

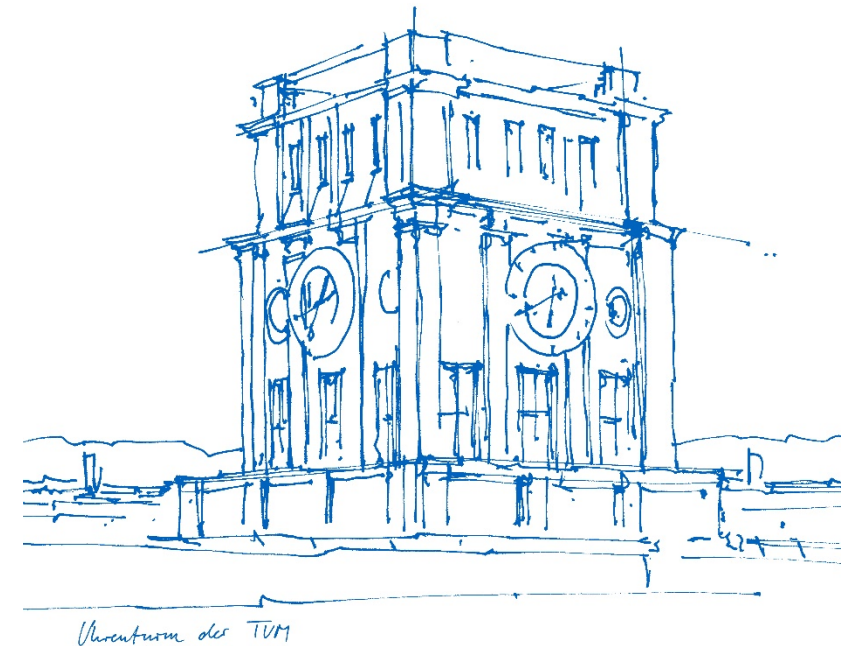
Research Design

Jürgen Pfeffer

Technical University of Munich

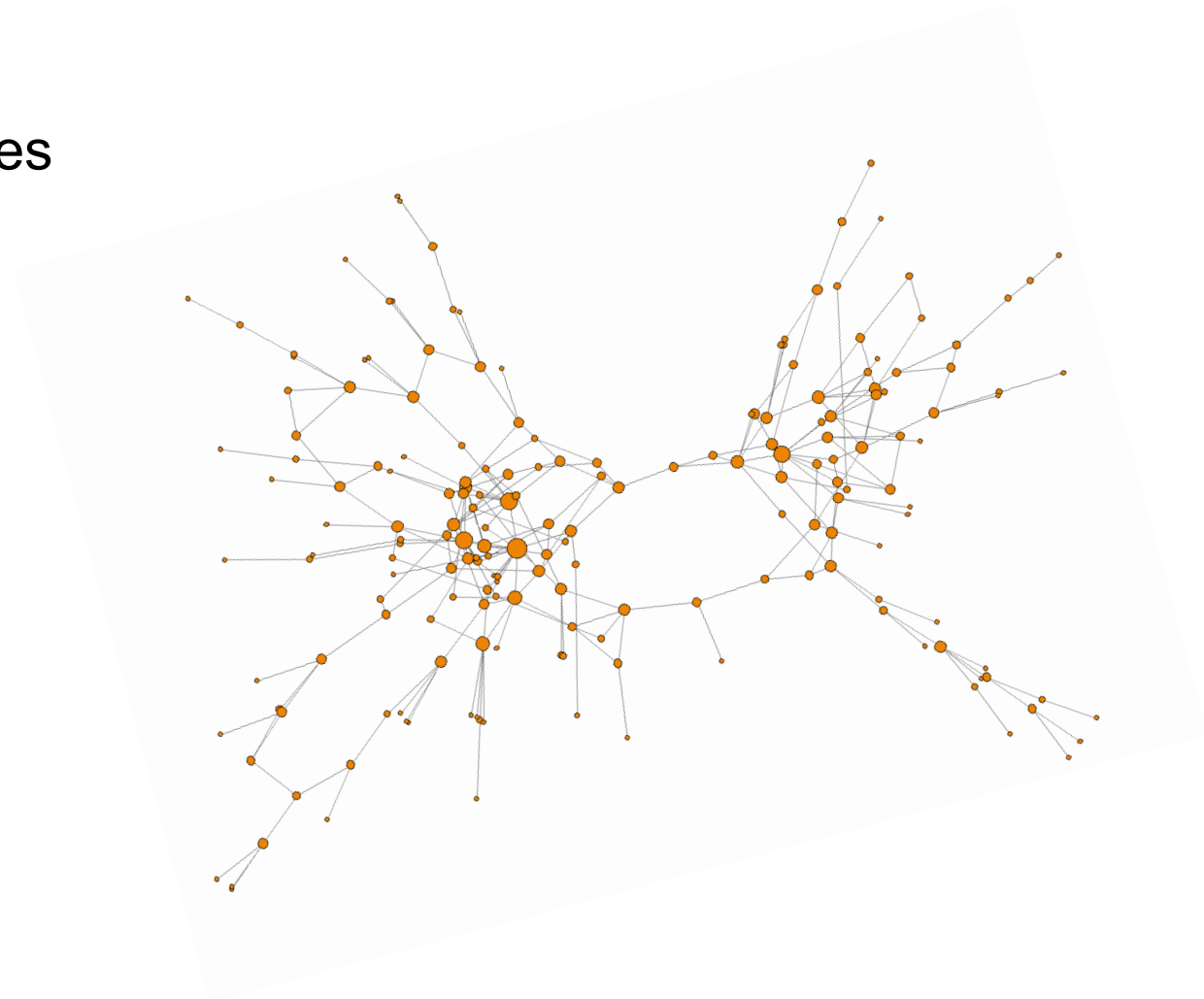
Bavarian School of Public Policy

juergen.pfeffer@tum.de | @JurgenPfeffer



The Research Process

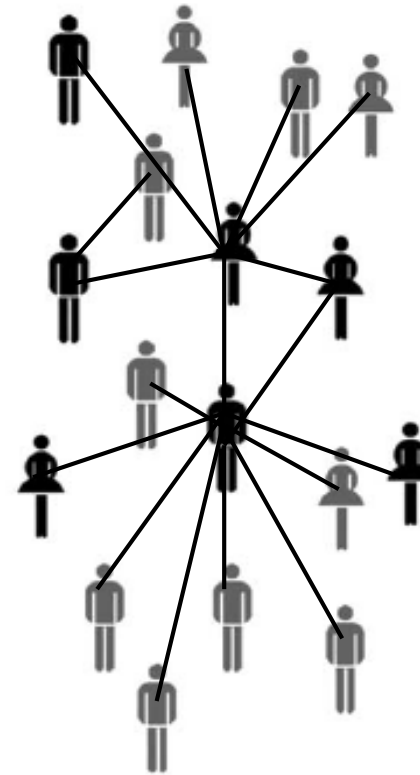
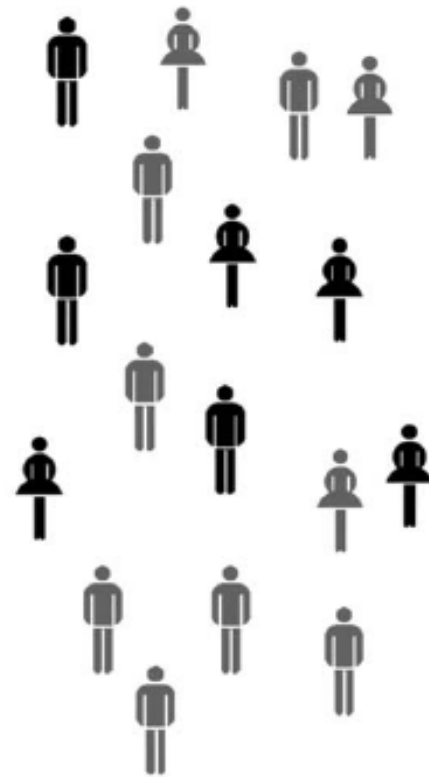
1. Problem
2. Research Question/Hypotheses
3. Theories
4. Methods
5. Data
6. Analysis
7. Result Presentation



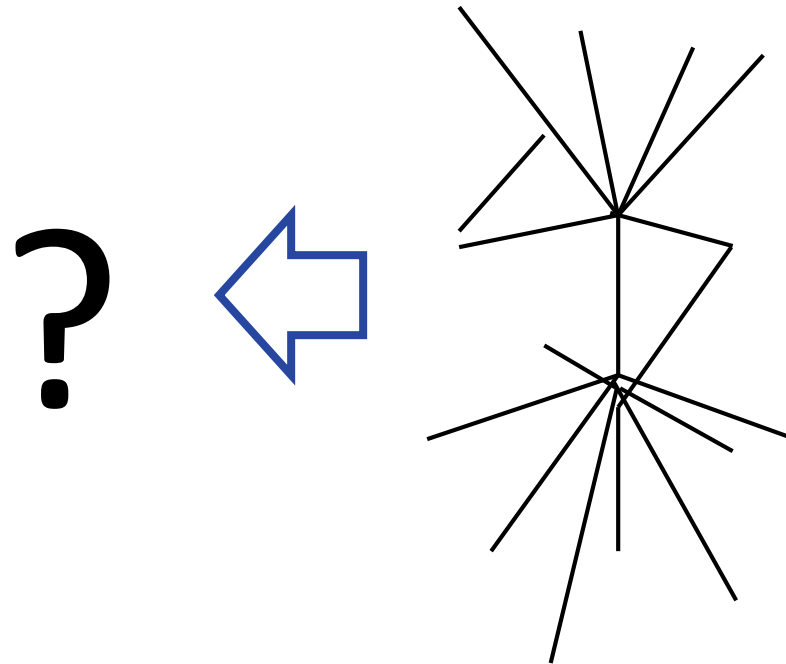
Network Studies

		Data	
		Qualitative	Quantitative
Analysis	Qualitative	Interpretive studies of texts	Interpretation of quantitative data processing
	Quantitative	Turning words, etc. into numbers	Statistical analysis of numbers

In a Nutshell: Individuals vs. Network



Where Do Network Data Come From?



Words and Numbers

	Data	
	Qualitative	Quantitative
	Texts , videos, sound, pictures, sculptures, buildings, technical devices, thoughts, feelings	Standardized surveys, population statistics, numbers describing people and things

Quantitative Coding
(explicit or implicit) →

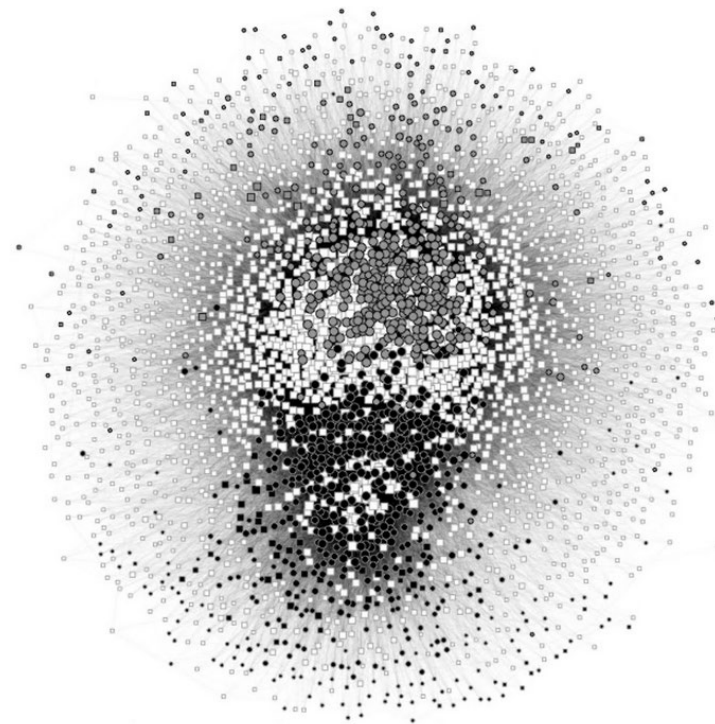


Beispiele für Netzwerke und deren Analysen

Quantitative Studies:

Political Parties and Campaign Finance Networks

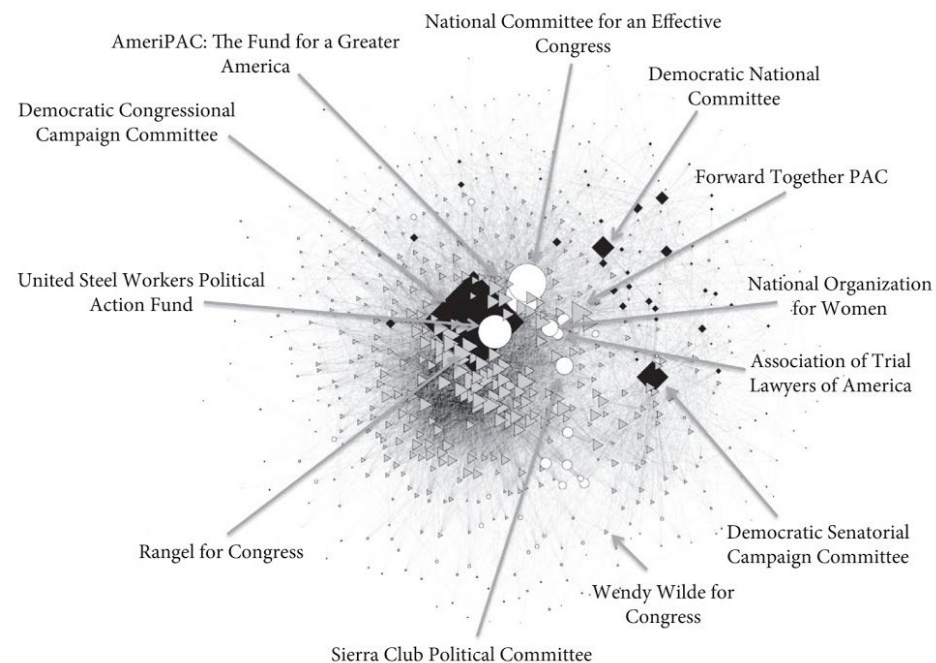
Full network of 6383 actors, their political orientation, or partisanship



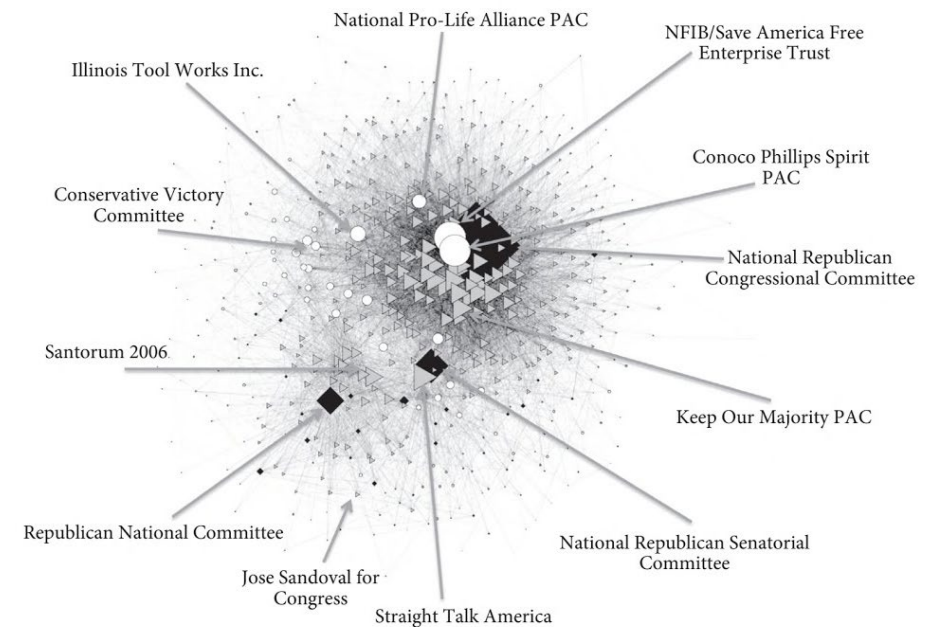
Herrnson & Kirkland, „Political Parties and Campaign Finance Networks“,
The Oxford Handbook of Political Networks (2017)

Quantitative Studies: Political Parties and Campaign Finance Networks

Democratic campaign finance network



Republican campaign finance network

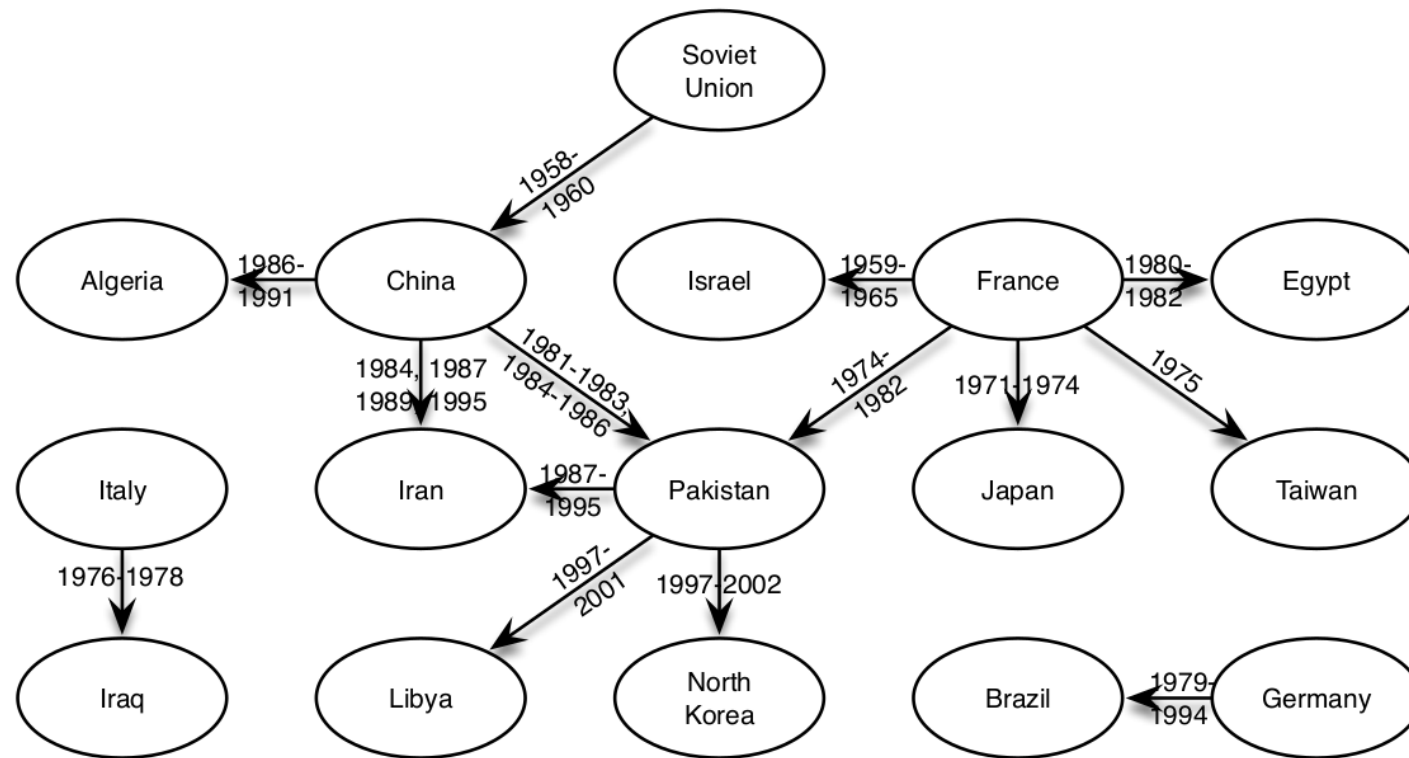


Herrnson & Kirkland, „Political Parties and Campaign Finance Networks“,
The Oxford Handbook of Political Networks (2017)

From Case Studies to Networks:

Arms Supply and Proliferation Networks

Proliferation of nuclear assistance (transfer of expertise) leads to a set of hubs

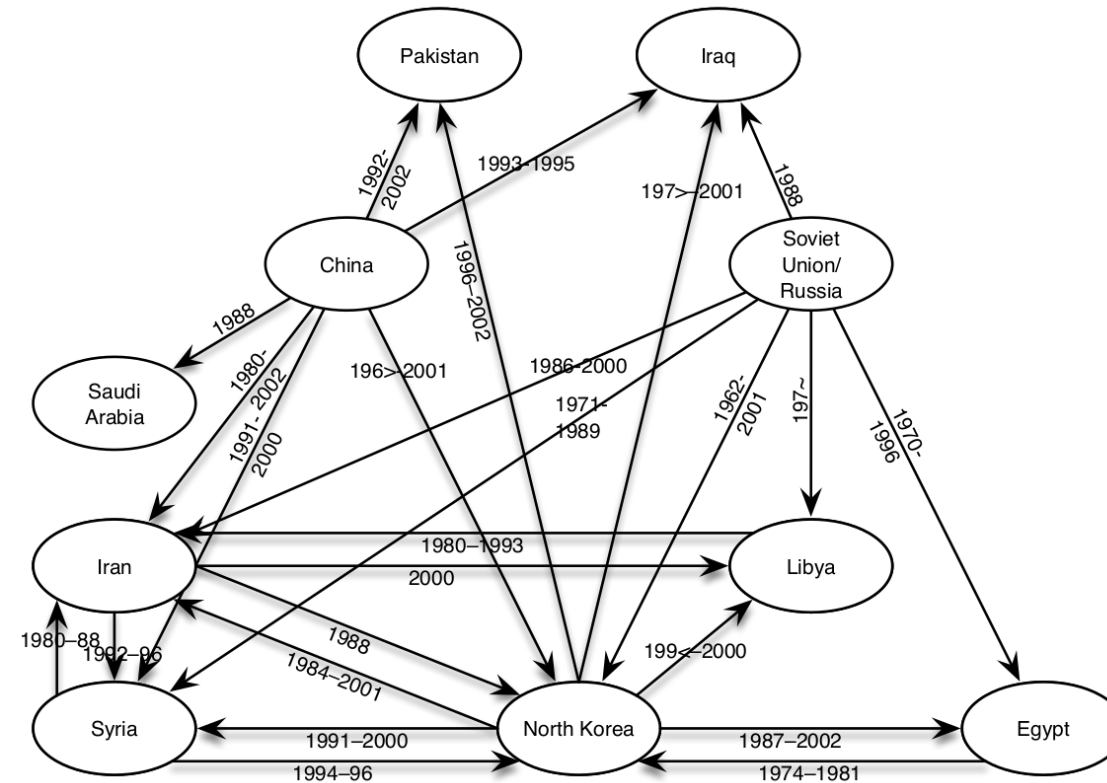


Kinsella & Montgomery, „Arms Supply and Proliferation Networks“,
The Oxford Handbook of Political Networks (2017)

From Case Studies to Networks:

Arms Supply and Proliferation Networks

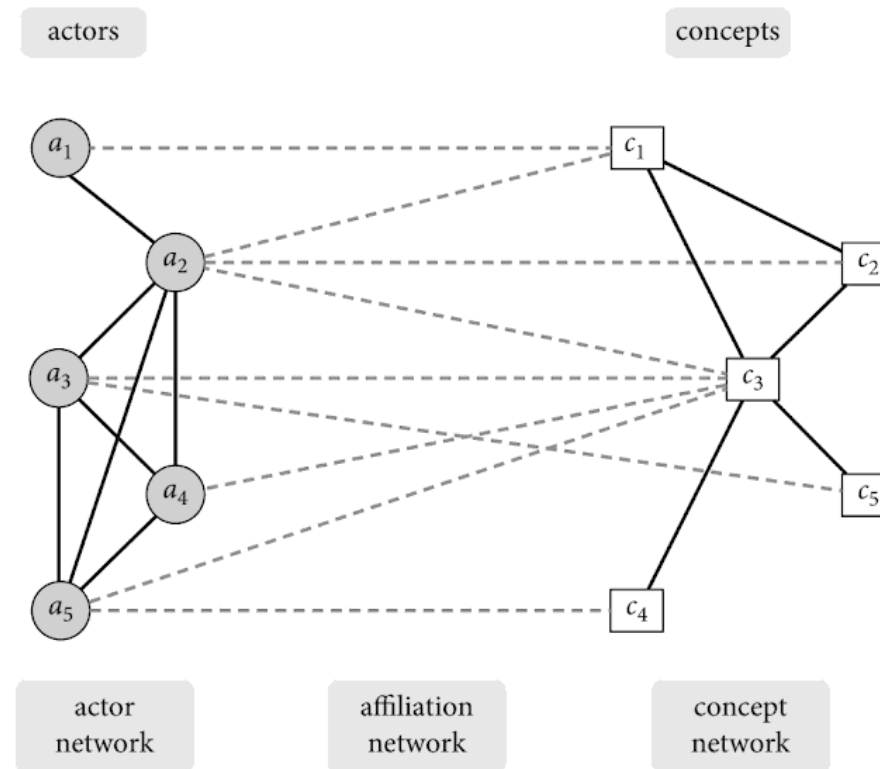
Proliferation of ballistic missiles appears denser and more reciprocal



Kinsella & Montgomery, „Arms Supply and Proliferation Networks“,
The Oxford Handbook of Political Networks (2017)

Discourse Network Analysis: German Pension Debate

From statements in a text to an affiliation network connecting actors and concepts.

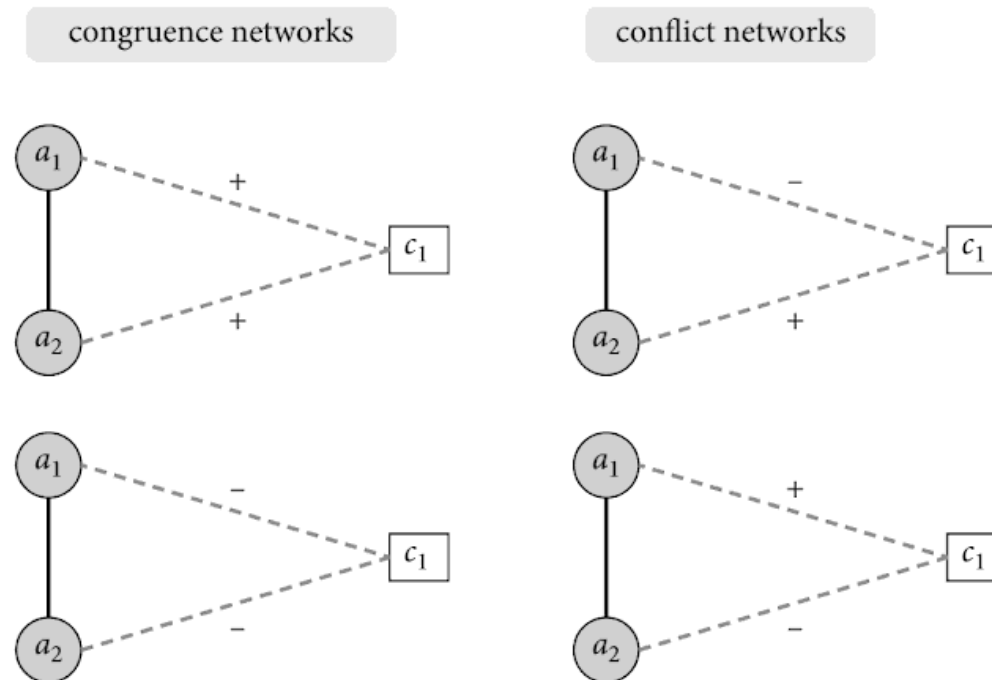


Leifeld, „Discourse Network Analysis“,
The Oxford Handbook of Political Networks (2017)

Discourse Network Analysis: German Pension Debate

Aggregate an actor network based on the number of concepts two actors dis-/agree on.

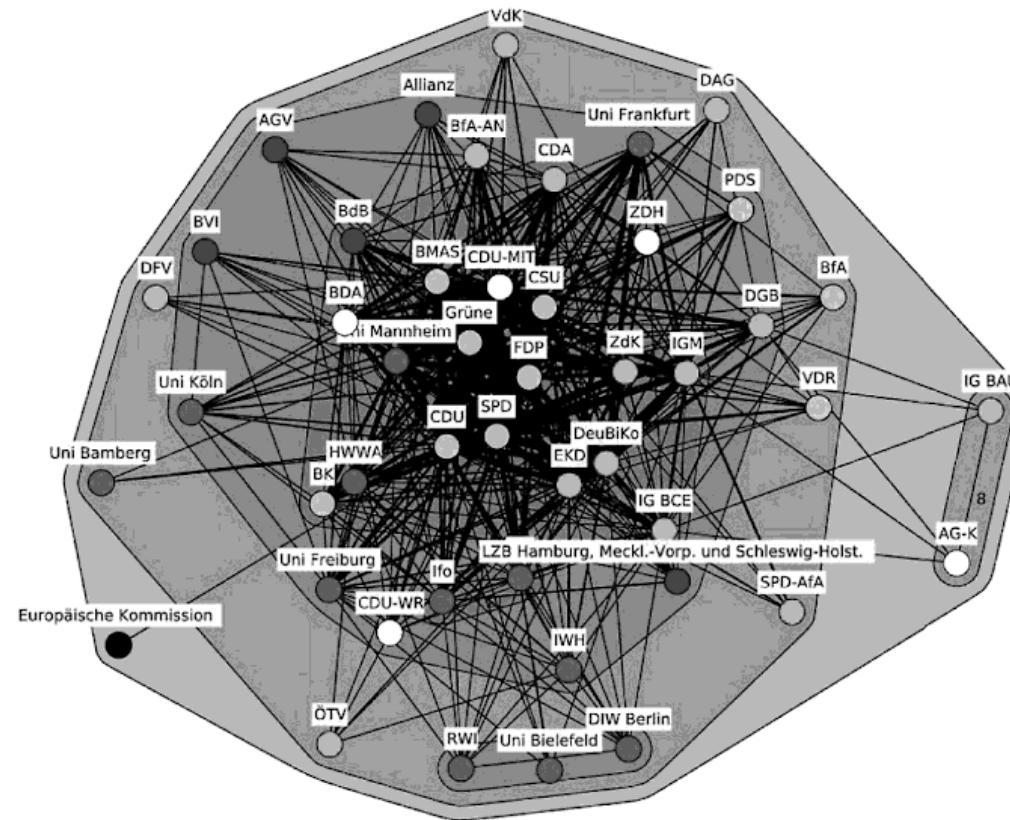
Aggregation leads to weighted edges.



Leifeld, „Discourse Network Analysis“,
The Oxford Handbook of Political Networks (2017)

Discourse Network Analysis: German Pension Debate

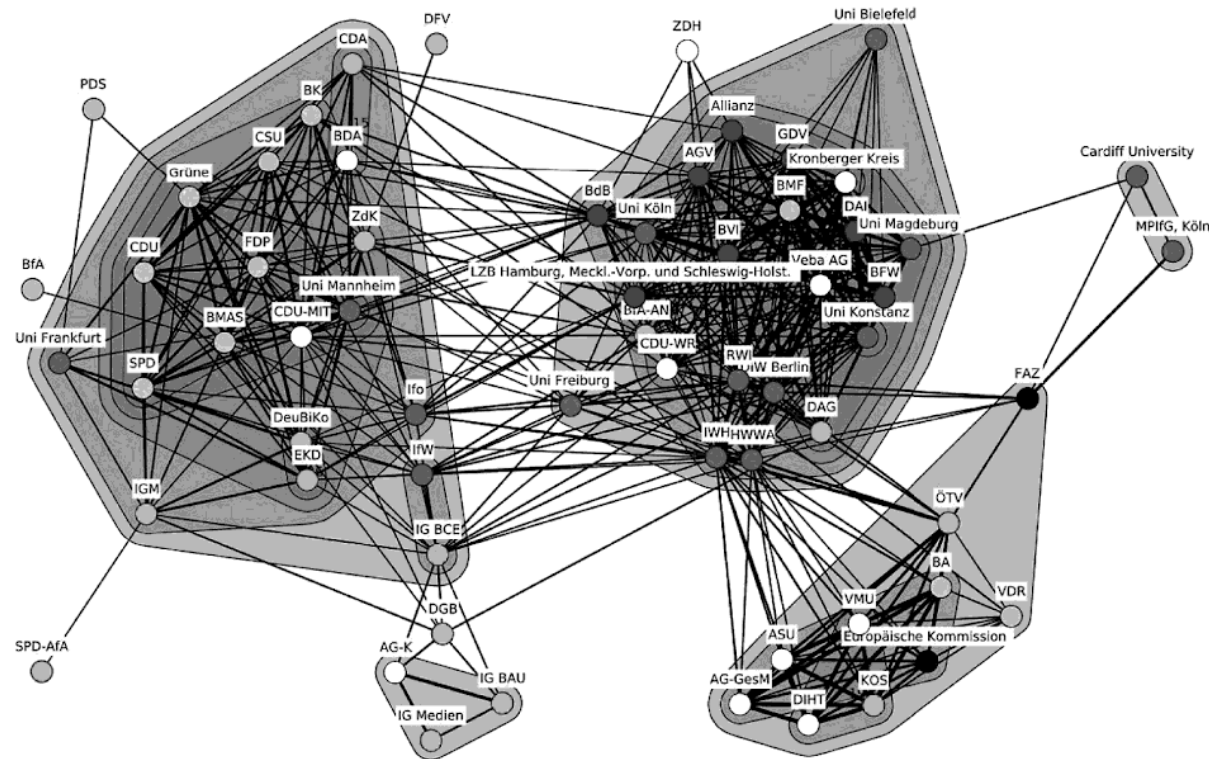
Complete discourse network for January - June 2000



Leifeld, „Discourse Network Analysis“,
The Oxford Handbook of Political Networks (2017)

Discourse Network Analysis: German Pension Debate

Normalization of edge weights makes coalitions apparent



Leifeld, „Discourse Network Analysis“,
The Oxford Handbook of Political Networks (2017)

Faculty Hiring Top CS Schools

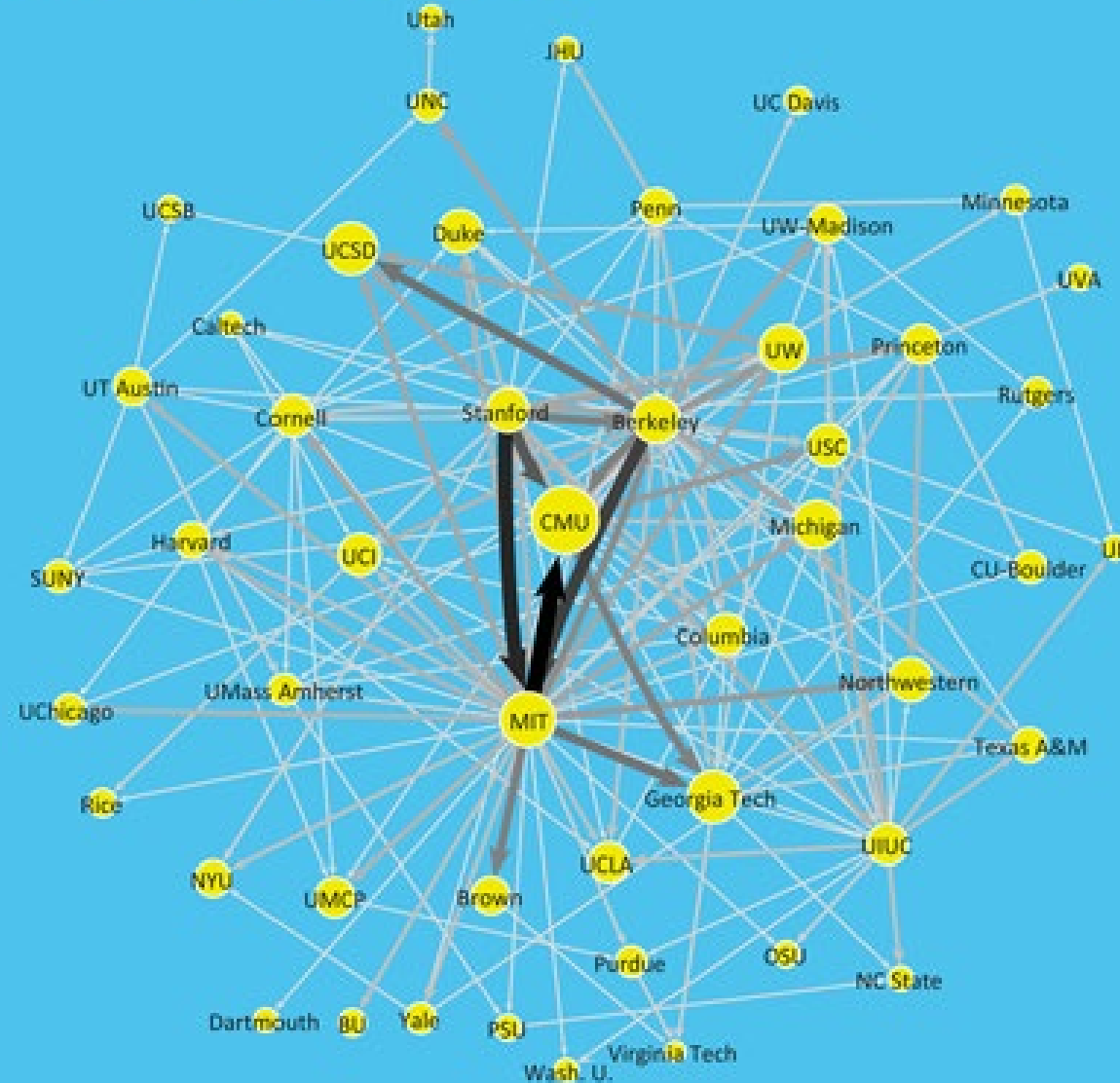
Data: 2,123 professors [6/2/2014] in top 51 CS Schools in the US.

Network Data: A link $a \rightarrow b$ with link weight w represents the number of people w that received their Ph.D. from school a and that are now professor at school b .

More info + data: <http://www.pfeffer.at/data/cshiring/>

Faculty Hiring Network of Top US CS Schools

Placements of Ph.D. Students



Network includes all current CS tenure track faculty except self-hirings.
 Node size = Kleinberg's Authority Centrality. Remove links <3 for visualization.
 Data Source: Brown University. More info: www.pfeffer.ut/cshiring

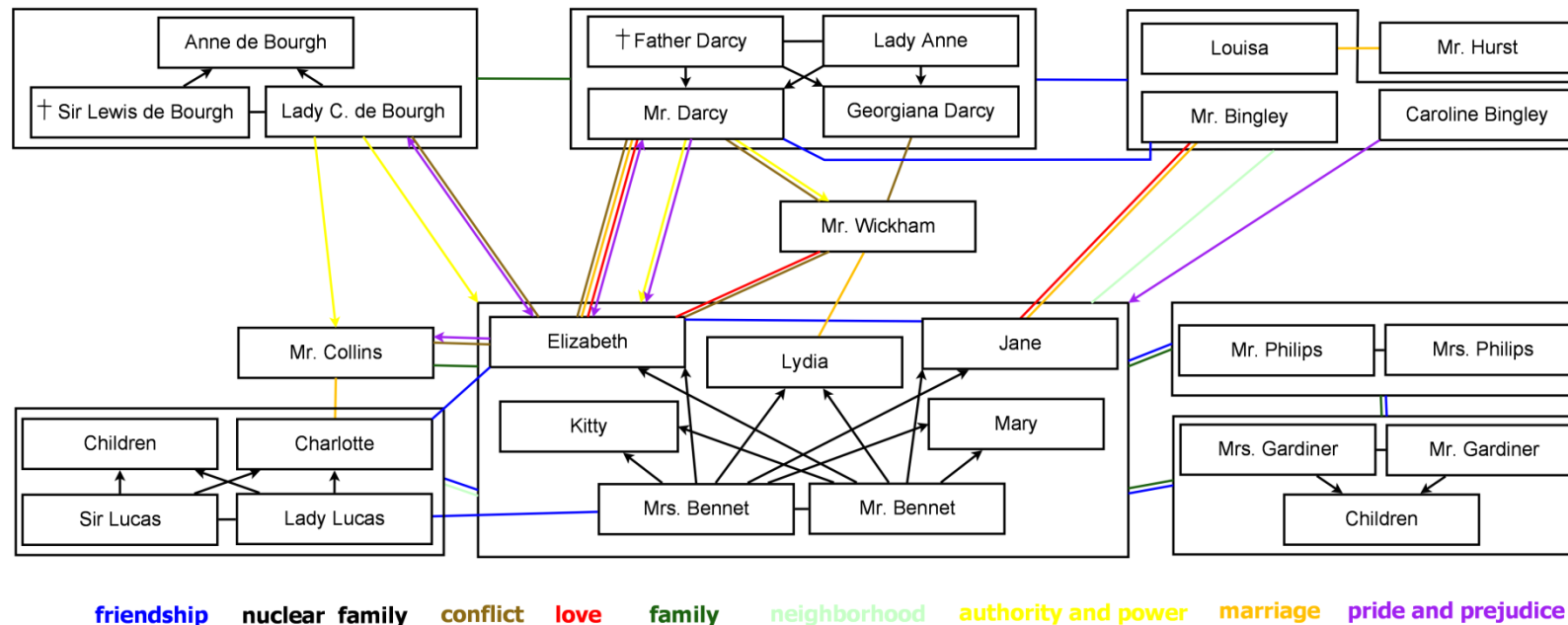
Jürgen Pfeffer
 Carnegie Mellon University

Pride and Prejudice

Pride and Prejudice: Novel by Jane Austen's, published in 1813

Social network of the main actors

Qualitative text analysis of nine different types of relationships



Relational Scene Coding: Examples

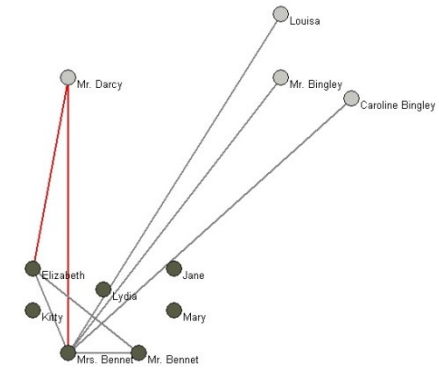
1st Scene:



2nd Scene:



9th Scene:



Co-Publishing Dermatology

Client:

Pharmaceutical company

Division: Sales, Event-Management

Questions:

How are dermatology specialists connected?

Who are the scientific key players?

Are there groups?

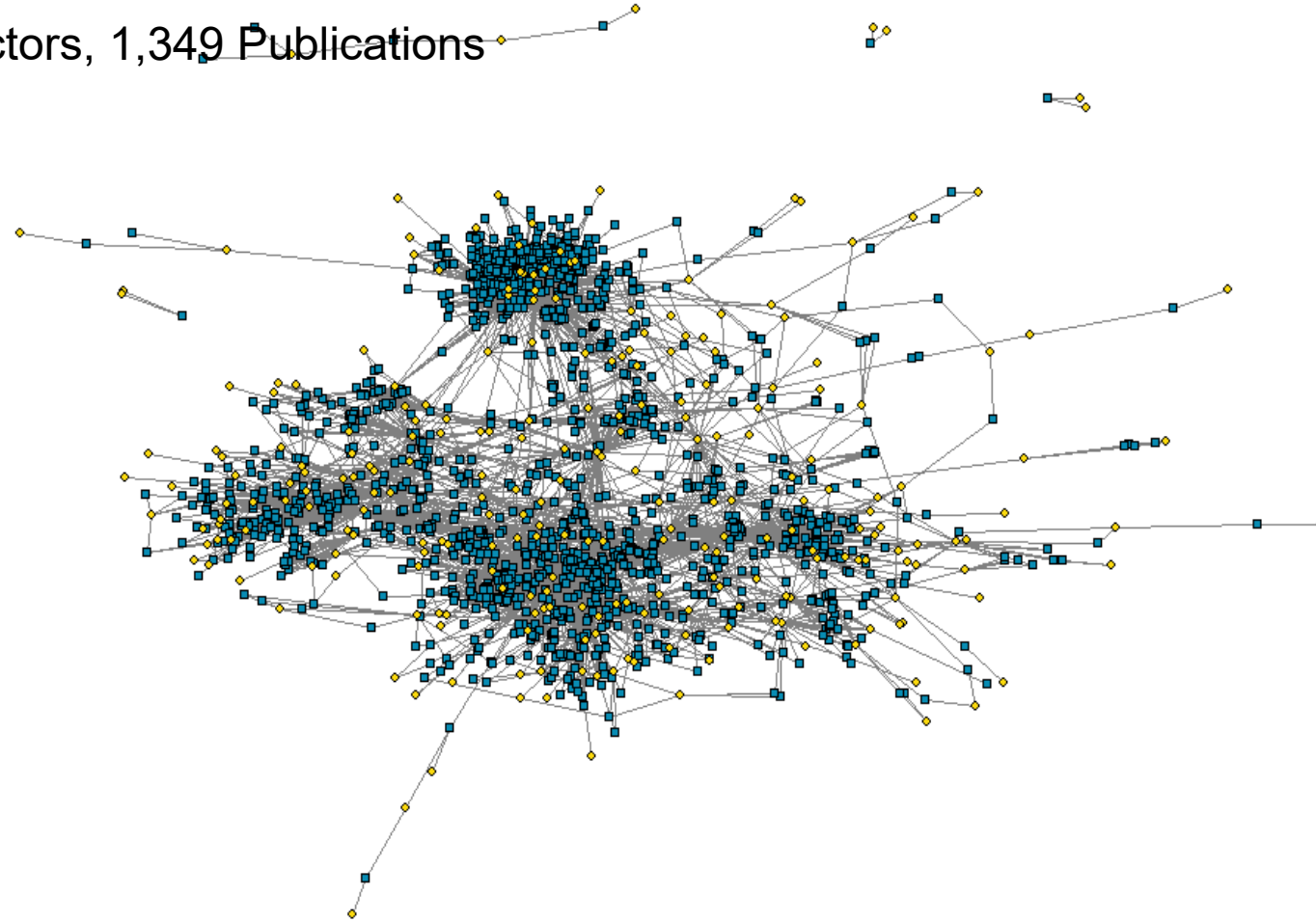
Are there implications for lobbying activities?

Data:

PubMed: database for medical publications

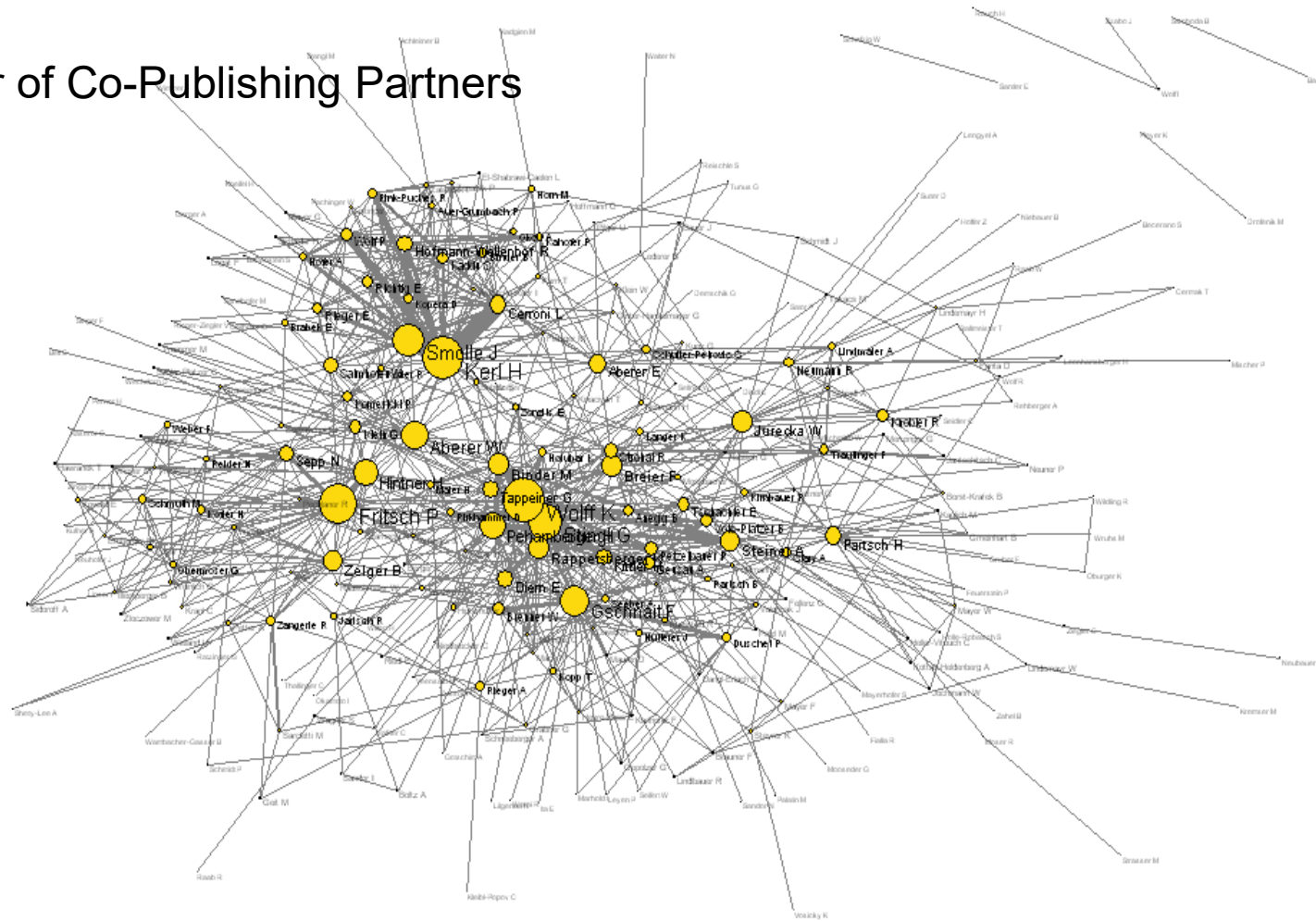
Co-Publishing Dermatology

254 Doctors, 1,349 Publications



Co-Publishing Dermatology

Number of Co-Publishing Partners



Organizational Network

Background:

Death of the old pope: 2. April 2005

Election of the new pope: 19. April 2005

→ 17 Days of media guesswork

PR project: “Social network analysts calculate who will be the next pope!”



Data



Network Data

Commission:

- Cultural Heritage of the Church
- Latin America
- Institute for Religion Works
- ...

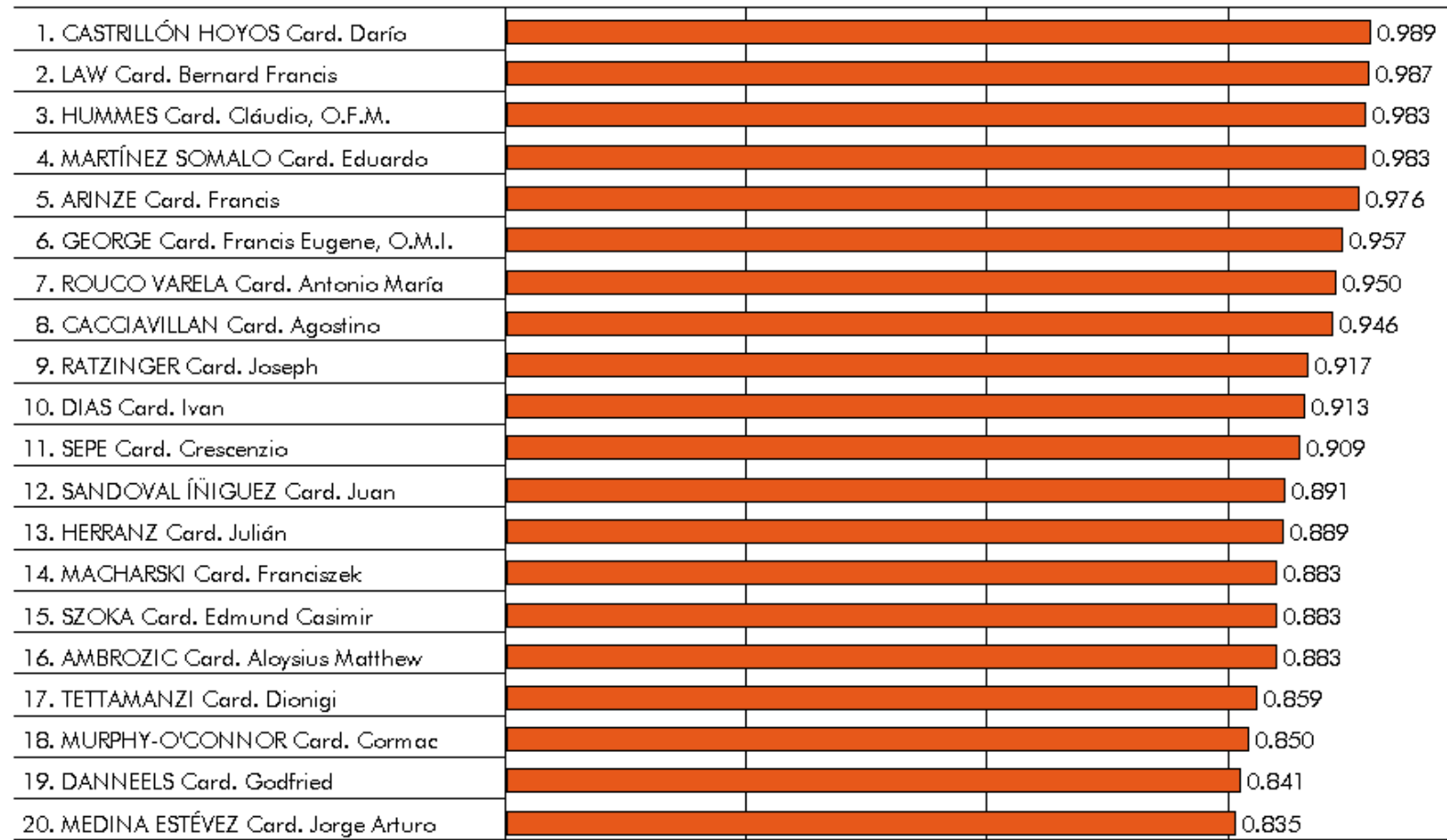
Congregations:

- Evangelization of Peoples
- Oriental Churches
- Causes of Saints
- Doctrine of Faith
-

Archbishops work together in commissions,...



The Next Pope?



At Least: Media Success



Words as Networks

STARTREK.COM : Star Trek: The Next Generation - Windows Internet Explorer

http://www.startrek.com/startrek/view/library/episodes/TNG/index.html

STARTREK.COM : Star Trek: The Next Generation

STARTREK.COM You are not logged in. TNG20

STAR TREK
STAR TREK: THE NEXT GENERATION
STAR TREK: DEEP SPACE NINE
STAR TREK: VOYAGER
STAR TREK: ENTERPRISE
MOVIES

cbs SportsLine.com FANTASY Football PREMIUM GAMES SIGN UP NOW WIN CASH PRIZES FROM \$50 TO \$3,500!

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LIBRARY



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EPISODES: THE NEXT GENERATION

SHOW ONLY
Star Trek: The Next Generation

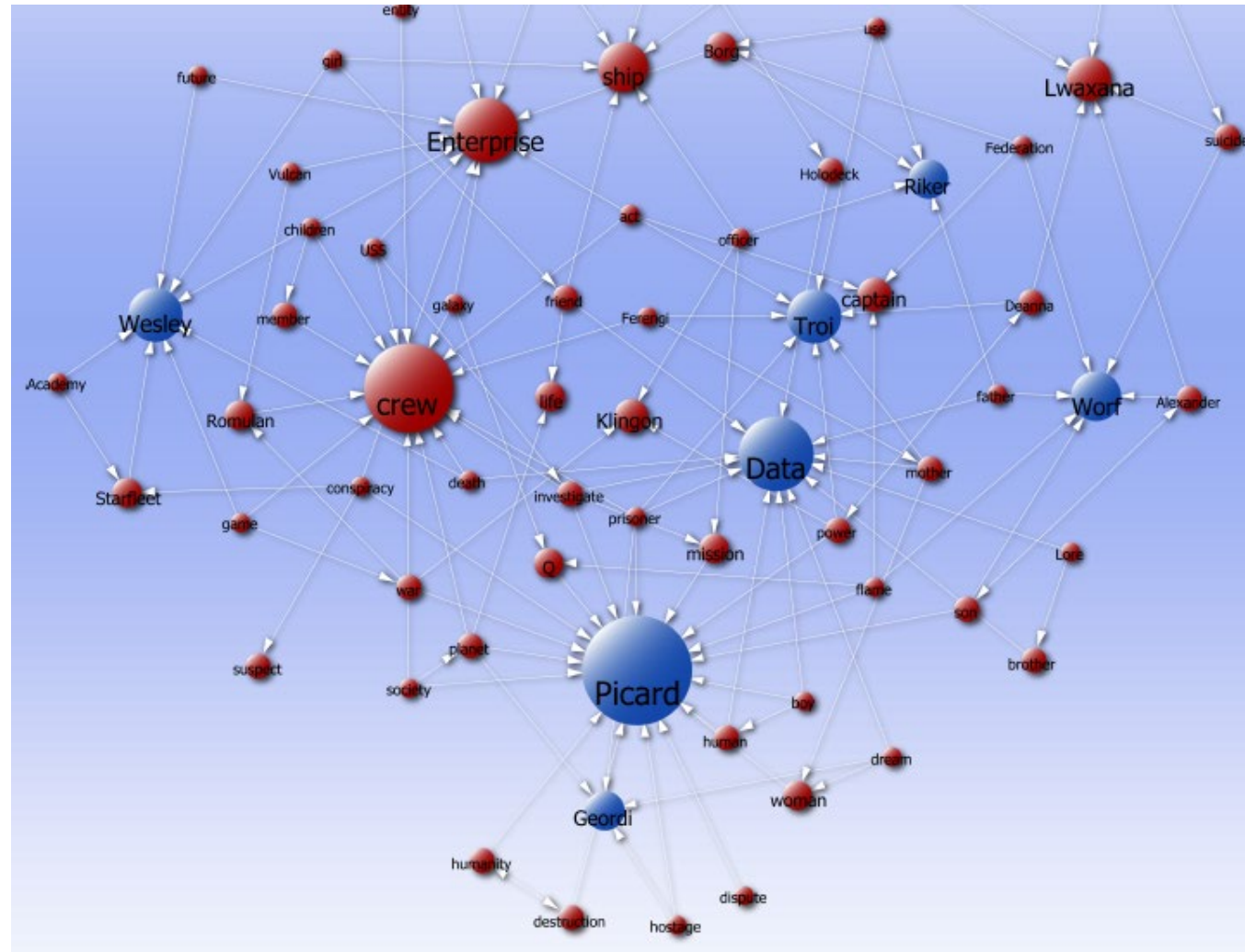
FEATURED EPISODE
True-Q
A gifted young intern learns that she is a Q.

1 - 26 of 26 sorted by date. Printable List View All Seasons










Season 1	Season 2	Season 3	Season 4	Season 5	Season 6	Season 7
Air Date	Title	Prod #	DVD #	Stardate		
	09.28.87 Encounter at Farpoint, Part I The new U.S.S. Enterprise and its crew set out "to boldly go where no one has gone before."	101	1	41153.7		
	09.28.87 Encounter at Farpoint, Part II At the trial, Q continues to denounce humans, while Picard defends his race.	102	1	41153.7		

Will your Sunday shows start on time?

Internet 100%

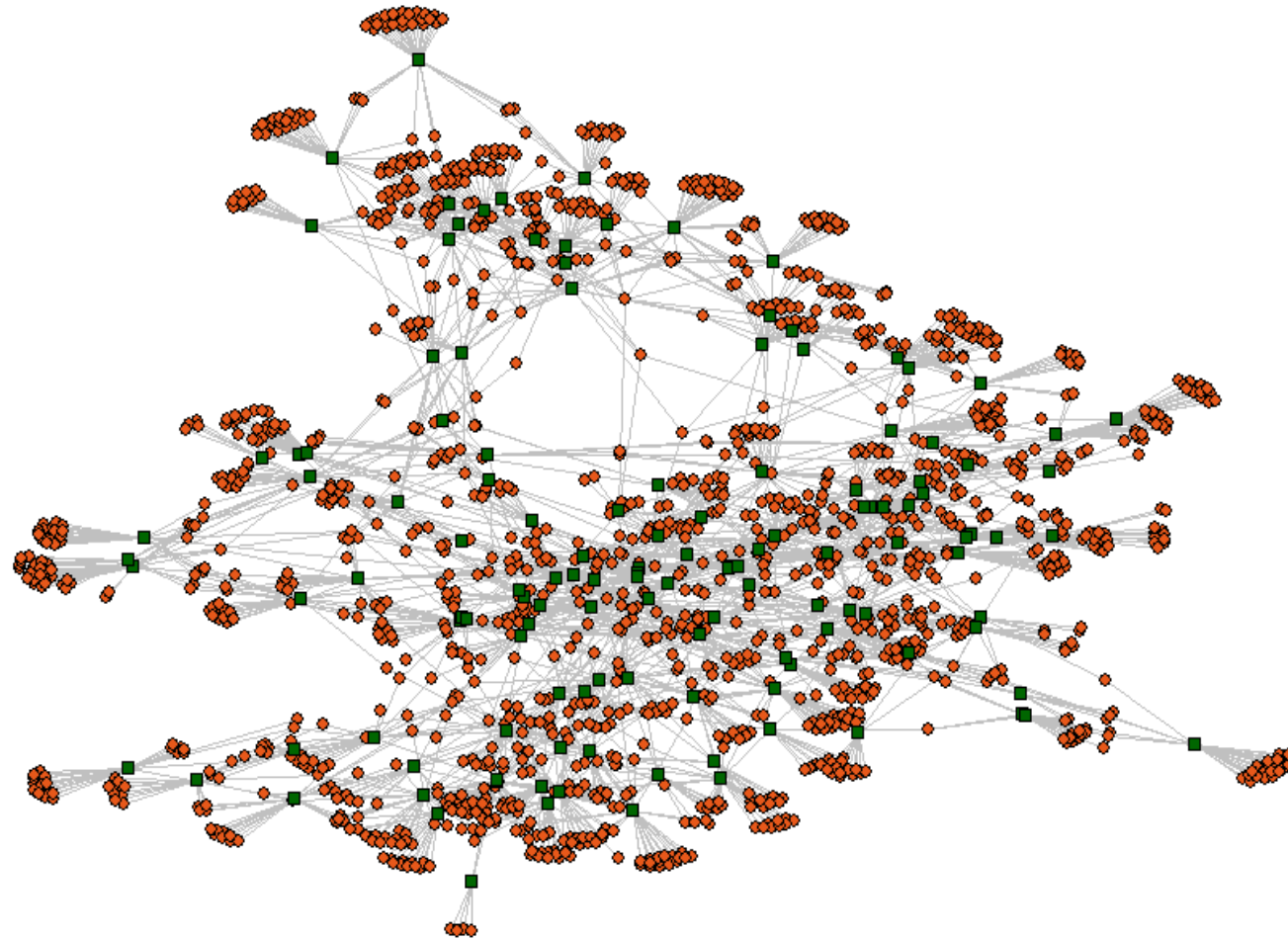


Transportation Networks

Name		Zonennummer im Tarifzonenplan	Planquadrat im Wien-Plan	Linien, die diese Haltestellen anfahren
11. Haidequerstraße 12.-Februar-Platz		100 100	R17 J11	76A D, N36
7. Haidequerstraße		100	R16	76A
Absbergbrücke		100, 270, 280	S13	68A, 266, 271
Absberggasse		100	R13	N6, 6
Achengasse		100	E18	32A
Adamovichgasse		100	V10	16A
Adam-Betz-Gasse		100	N22	99B
Ada-Christen-Gasse		100	U13	19A
Adolf-Loos-Gasse		100	F17	N25, 29A
Adolf-Unger-Gasse		100	U13	19A
Afritschgasse		100	J17	N20, 23A
Agavenweg		100	J20	24A
Agnesgasse		100	J 8	N35, 35A, 35B
Aichholzgasse		100	R 9	9A
Aichholzgasse/Ratschkygasse		100	R 9	9A
Aignerstraße		100	J12	5A
Akazengasse		100	W 9	255
Alaudgasse		100	T12/13	N67, 67, 19A, 267, 368, 467, 469
Albern Sendnergasse		100, 280	T19	76A, 279
Alberner Hafen		100	T19	76A
Alberner Hafenzufahrtsstraße		100	R18	73A, 76A, 80B
Alberner Straße		100, 280, 290	T19	76A, 279
Albertgasse		100	N10	J, 5, 33
Albertinaplatz		100	O12	3A
Albert-Schultz-Halle		100	K16	27A
Albert-Schweitzer-Gasse		100	O 3	150
Albrechtskreithgasse		100	M 9	10A
Algenweg		100	J21	24A, 99B
Allerheiligengasse		100	K13	5A, 11A
Allerheiligenplatz		100	K13	37A
Allissen		100	E15	32A
Alois-Behr-Straße		100, 240	O 4	149, 153, 249
Alois-Miesbach-Straße		100	S10	65A
Alsegger Straße		100	L 9	40
Alser Straße	L 	100	M10	U6, N43, N6, N64, 43
Alte Donau	L	100	K15	U1, N25, N26, 20B
Alterlaa	L 	100	U 9	U6, N66, 64A, 66A
Altes Landgut		100	T13	N67, 67, 15A, 267, 368, 467, 469
Althanstraße		100	L11	D, 33
Altmannsdorfer Straße		100	S 9	62, 16A, 64A
Am Fasangarten		100	S 8	8A
Am Heidjöchl		100	K18	N20, 23A, 96B
Am Heidjöchl/Hausfeldstraße		100	K19	N20, 96B
Am Heumarkt		100	O12	71
Am Himmelreich		100	S16	N71, 73A
Am Hundsturm		100	Q10	N60, 12A
Am Kanal		100	S14	15A, 69A
Am Kanal/Hasenleitengasse		100	S15	N6, 69A, 72A
Am Modenapark		100	O12	4A
Am Platz		100	Q 8	56B, 58B, 156B
Am Rosenhügel		100	T 7	56B, 58B, 63A, 156B, 260
Am Schöpfwerk	L 	100	T 9	U6, N66, 16A
Am Spiegeln		100	U 7	56B, 58B, 60A, 156B
Am Spitz		100, 220, 230	H13	N20, N29, N31, 26, 33B, 232, 431
Am Tabor		100	L/M13	N, N29, 5
Arneisbachzeile		100	O 7	51A
Arneisgasse		100	P 8	52, 51A
Armerweg		100	M 5	148
Amongasse		100	L18	98A
Arntshaus Muthgasse		100	J12	34A

Transportation Networks

1,511 Stations, 134 Lines



Abstracts of Research Proposals

Data

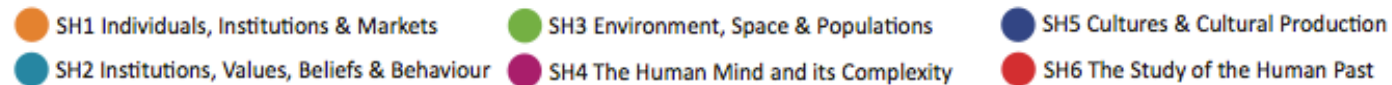
- 814 English abstracts of successful proposals from 2007-2013 in the SSH domain incl. metadata such as PI, country, institution, funding, duration, ...

Term Extraction

- all syntactically plausible 1- and n-grams cross document co-occurrence min 2.

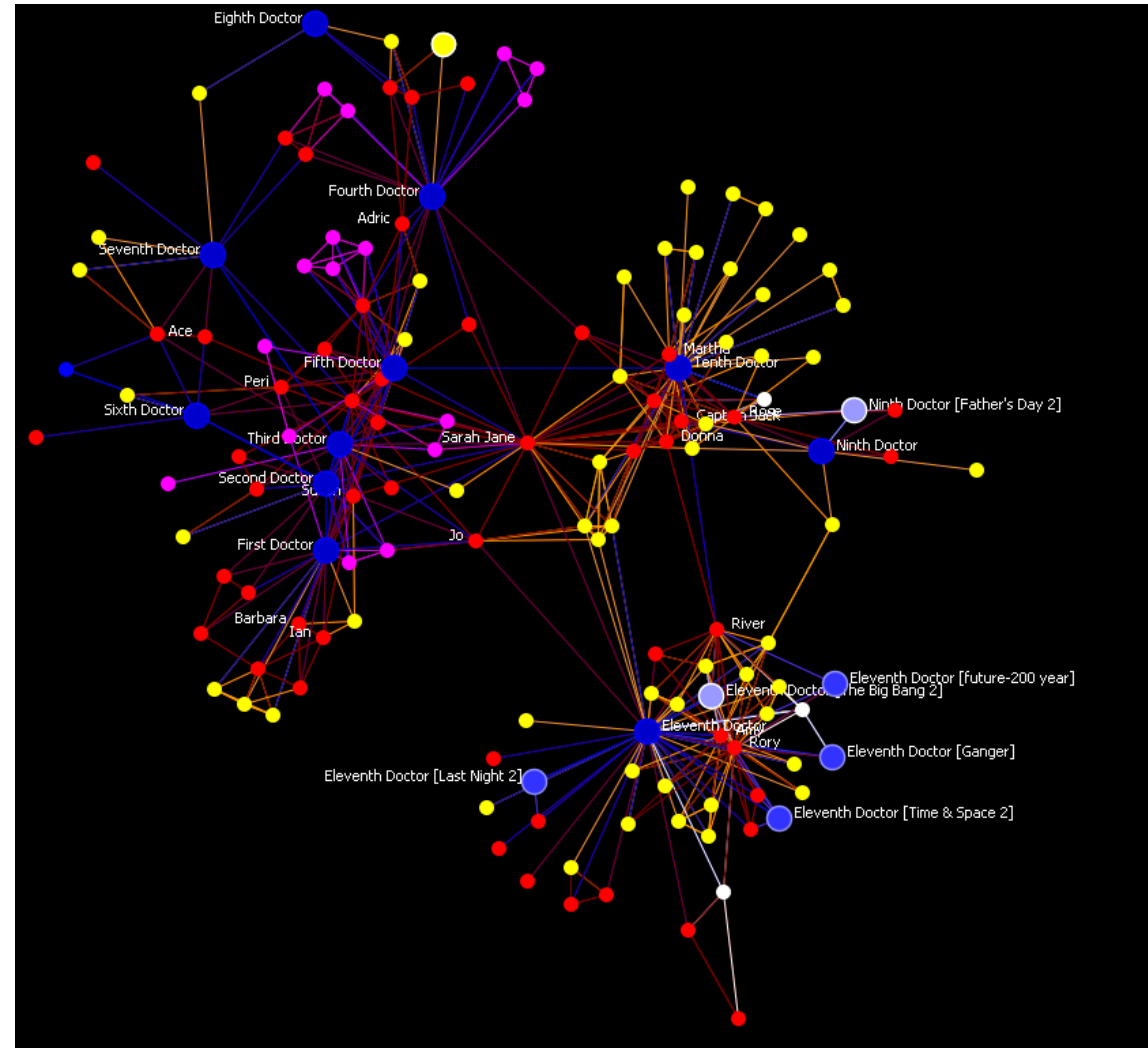
Term validation and cleaning phases:

- Stop word list
- matching with several lexical sources and thesauri (e.g. Wikipedia)
- British/American English
- Singular/plural reduction (selected)
- Manual inspection of resulting term list

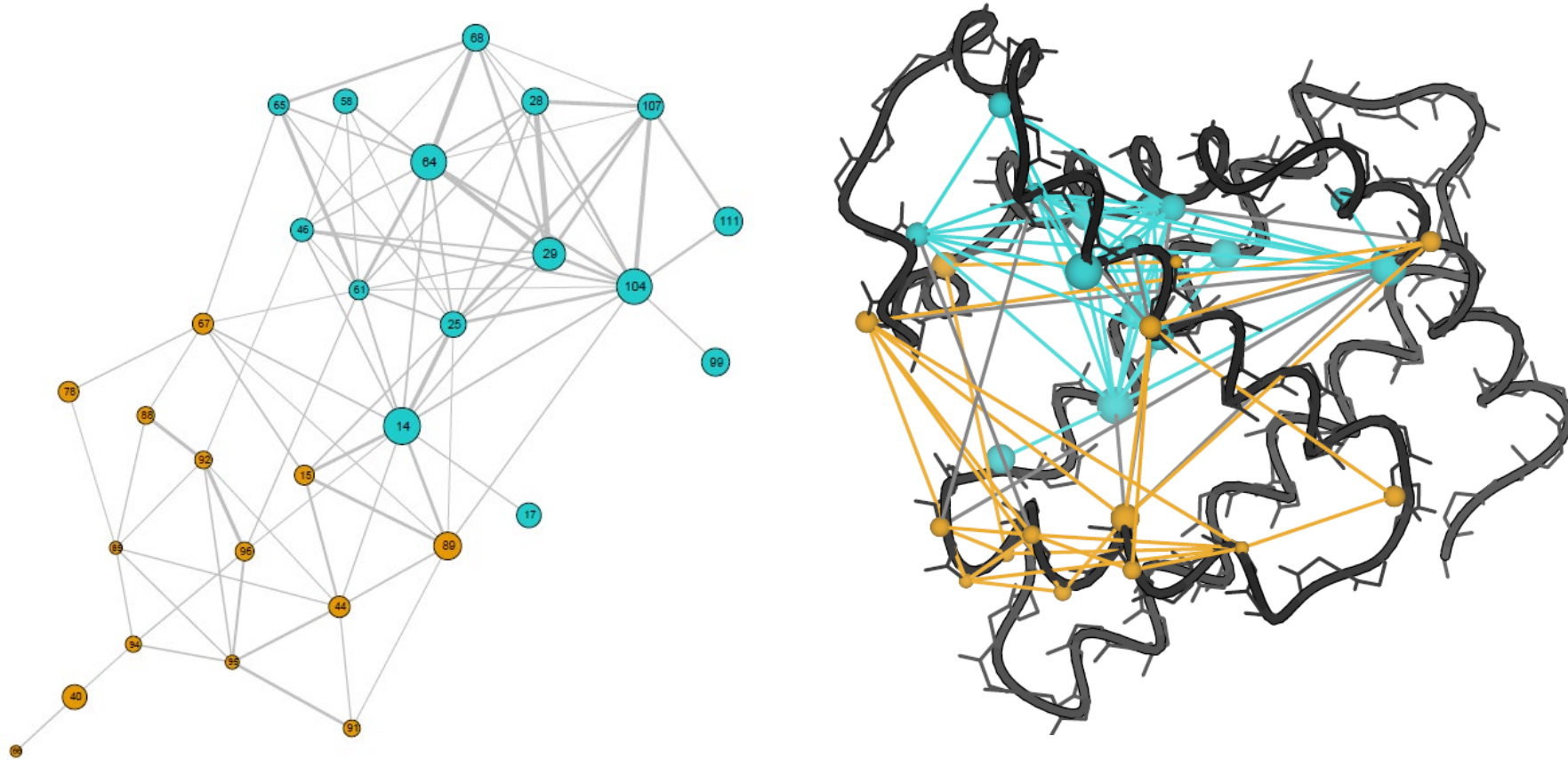




The Network of the Doctor(s)



Protein Families



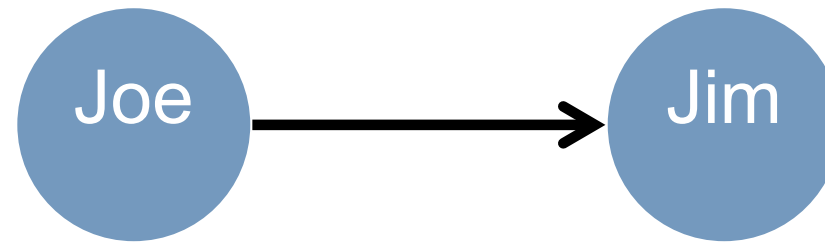
From Tweets to Networks

Joe: RT @Jim: This is bad! #sandy destroys #NYC (Loc)

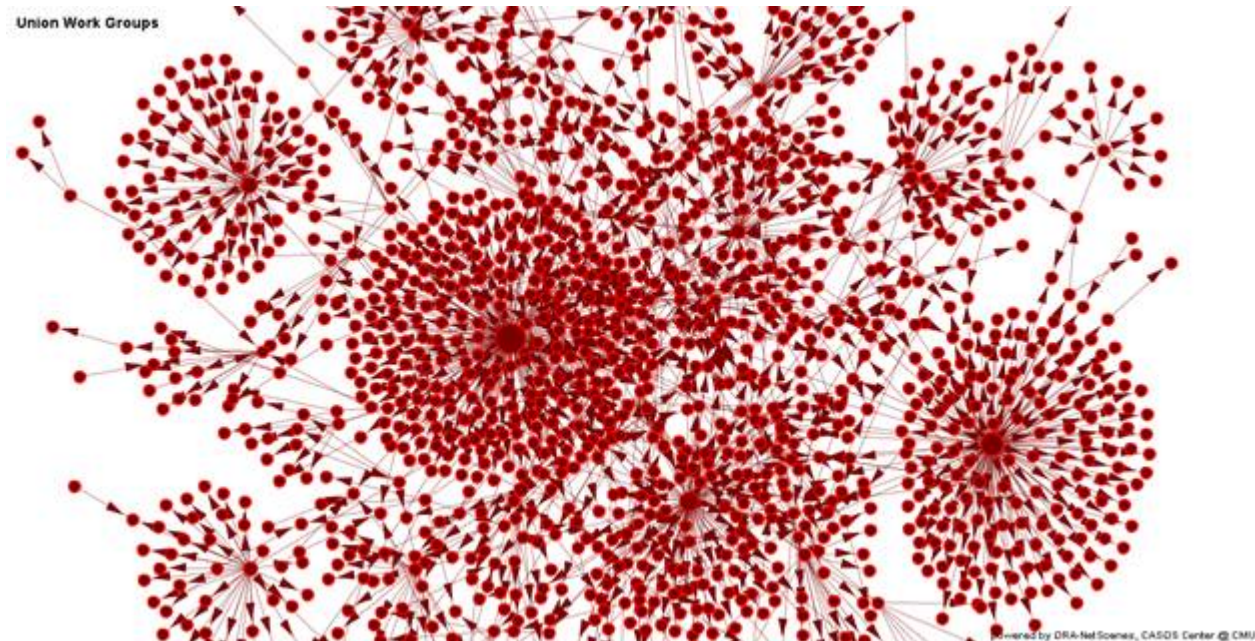
Networks:

User/User:	Joe → Jim
User/Hashtag:	Joe → #sandy, Joe → #NYC
Hashtag/Hashtag:	#sandy → #NYC
User/Location:	Joe → Loc/Joe
Hashtag/Location:	#sandy, #NYC → Loc/Joe
Location/Location:	Loc/Joe → Loc/Jim

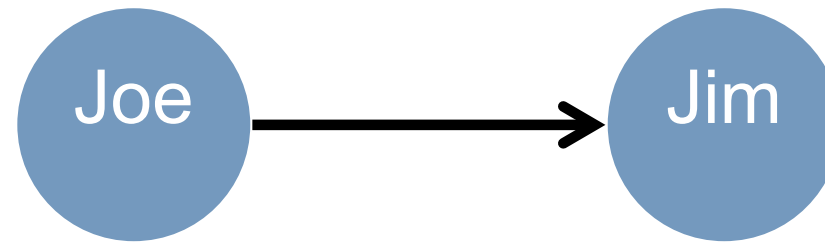
Twitter Networks



Many Twitterer



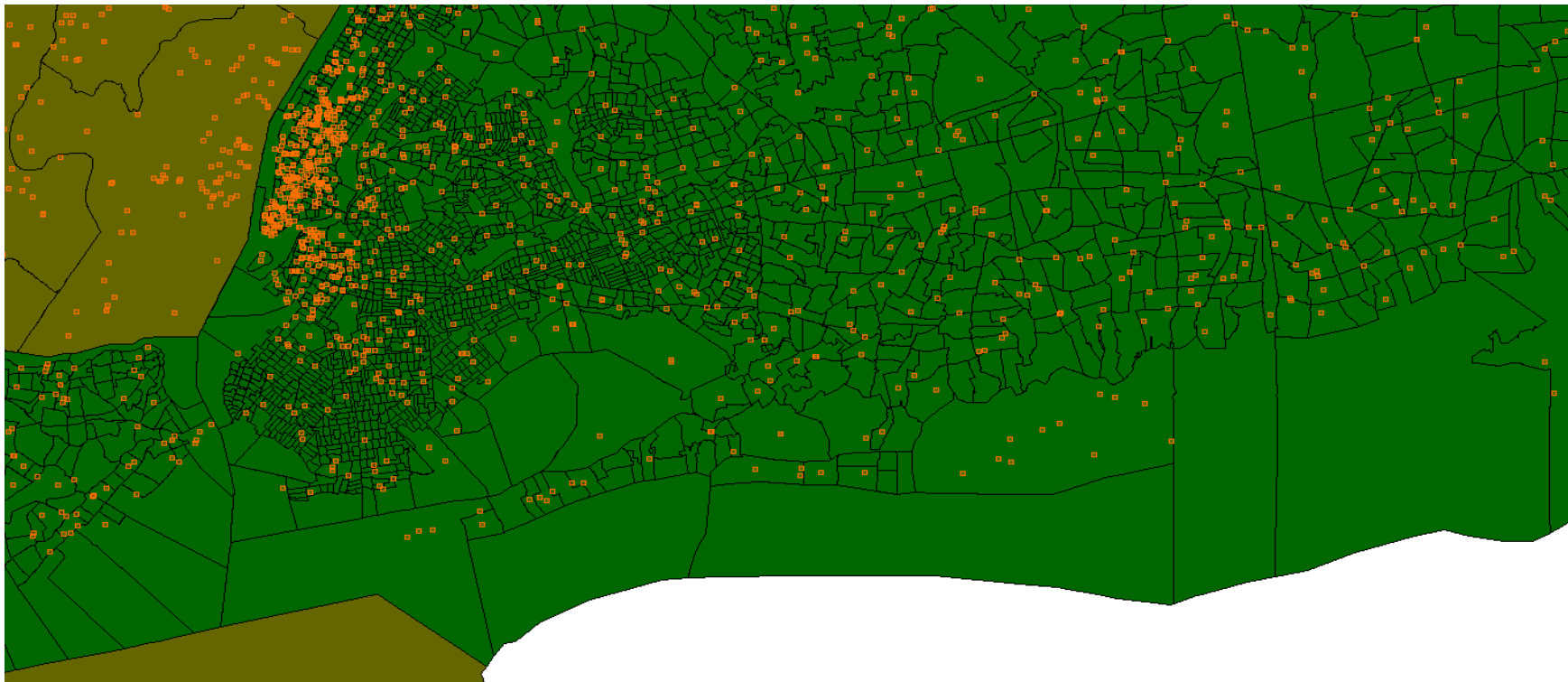
Twitter Networks



What about Re-Re-Tweet?

Geo-Spatial Analysis

1.5 % of Tweets are geo-tagged.



Ethical Considerations

Degree of intrusion

Data storage

Protection of privacy

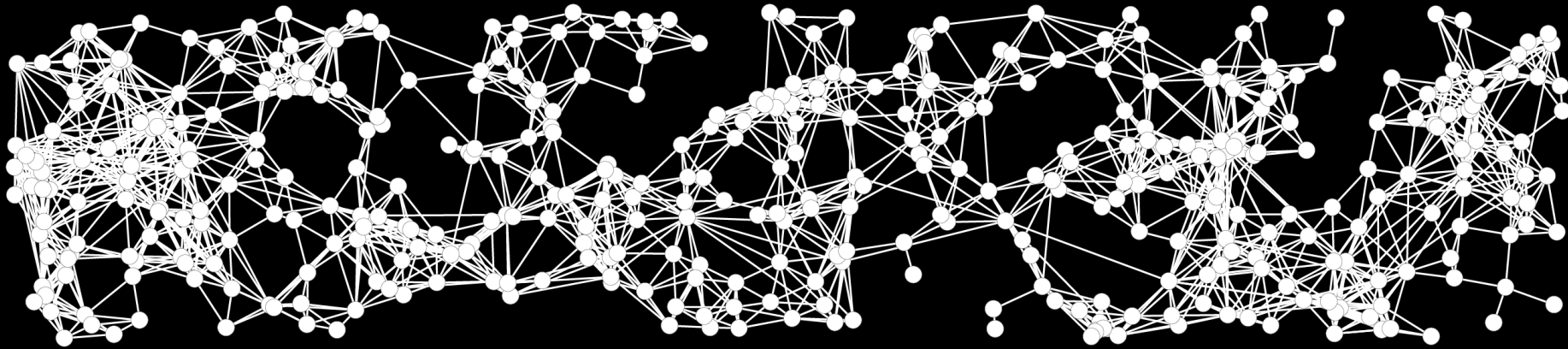
Can network data be anonymous?

Personal identifiable information

Internal Review Board (IRB), Ethics Board?

*“Our mission is to go forward, and it has only just begun.
There's still much to do, still so much to learn. Engage!”*

Jean-Luc Picard, Star Trek TNG, Season 1 Episode 26



Juergen.Pfeffer@tum.de