Co-authorship Network of SSRN Conflict Studies eJournal

Drew Conway

New York University — Department of Politics

December 2, 2010

Talk Summary

The Social Science Research Network

- What the SSRN provides
- The eJournal system
- Studying co-authorship networks

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- Conflict Studies eJournal as bipartite graph
- Adding context to the network
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- Dealing with scale
- Degree distribution and fit
- Community detection and topic modeling

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Network Economics

- Extending research

The Social Science Research Network

Mission

Social Science Research Network (SSRN) is devoted to the rapid worldwide dissemination of social science research and is composed of a number of specialized research networks in each of the social sciences...Each of SSRN's networks encourages the early distribution of research results by publishing Submitted abstracts and by soliciting abstracts of top quality research papers around the world.

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SSRN basics

- Operating for 16 years
- 290,000 documents
- 148,000 authors
- 40.9 million downloads

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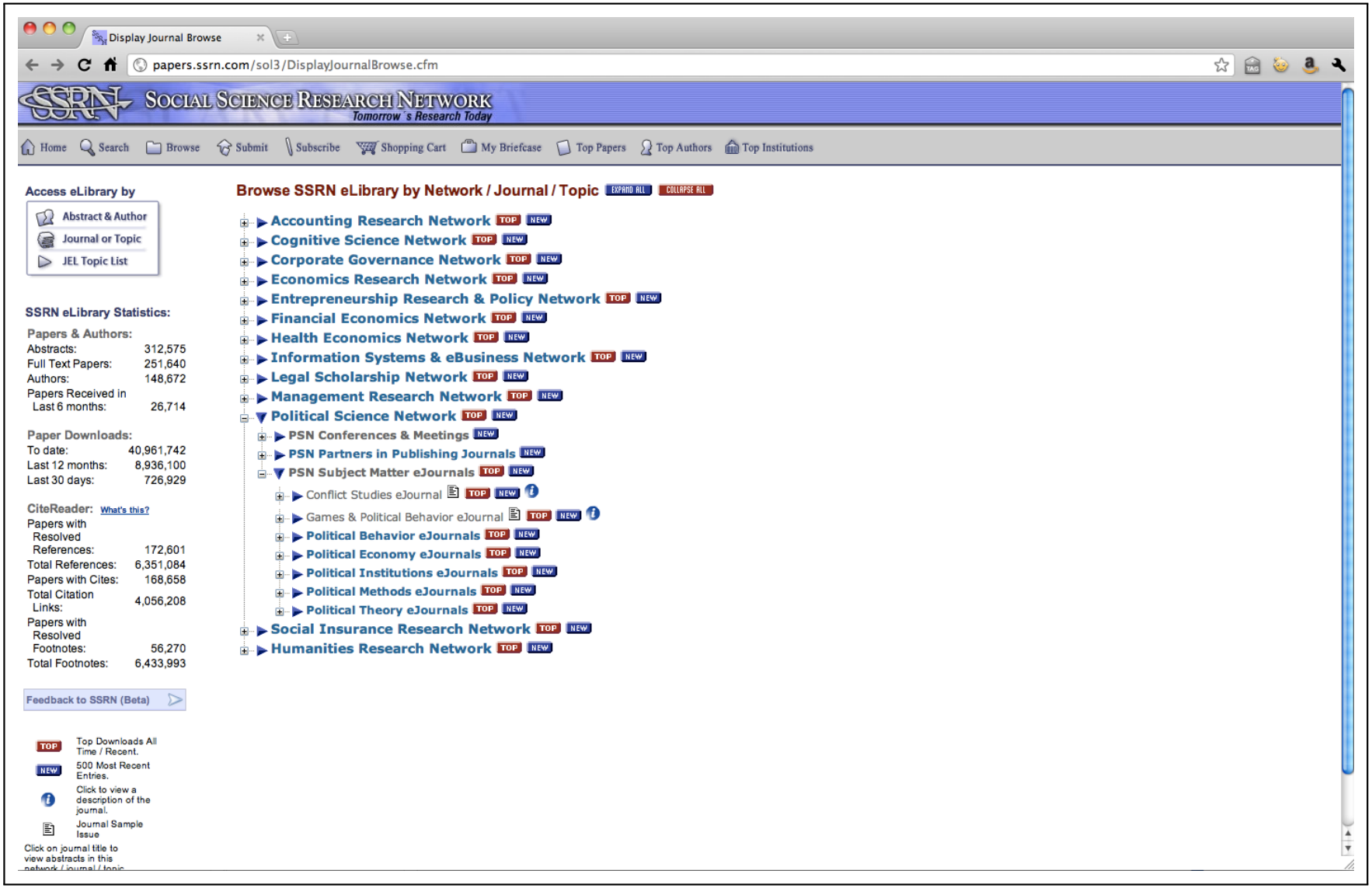
Very similar to open research efforts in other disciplines

- Best example is the ArXiv (`http://arxiv.org/`) archive
- Physics, Mathematics, Computer Science, Quantitative Biology, Quantitative Finance and Statistics
- No peer-review, maintains high signal-to-noise

The eJournal Library



Conflict Studies eJournal

For this analysis I focus on the **Conflict Studies eJournal** in the Political Science Network

eJournal Description

This eJournal distributes working and accepted paper abstracts on the theoretical or empirical study of conflict. This includes both the causes, processes, and termination of conflict as well as approaches used to prevent and stop conflicts. Papers might address issues such as coercion and violence within and between countries (e.g inter-state wars, civil wars, and terrorism), cooperative approaches to preventing and alleviating conflict (e.g. alliances, arms control, mediation, international institutions), and the effect of conflict on international and domestic politics.

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Why focus on a single eJournal

- Entire network too large, needed to focus on sample
- Lack domain knowledge to provide context to analysis
- I study conflict, no previous analysis of this sub-discipline

Studying co-authorship networks

SSRN-Law as a Seamless We

papers.ssrn.com/sol3/papers.cfm?abstract_id=1419525

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Feedback to SSRN (Beta)

Abstract
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References (11)
Beta

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Law as a Seamless Web? Comparison of Various Network Representations of the United States Supreme Court Corpus (1791-2005)

Michael James Bommarito II
University of Michigan, Department of Financial Engineering; University of Michigan, Center for the Study of Complex Systems; University of Michigan, Department of Political Science

Daniel Martin Katz
University of Michigan at Ann Arbor - Department of Political Science; University of Michigan Law School ; University of Michigan at Ann Arbor - Center for Study of Complex Systems

Jon Zelner
University of Michigan at Ann Arbor - Center for Study of Complex Systems

June 14, 2009

Proceedings of the 12th International Conference on Artificial Intelligence and Law (ICAIL 2009)

Abstract:
Citation networks are a cornerstone of network research and have been important to the general development of network theory. Citation data have the advantage of constituting a well-defined set where the nature of nodes and edges is reasonably well specified. Much interesting and important work has been done in this vein, with respect to not only academic but also judicial citation networks. For example, previous scholarship focuses upon broad citation patterns, the evolution of precedent, and time-varying change in the likelihood that communities of cases will be cited. As research of judicial citation and semantic networks transitions from a strict focus on the structural characteristics of these networks to the evolutionary dynamics behind their growth, it becomes even more important to develop theoretically coherent and empirically grounded ideas about the nature of edges and nodes. In this paper, we move in this direction on several fronts. We compare several network representations of the corpus of United States Supreme Court decisions (1791-2005). This corpus is not only of seminal importance, but also represents a highly structured and largely self-contained body of case law. As constructed herein, nodes represent whole cases or individual 'opinion units' within cases. Edges represent either citations or semantic connections. As our broader goal is to better understand American common law development, we are particularly interested in the union, intersect and compliment of these various citation networks as they offer potential insight into the long-standing question of whether 'law is a seamless web'? We believe the characterization of law's interconnectedness is an empirical question well suited to the tools of computer science and applied graph theory. While much work still remains, the analysis provided herein is designed to advance the broader cause.

Keywords: computational legal studies, computer programming and law, network analysis, judicial citation networks, law as a complex system, evolutionary graph theory, computational linguistics and law, semantic analysis, supreme court citations, evolution of law

JEL Classifications: C63, K40, K, D71, D72

Working Paper Series

Date posted: June 16, 2009 ; **Last revised:** June 03, 2010

Paper statistics
Abstract Views: 1,198
Downloads: 359
Download Rank: 24,206
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eJournal as a bipartite network

SSRN data very rich

- Relationships between authors and articles
- Each observation contains significant contextual information

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Data in graph

- Author
  - Institution
  - SSRN related statistics
- Article
  - Title
  - Abstract
  - Keywords, etc.

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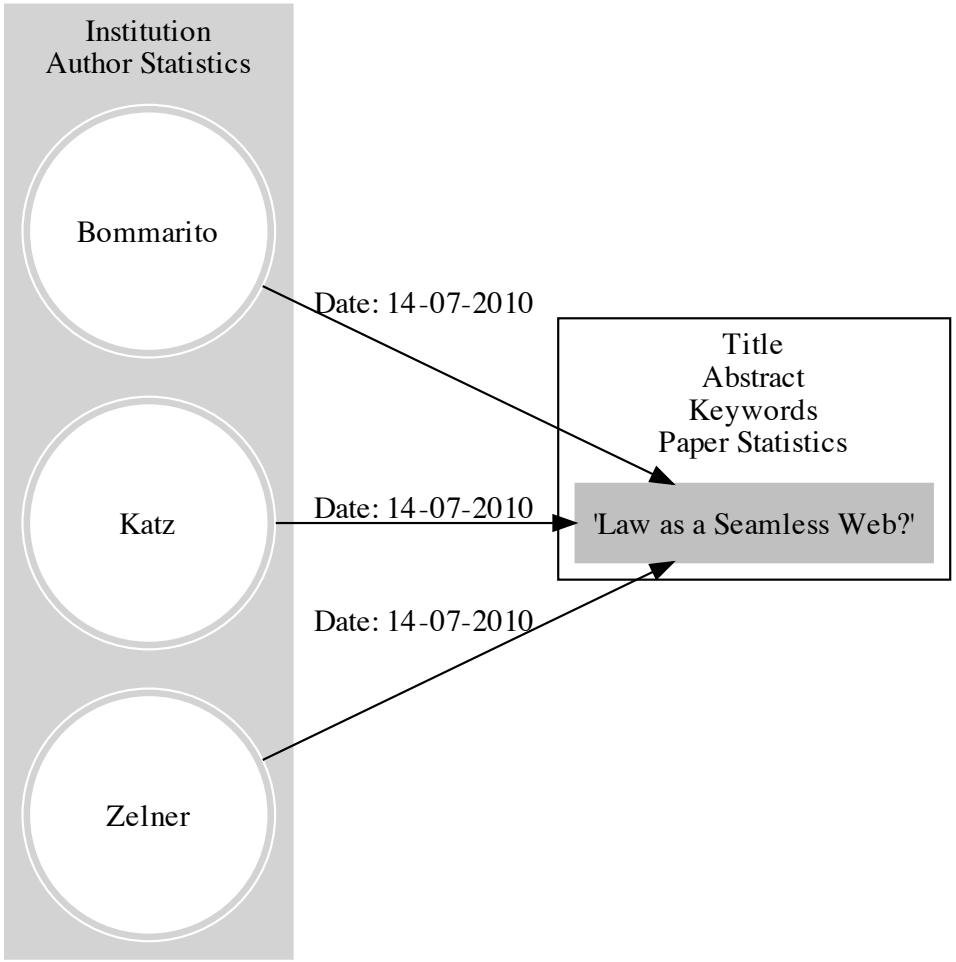
Naturally represented as a **bipartite graph**

- Special class of graphs
- Two mutually exclusive vertex sets that cannot directly connect
- $V_{SSRN} = \{author, articles\}$

Representing co-authorship as rich bipartite graph



Gathering the data

1. Find max number of articles in Conflict Studies eJournal
   1.1 At time of data collection, 2,416

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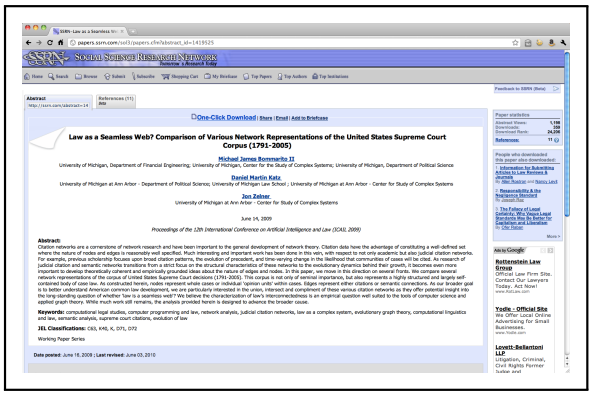

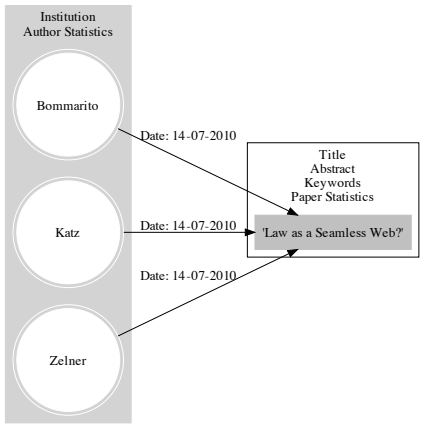

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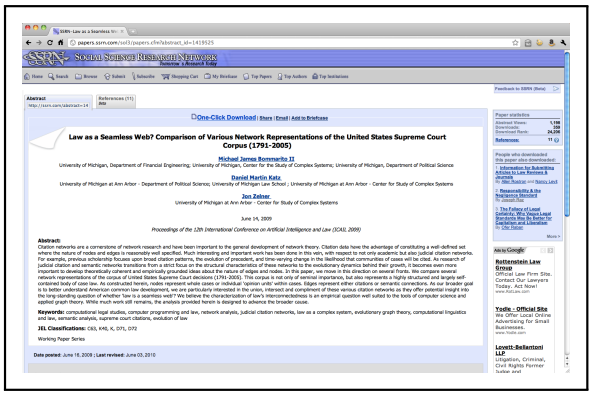

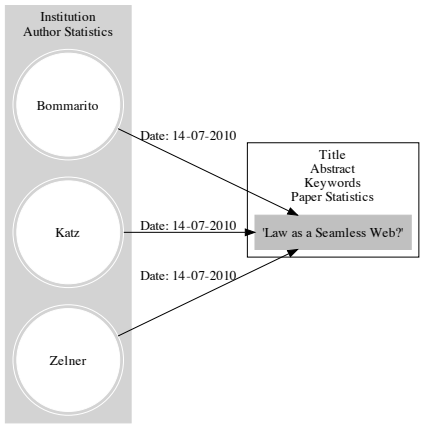

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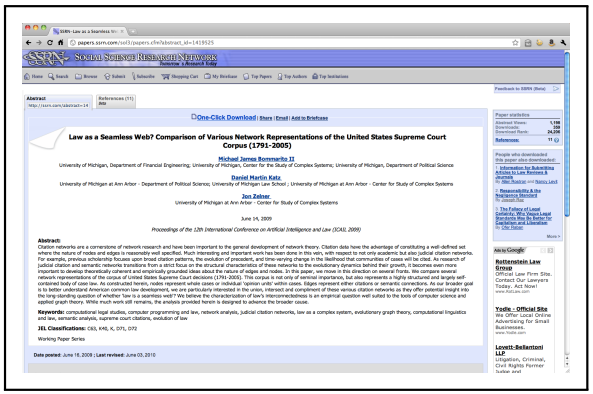
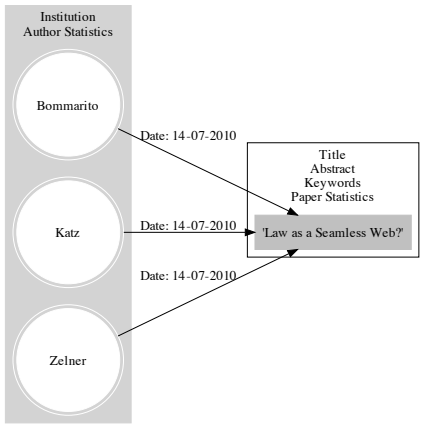
4. Save as GraphML file



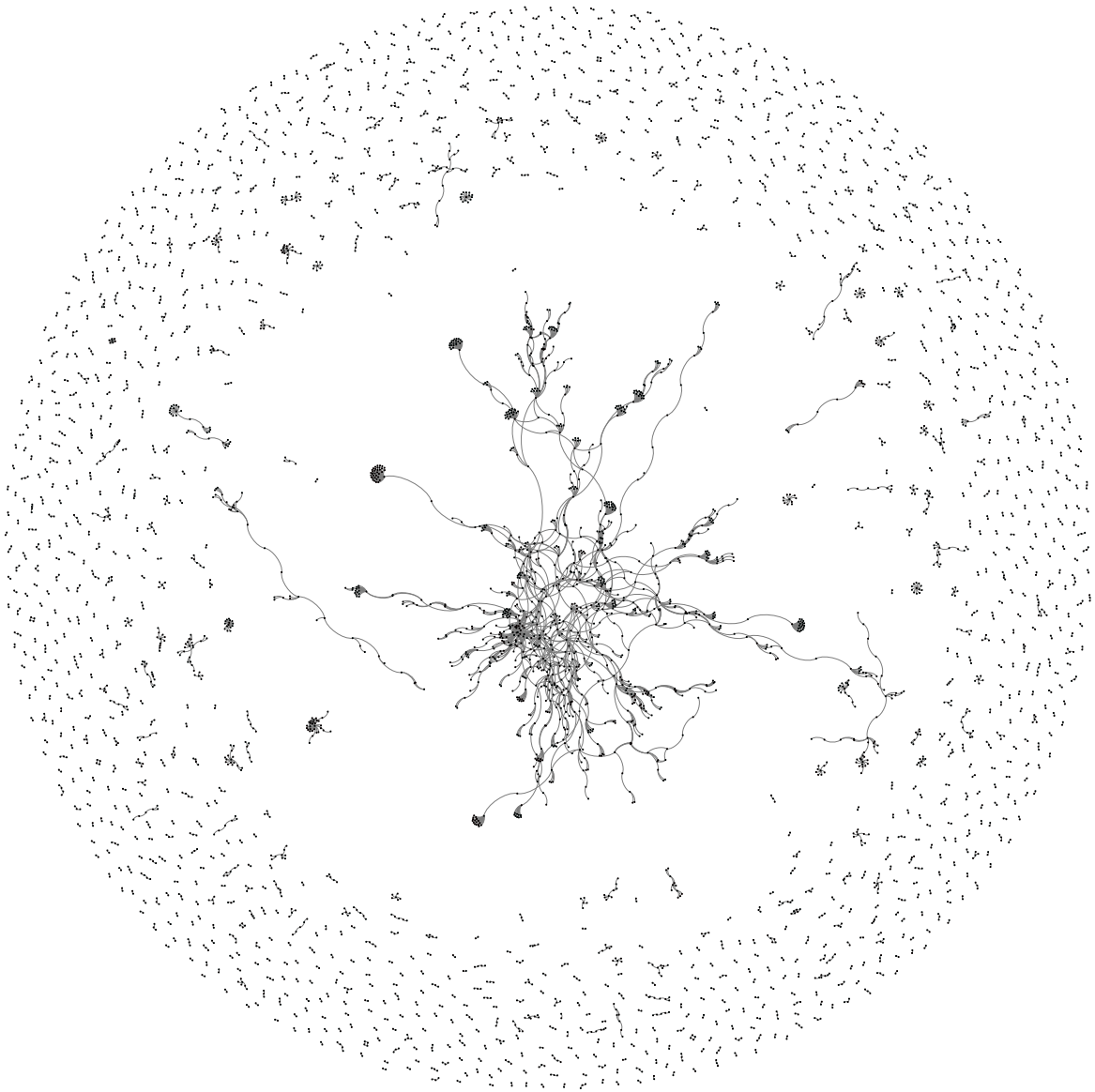


	A	B	C
1	Author	Article	weight
2	100009	1154168	1
3	1000663	1553101	1
4	1000667	1330243	1
5	1001381	1296023	1
6	1001381	1692537	1
7	1001531	1122876	1
8	1003154	1336045	1
9	1003168	1450445	1
10	1003168	1594386	1
11	1005321	1576189	1
12	1005321	1576190	1
13	1005401	1121003	1
14	100574	1485175	1
15	100574	1580219	1
16	1006154	1125065	1
17	1006914	1069906	1
18	1007261	1592837	1
19	1007261	1592863	1
20	1007261	1592902	1
21	1007261	1592903	1
22	1007978	1526088	1
23	100809	1594870	2
24	1010074	1599077	1
25	1010966	1120845	1
26	1010966	1277583	1
27	1012481	1634299	1
28	1015136	1330243	2
29	1015505	1117204	1
30	101581	1263682	2

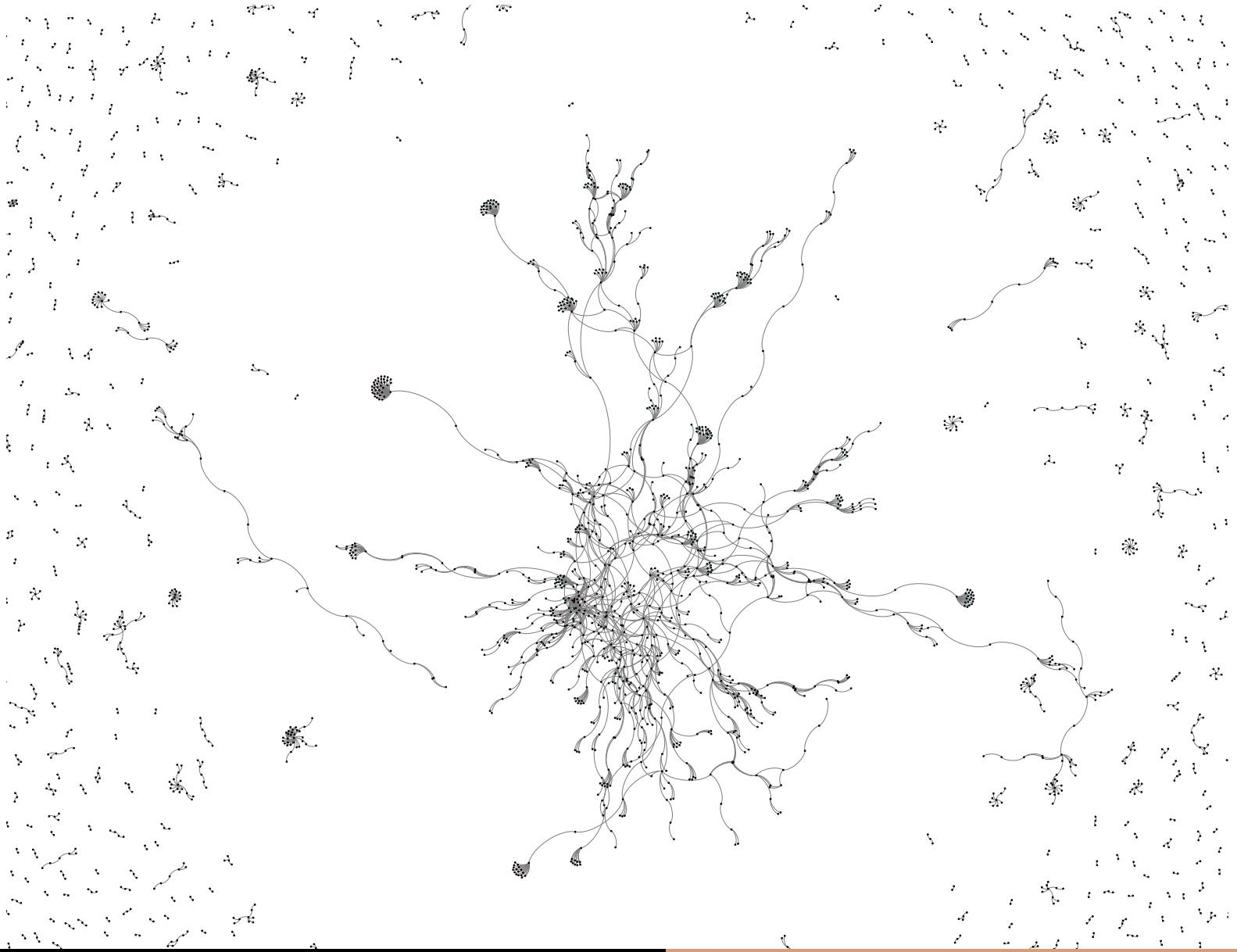
The full network

Full network statistics

- 5,248 nodes
  4,249 edges
- Mean degree 1.6
- Max degree 14
- 1411 weakly connected components
- Largest connected component consists of 1158 nodes



Focusing on the main component



Creating the affiliations networks

In bipartite form, difficult to study relationships among each actor type

- Author-to-author
- Article-to-article

Perform basic matrix algebra to capture "affiliations"

- $Aff_{Authors} = M'xM$

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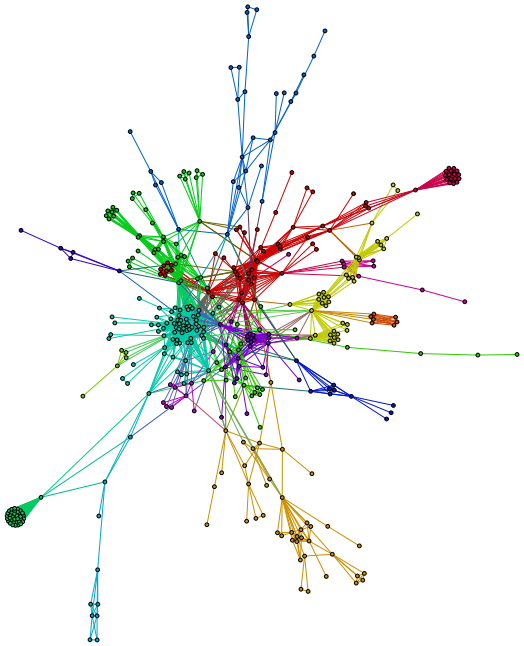
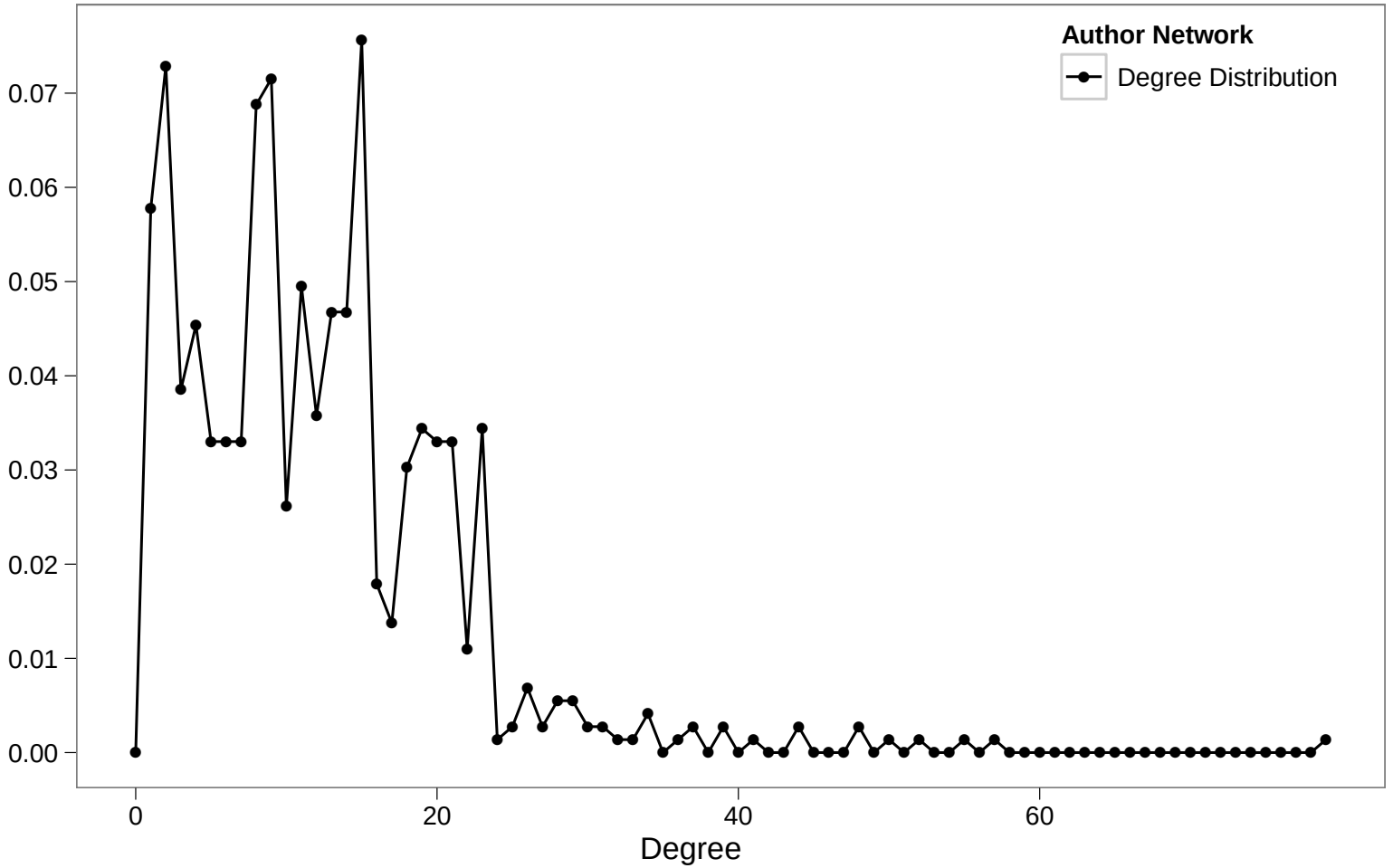


Articles

Degree distributions

Authors



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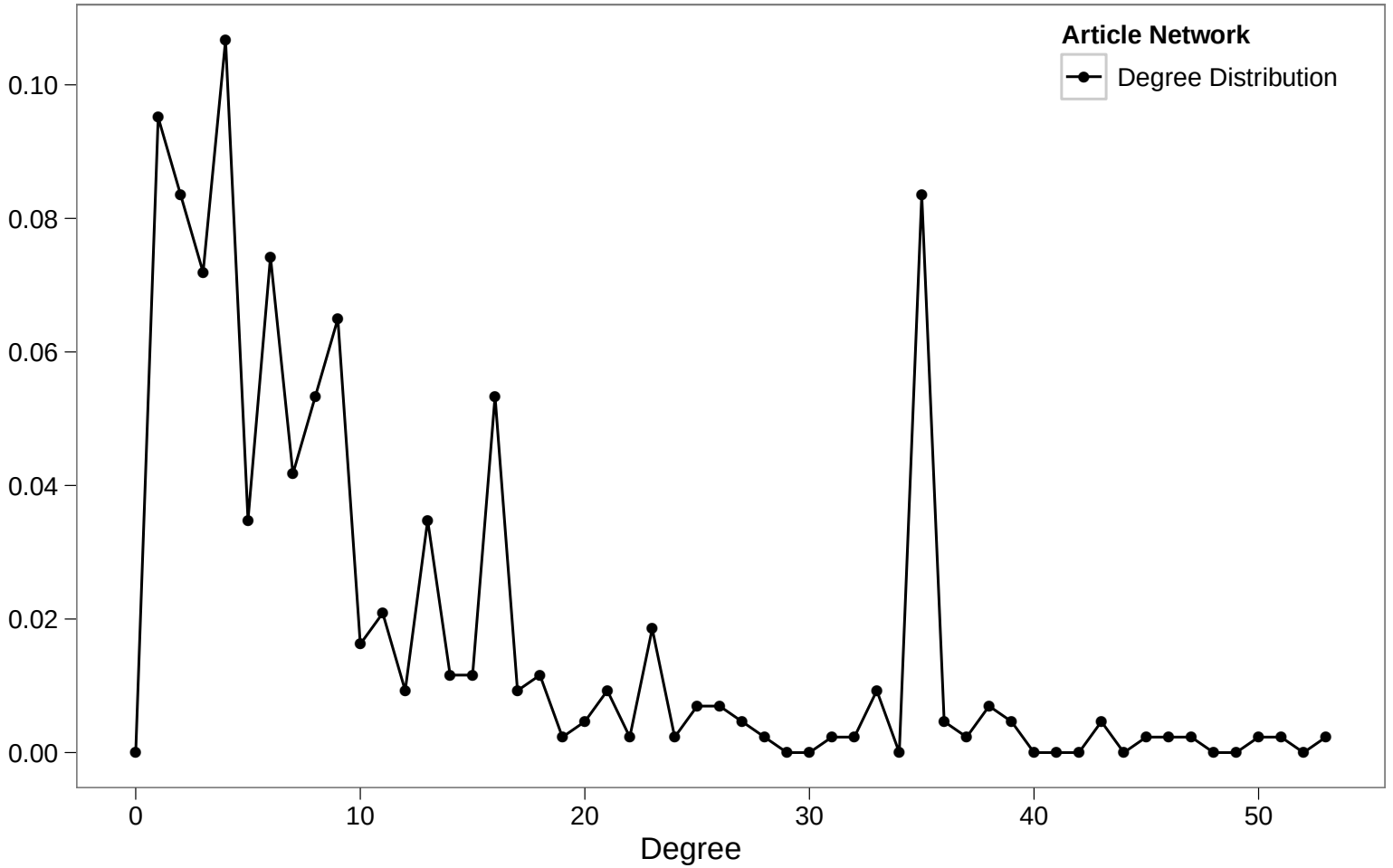
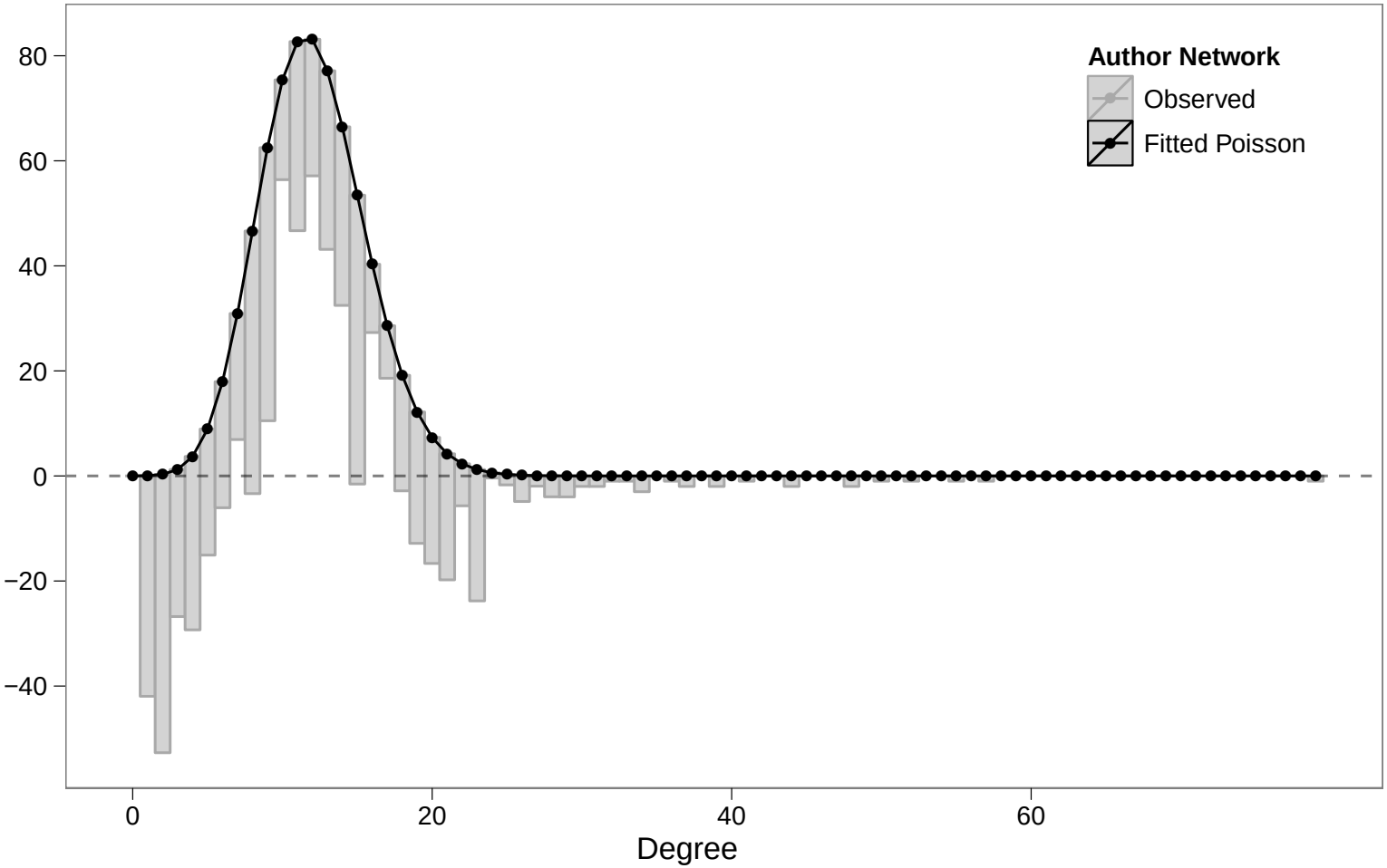


Poisson fit

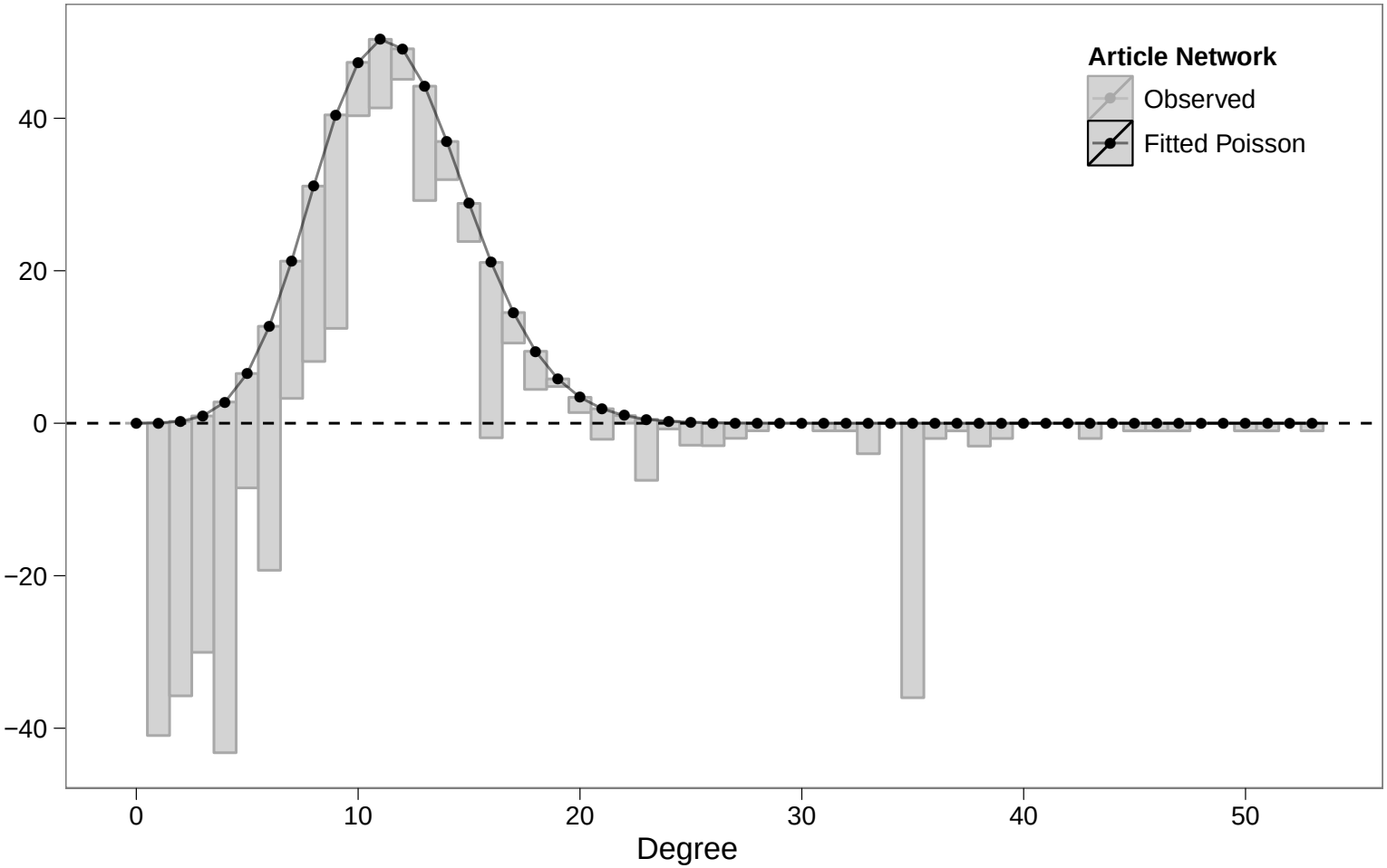
Authors



$\lambda = 12.06 \quad \chi^2 = 1760 \quad$ p-value$= 0.3509$

Poisson fit

Articles



$\lambda = 11.70 \quad \chi^2 = 918 \quad$ p-value$= 0.3396$

Communities in article network

Does network structure reveal communities within Conflict Studies?

- What similarities exist among authors with similar structure?
- What topics are covered by articles with similar structure?

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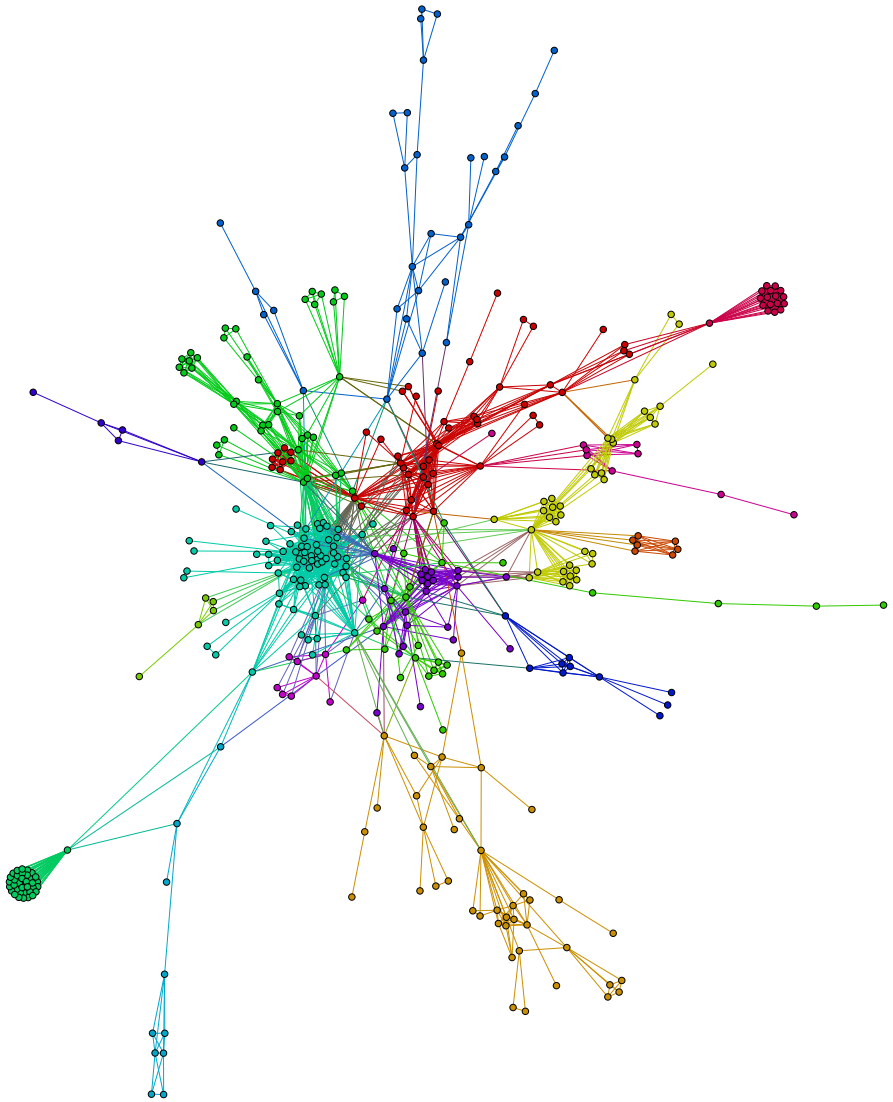
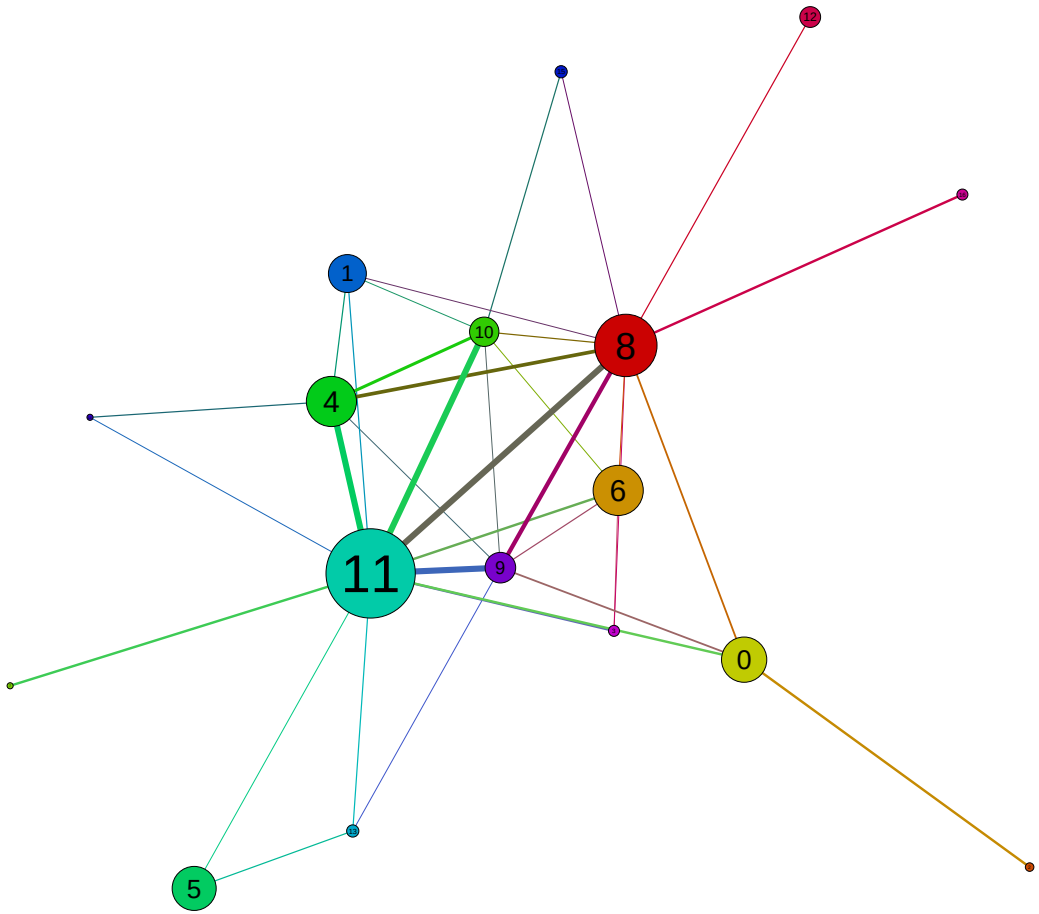
Topic model of articles network

- Latent Dirichlet Allocation (LDA)
- Generate topics and terms
- Common and divergent themes?

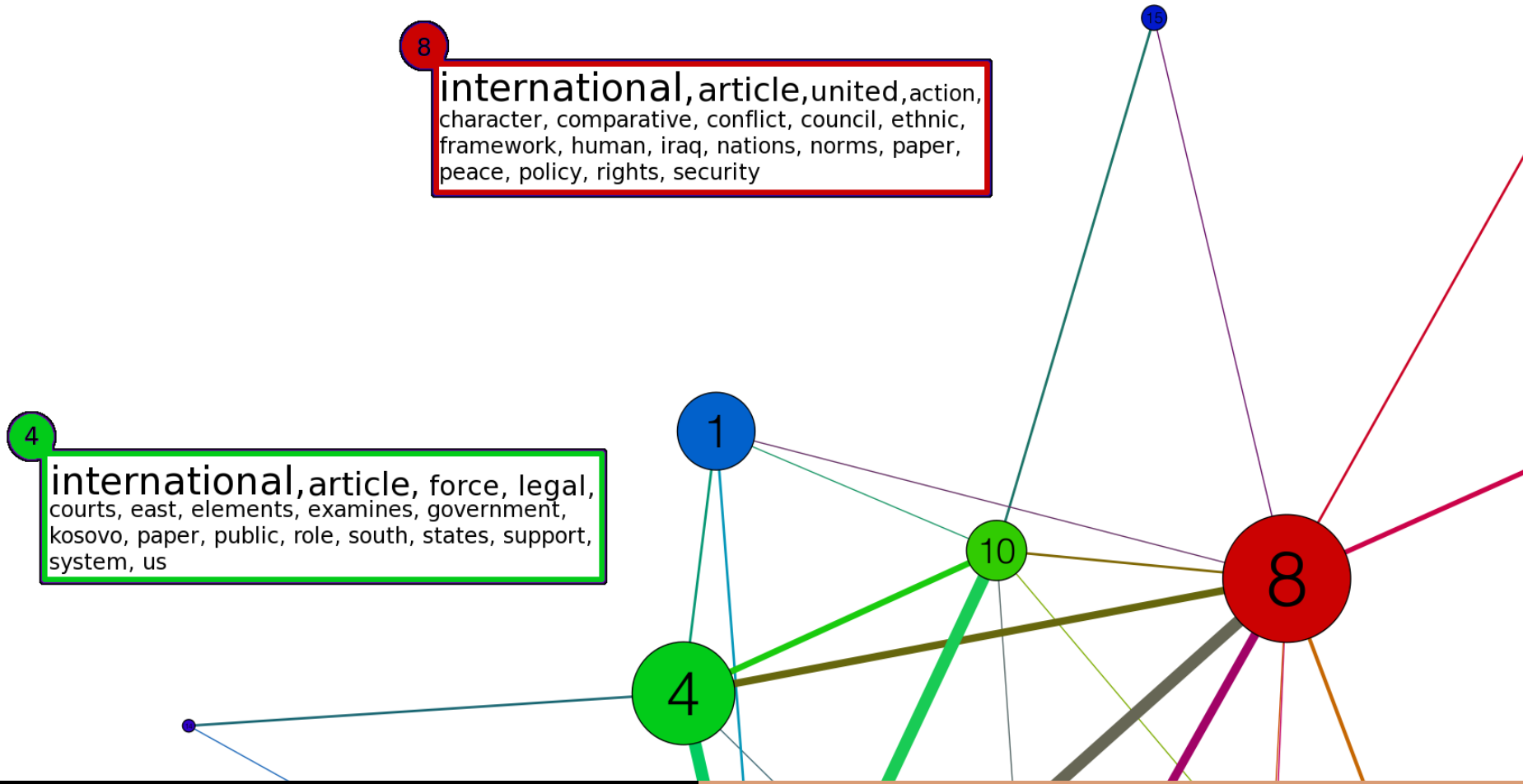
Visualizing communities in article network



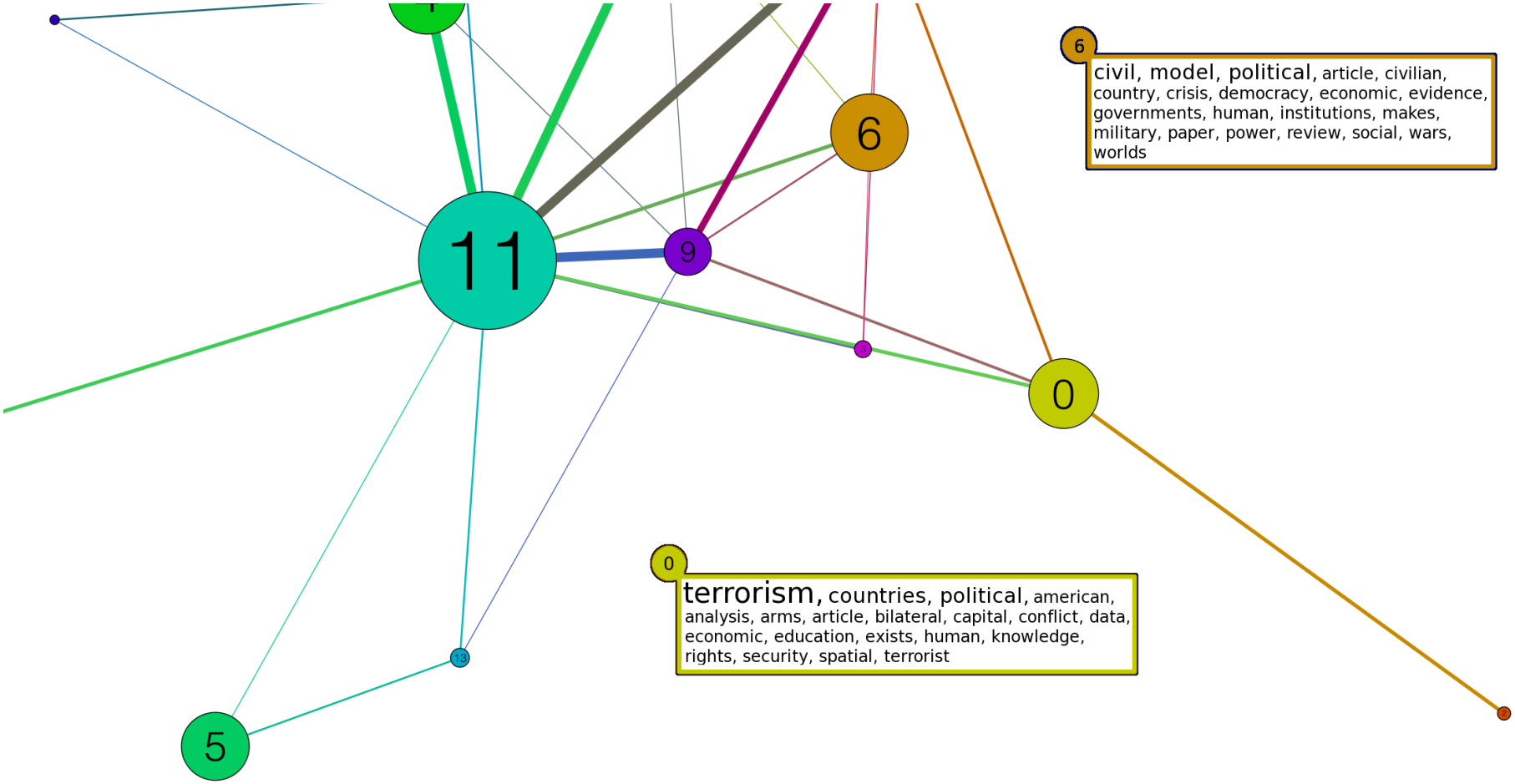
Articles block model



LDA topic models of partitions 4 & 8



LDA topic models of partitions 0, 6 & 11



Extending this research

Can this type of analysis be applied to economic networks?

- What would be the value?
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- Additional analyses?

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- Edges naturally temporal and weighted (frequency/amount)
- Structural communities vs. institutional
- Predict future co-investments

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- Trade
- Defense
- Evolution and/or decay

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Market analysis

- Investor $\longrightarrow$ security
- Market analysts $\longrightarrow$ security
- Individuals $\longrightarrow$ corporate governance