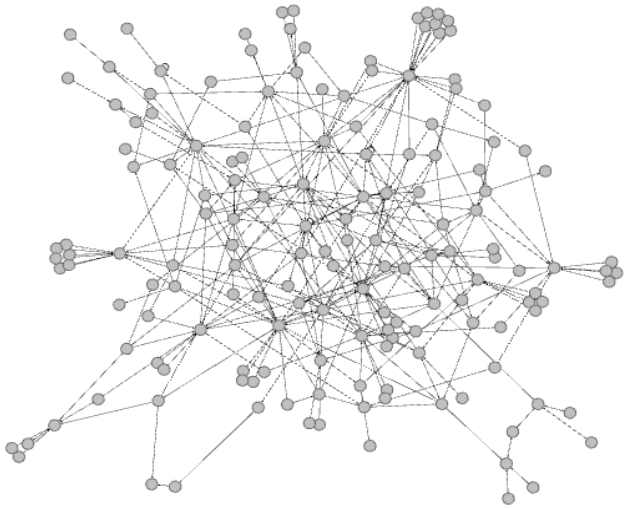
→「健身板」網絡緊密而難以分群

健身板與狗板僅呈現前四大模組(約佔網絡總節點數30%)

→「狗板」分群結果明顯，小團體各自有其話題，但團體之間仍有往來

網絡型態

C++



- Average path length 短
- Weighted Clustering coefficient高

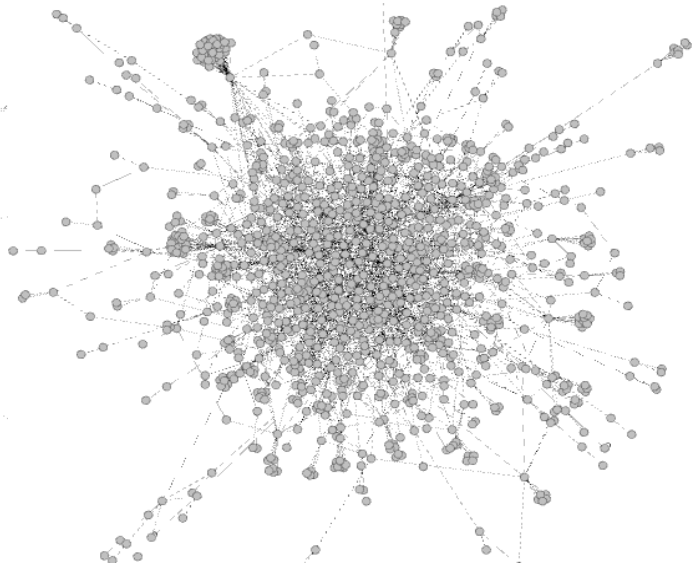
→與「小世界」相似

健身板

- 網絡整體緊密難以分群

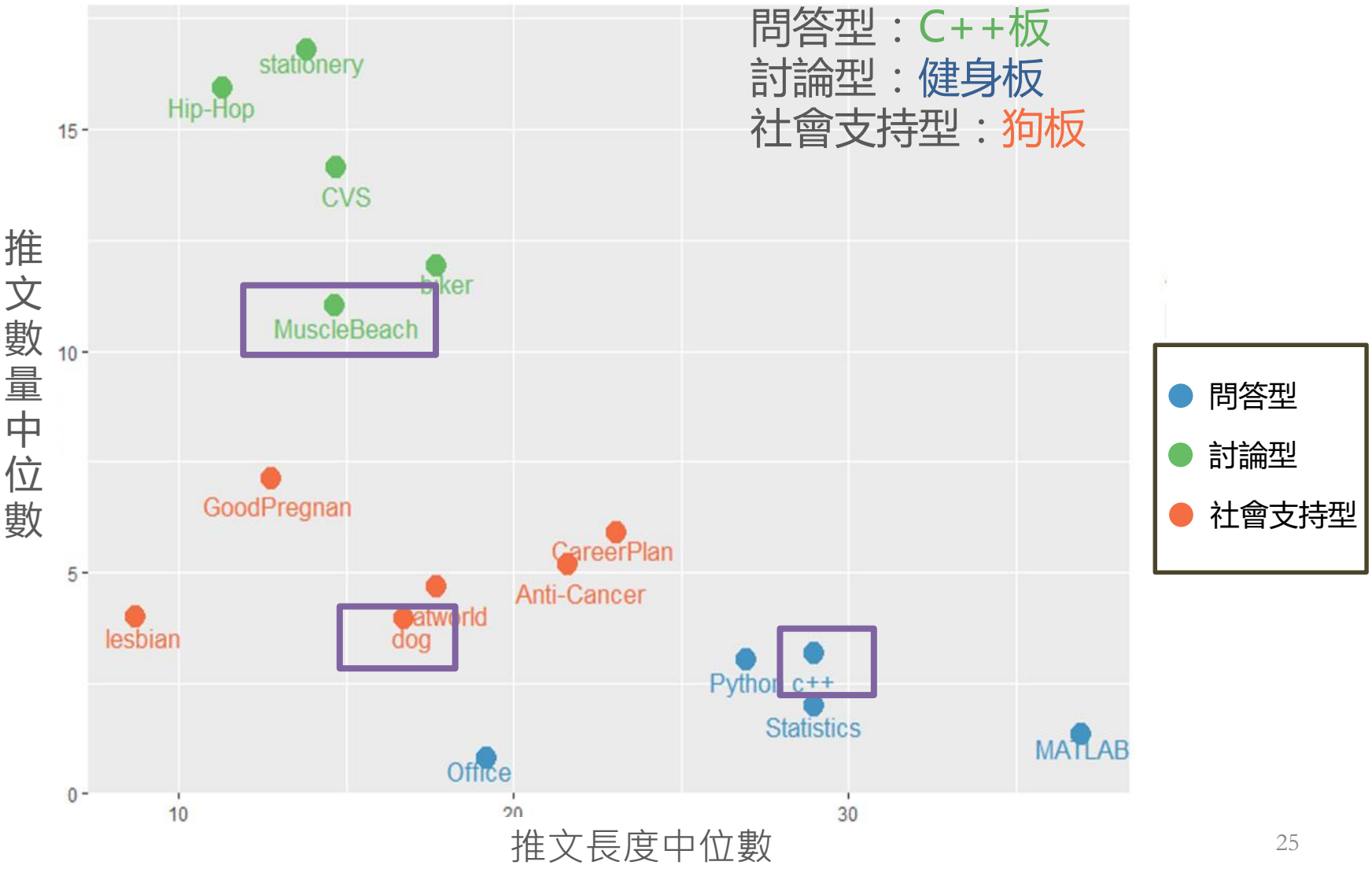
→本研究提出「萍水相逢」網絡型態描述此種特徵的網絡

狗板



- 網絡分群結果明顯
- 小團體內部互動密切
- 小團體之間仍有接觸

→與「結構凝聚」相似


問答型：C++板
討論型：健身板
社會支持型：狗板
推文數量中位數
推文長度中位數
stationery
Hip-Hop
CVS
biker
MuscleBeach
GoodPregnan
CareerPlan
Anti-Cancer
lesbian
dog
Office
Python
c++
Statistics
MATLAB
問答型
討論型
社會支持型

“Special” topics in SNA

- Scholarly communication
  - Citation network
  - Author collaboration network
- Recommender system
  - User who bought this also bought
- Social capital
  - Network view of social capital

Social network assumptions

- Relational
  - Linkage, connection, association, affiliation, membership
- Social units are interdependent
- Network structure **enable** and **constrains** action
- Structure-level relational properties are important
  - Network formulation of social constructs
    - Help us to see one step further…