Network Analysis of Data Reuse in the Social Sciences

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Intro

- Knowledge transfer within and between fields
  - Citation analysis and bibliometics
- Studying data reuse in the social sciences

- My goal: using citation analysis to characterize reuse patterns within the social sciences

What do I mean by reuse?

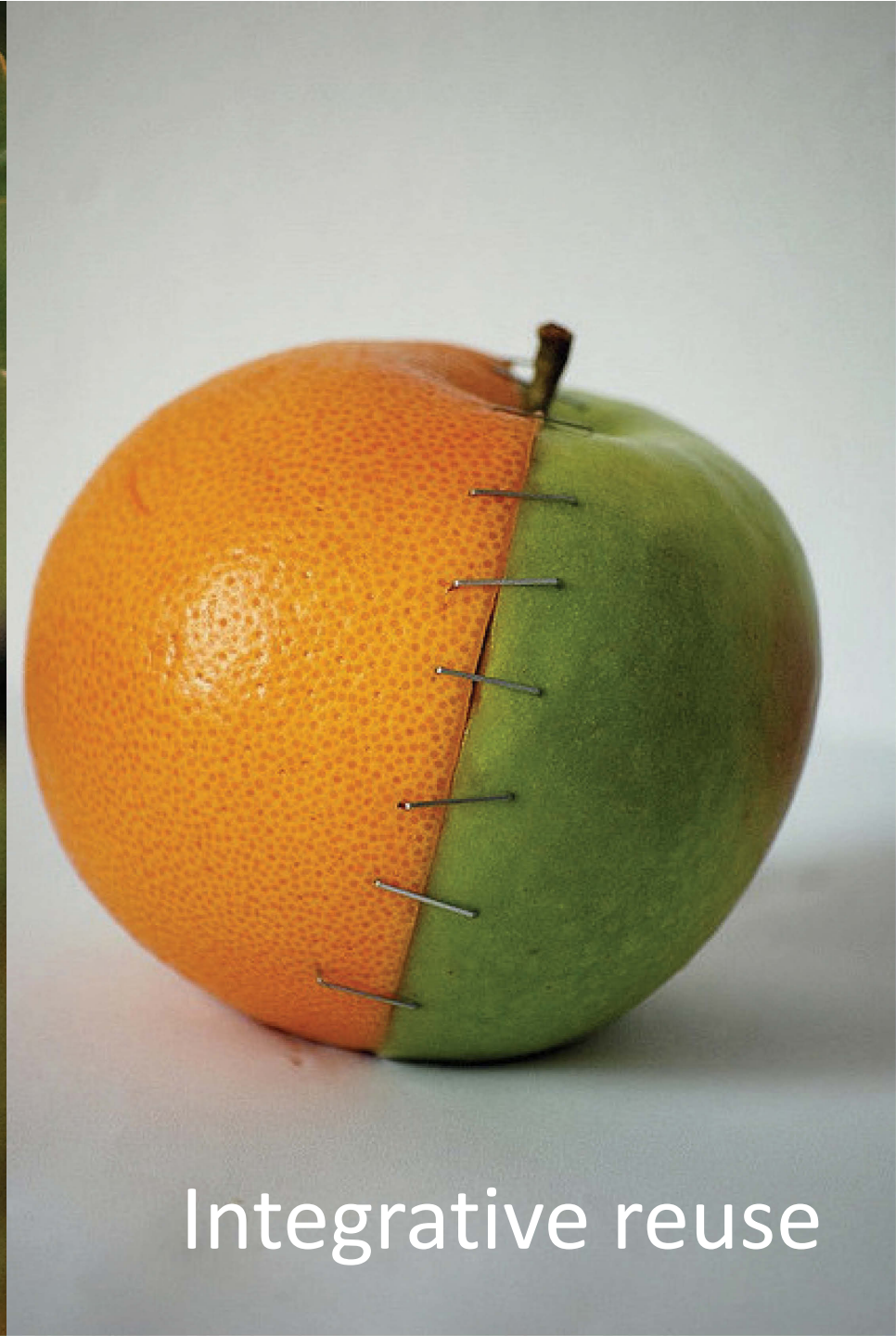
- Using data you did not collect yourself
  - Secondary analysis (or reanalysis or replication) (Chao & Weber 2011)

- What about interdisciplinary reuse?

"one of the most productive and inspiring of human pursuits"

(Committee on Facilitating Interdisciplinary Research, National Academy of Sciences, National Academy of Engineering, Institute of Medicine, 2004, p. 1)

Multidisciplinary reuse



Integrative reuse

Hypotheses

- *H1:* Multidisciplinarity will be more common than interdisciplinarity.

- *H2:* For the case of both multidisciplinarity and interdisciplinarity, citations will be primarily to nearby disciplines rather than distant ones.

About ‘distance’

- Citation studies of interdisciplinarity show that while interdisciplinarity is increasing, most interdisciplinary citations are to neighboring fields

Source data: ICPSR bibliography

- Citation analysis requires a corpus of citation data

- ICPSR closely tracks reuse of data holdings

Source data: ICPSR bibibliography

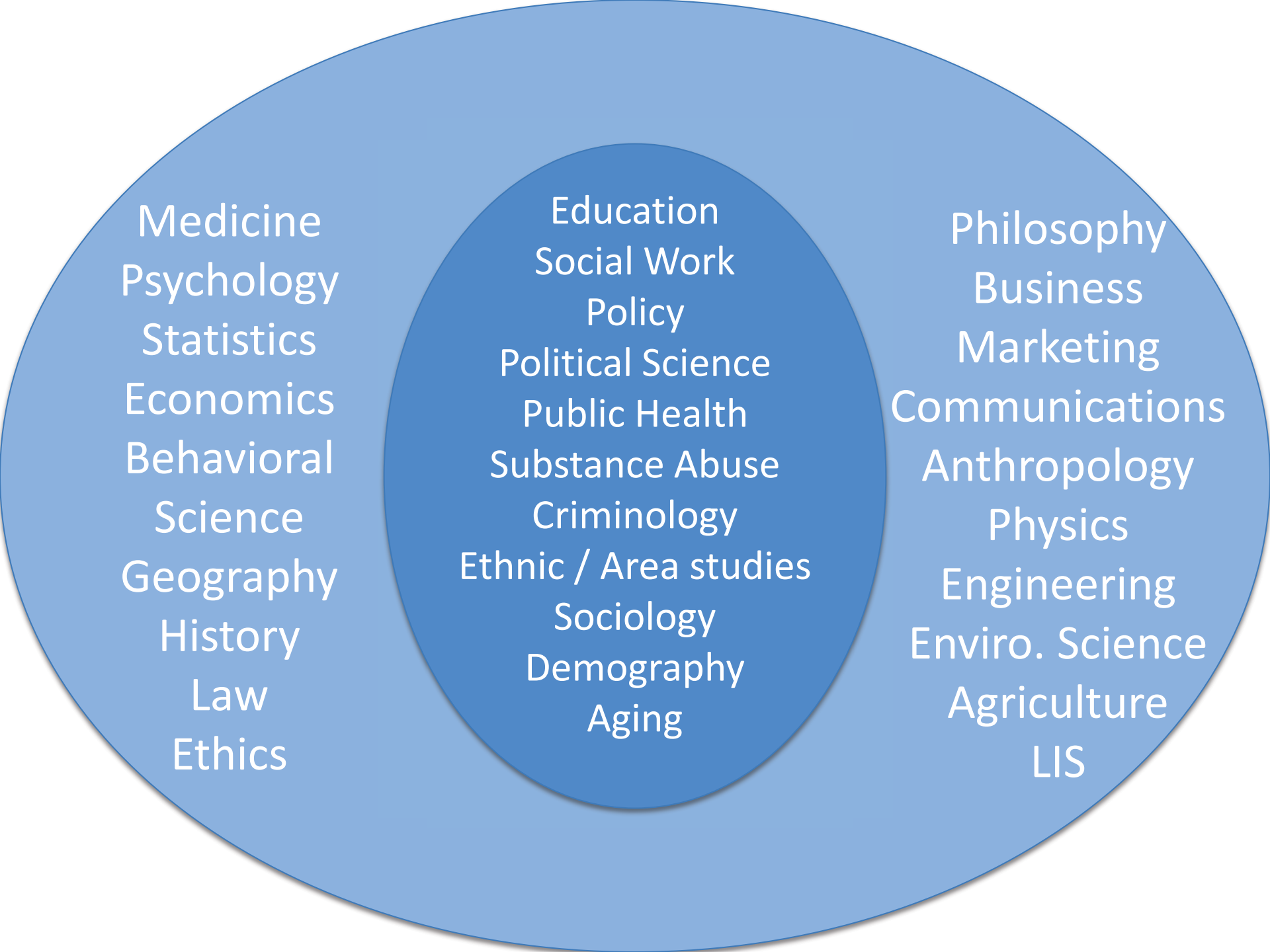
- Comprised of citations from books, book sections, conference publications, journal articles, reports, and theses

- Each entry includes: authors, title, dataset(s) cited, year published, etc.

- Some caveats:
  - Non-standard citation practices increase possibility of missing citations
  - Limited to journal citations to avoid duplication
  - Excluded analysis of author discipline

Citations to ICPSR data, 2006 - 2011

	Full Dataset	Study sample
Number of items	7973	5850
Number of data citations	15,787	12,532
Datasets cited per publication	Mean = 1.98 *(range: 1 – 121)*	Mean = 2.14 *(range: 1 – 121)*

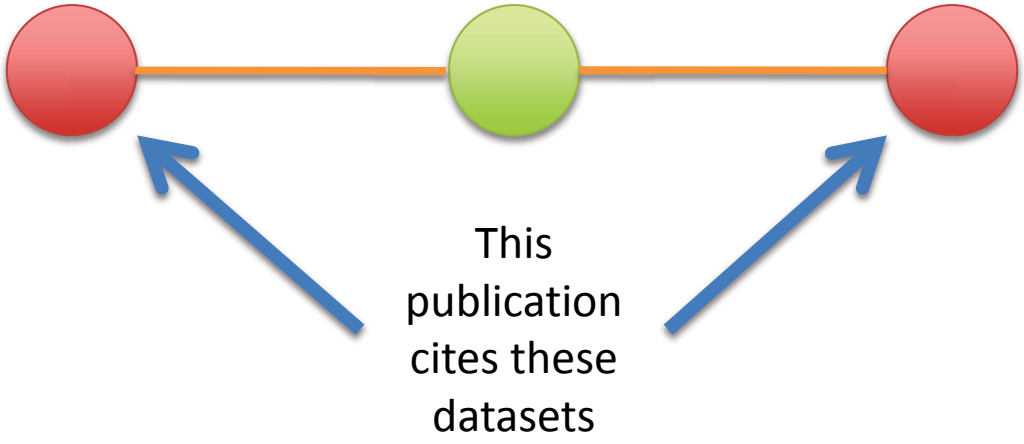

Medicine
Psychology
Statistics
Economics
Behavioral Science
Geography
History
Law
Ethics
Education
Social Work
Policy
Political Science
Public Health
Substance Abuse
Criminology
Ethnic / Area studies
Sociology
Demography
Aging
Philosophy
Business
Marketing
Communications
Anthropology
Physics
Engineering
Enviro. Science
Agriculture
LIS

Metrics

- Multidisciplinarity
  - How many disciplines are represented among the citing papers?
- Integrative index
  - How often is the dataset co-cited with other datasets?
- Distance
  - 0 or 1

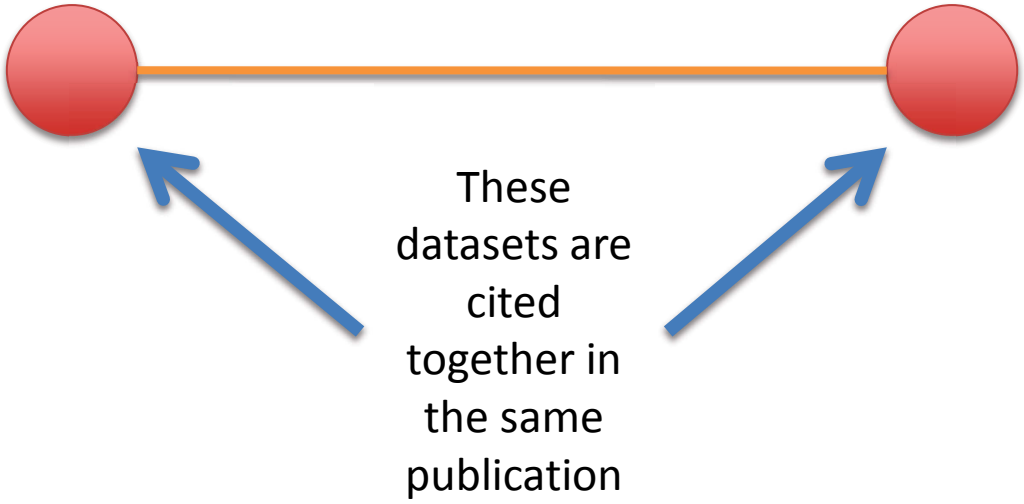
Method: Network analysis

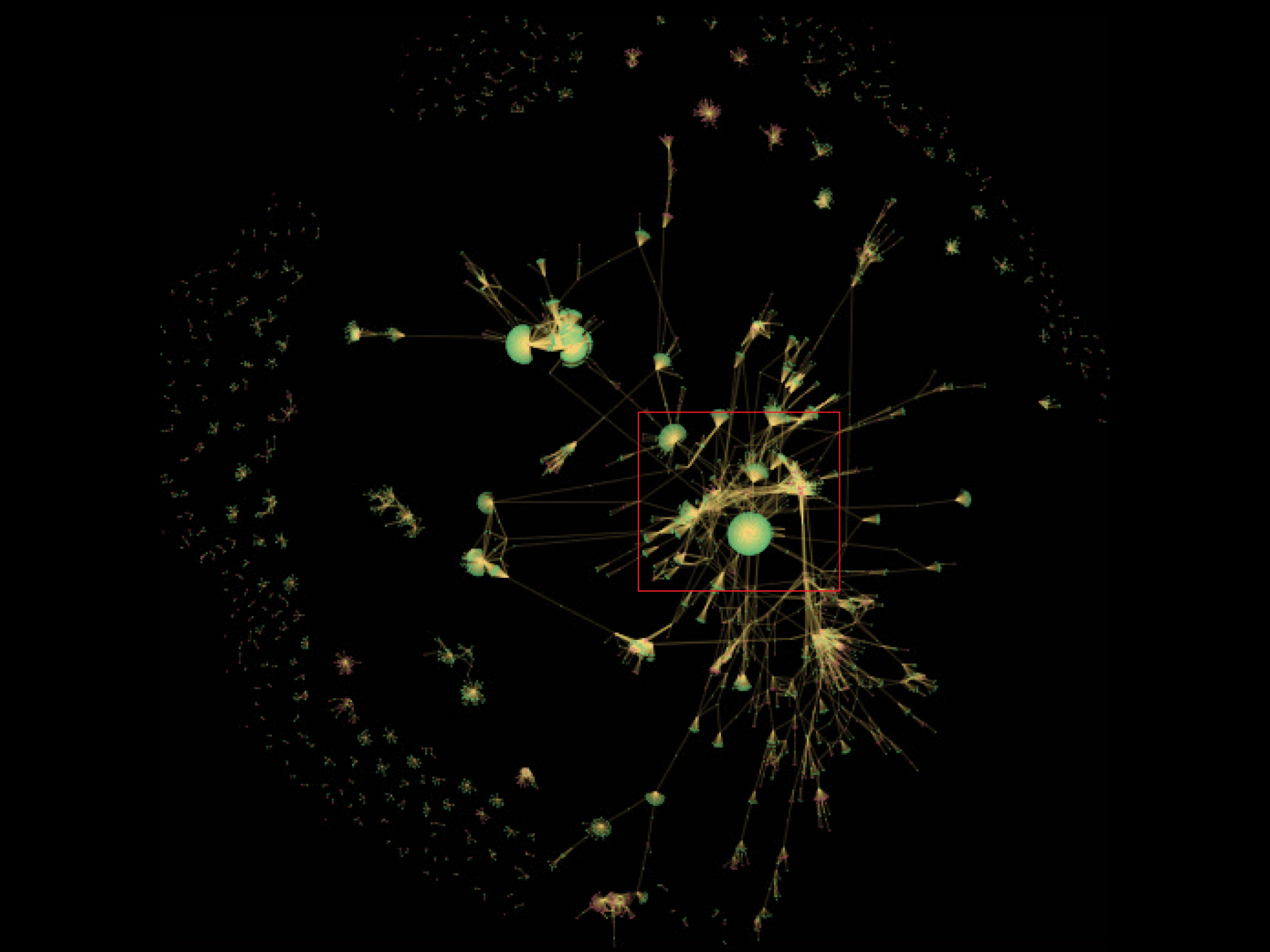
- Full network:
  - Nodes: publications and datasets
  - Edges: citation from a publication to a dataset

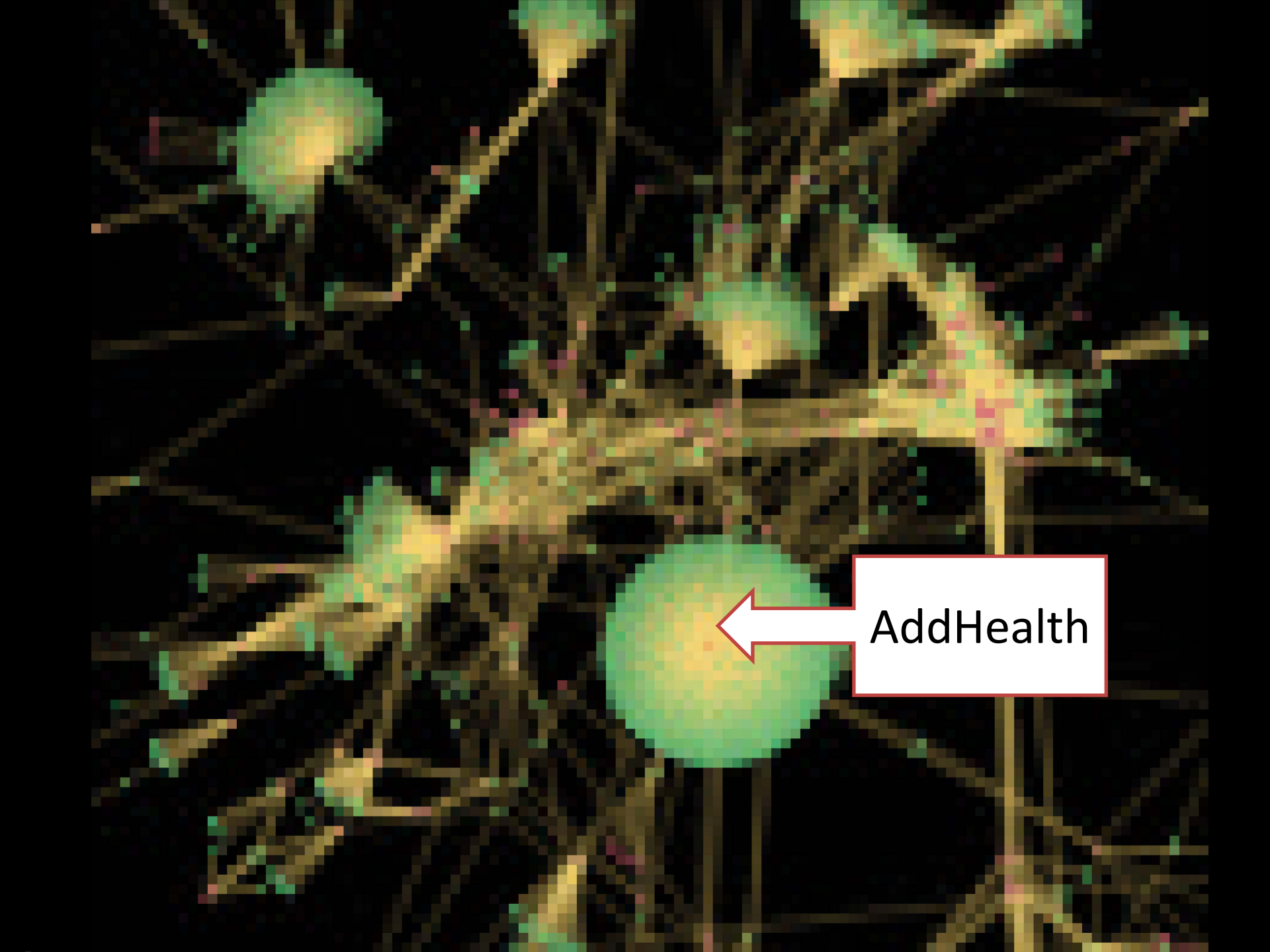


Method: Network analysis

- Data co-citation network
  - Nodes: datasets
  - Edges: co-citation in a single publication



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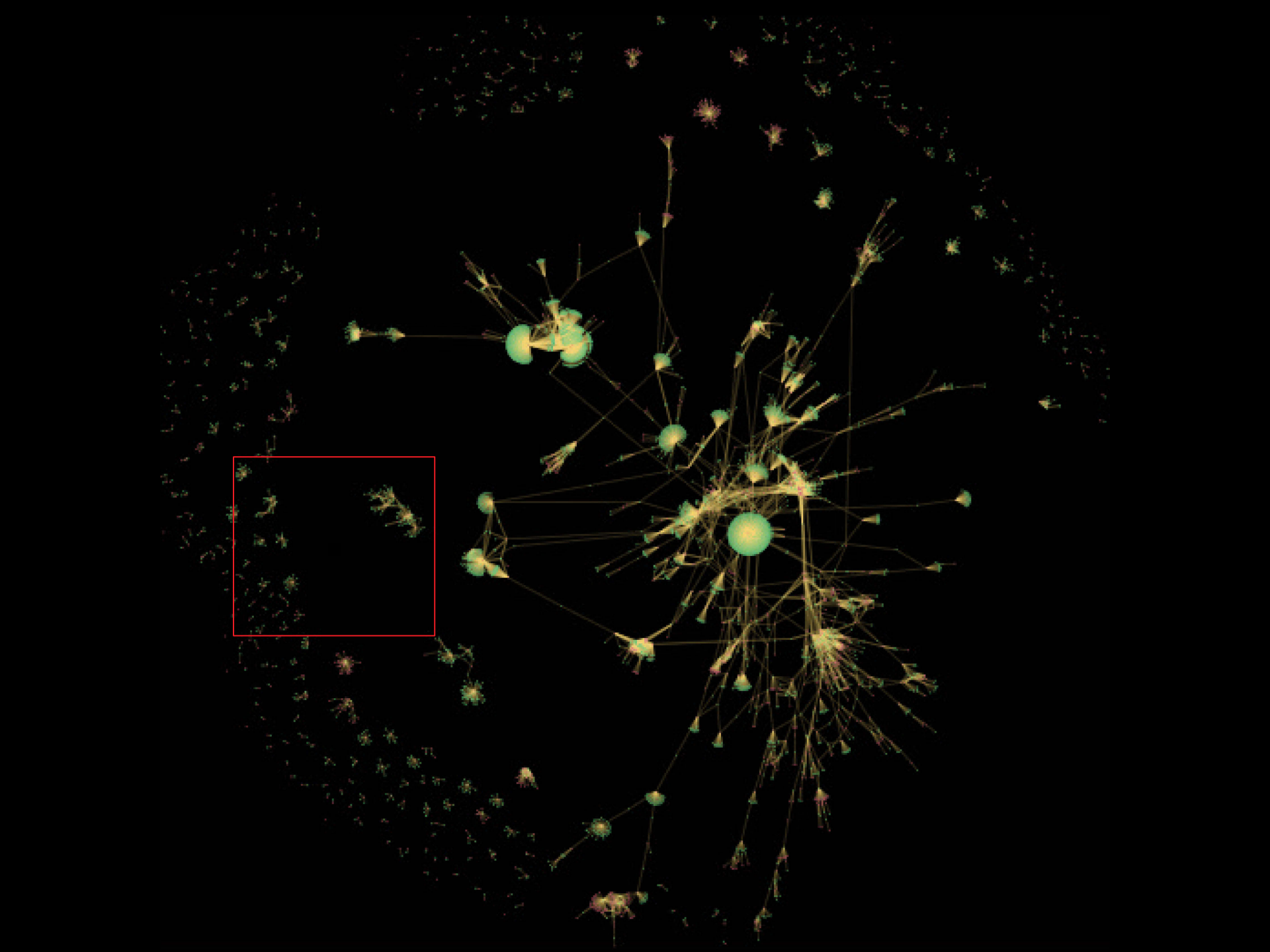
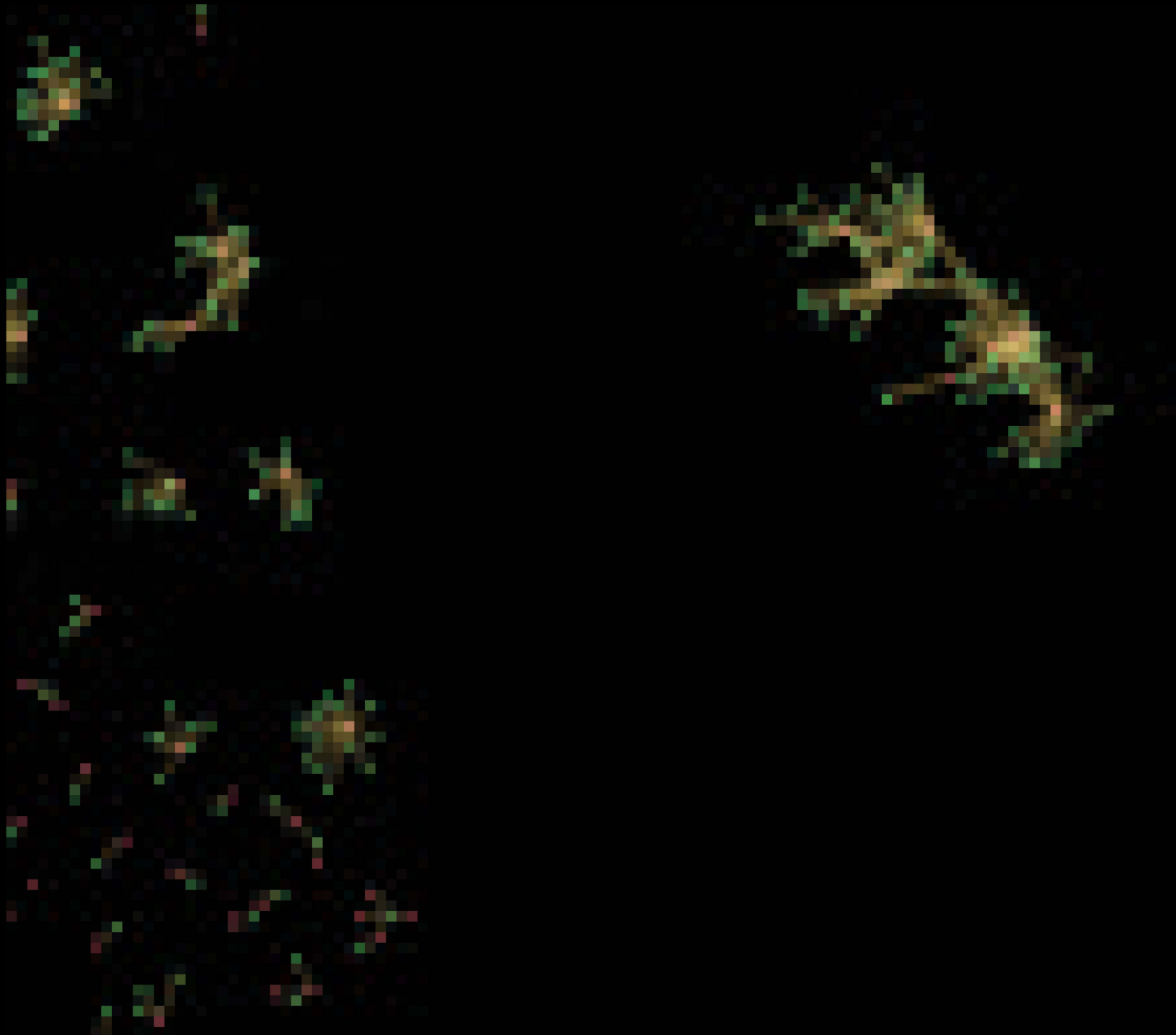
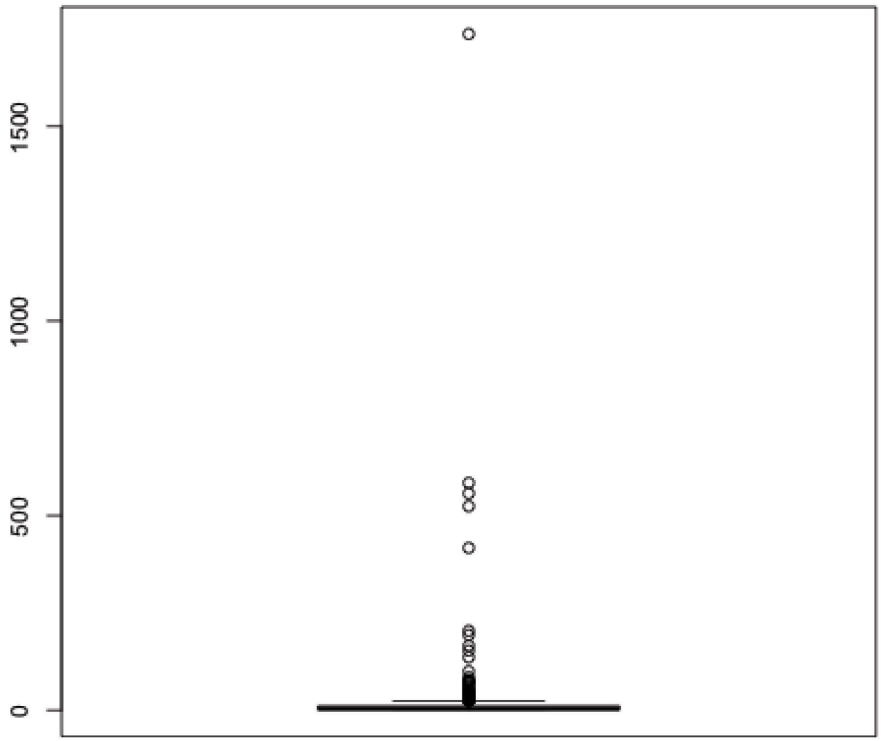




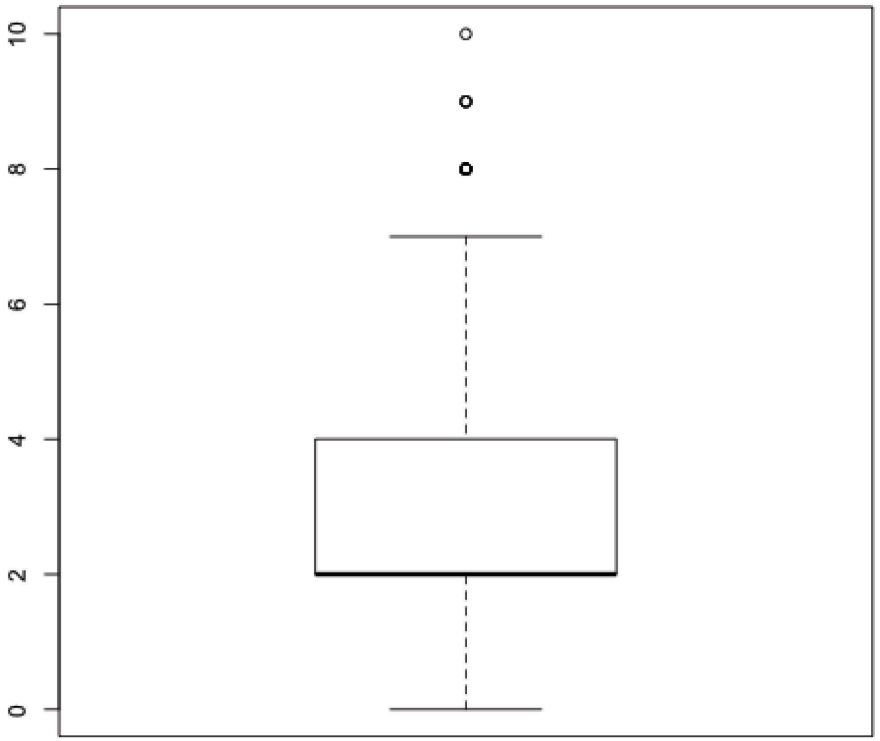
Findings: Reuse overall

- Of 1684 datasets represented in the sample, 928 (55%) were cited more than once
  - Mean: 8.37
  - Median: 2, 3rd Q: 5
- 660 are in giant connected component



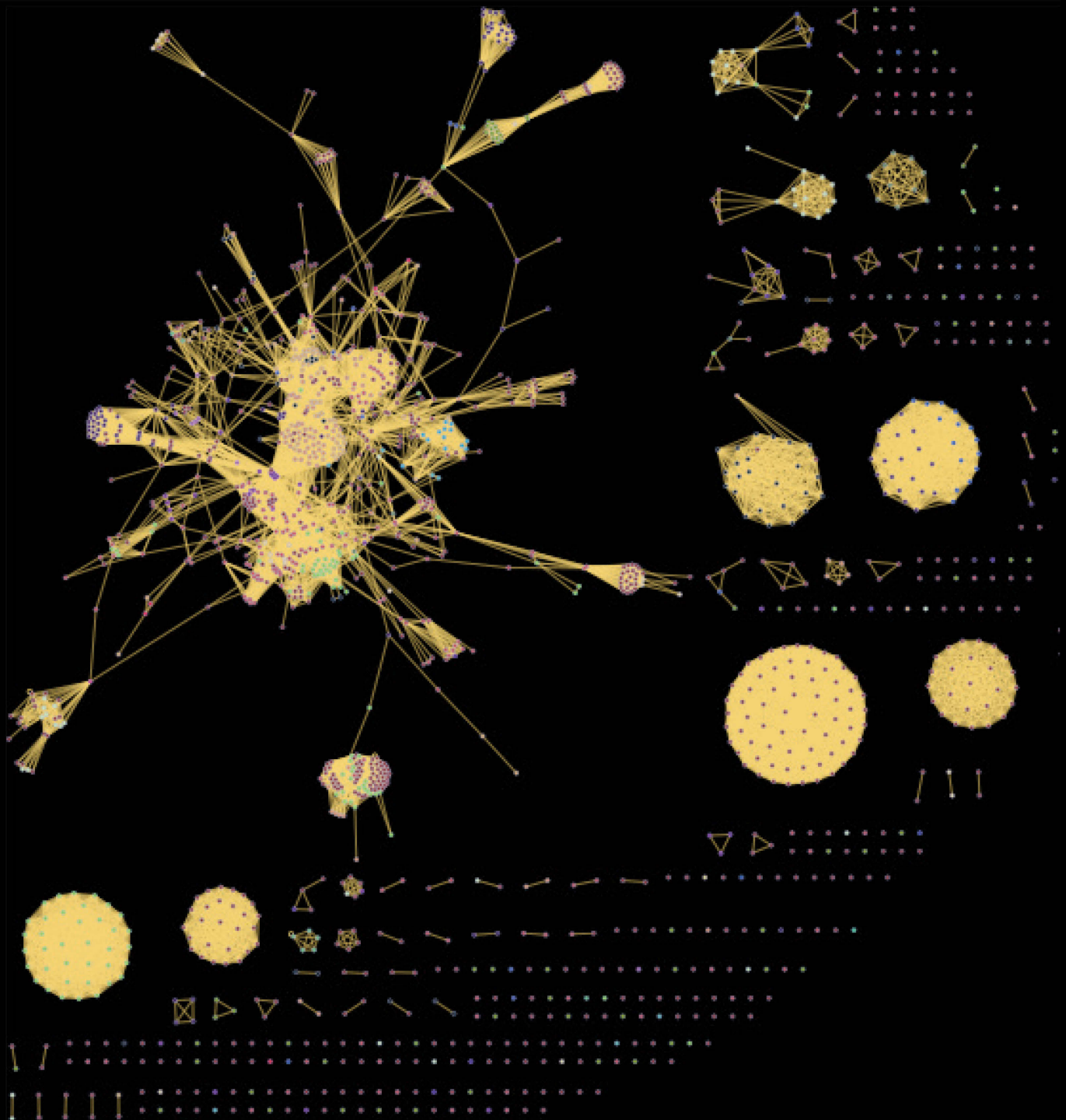
Findings: Multidisciplinary reuse

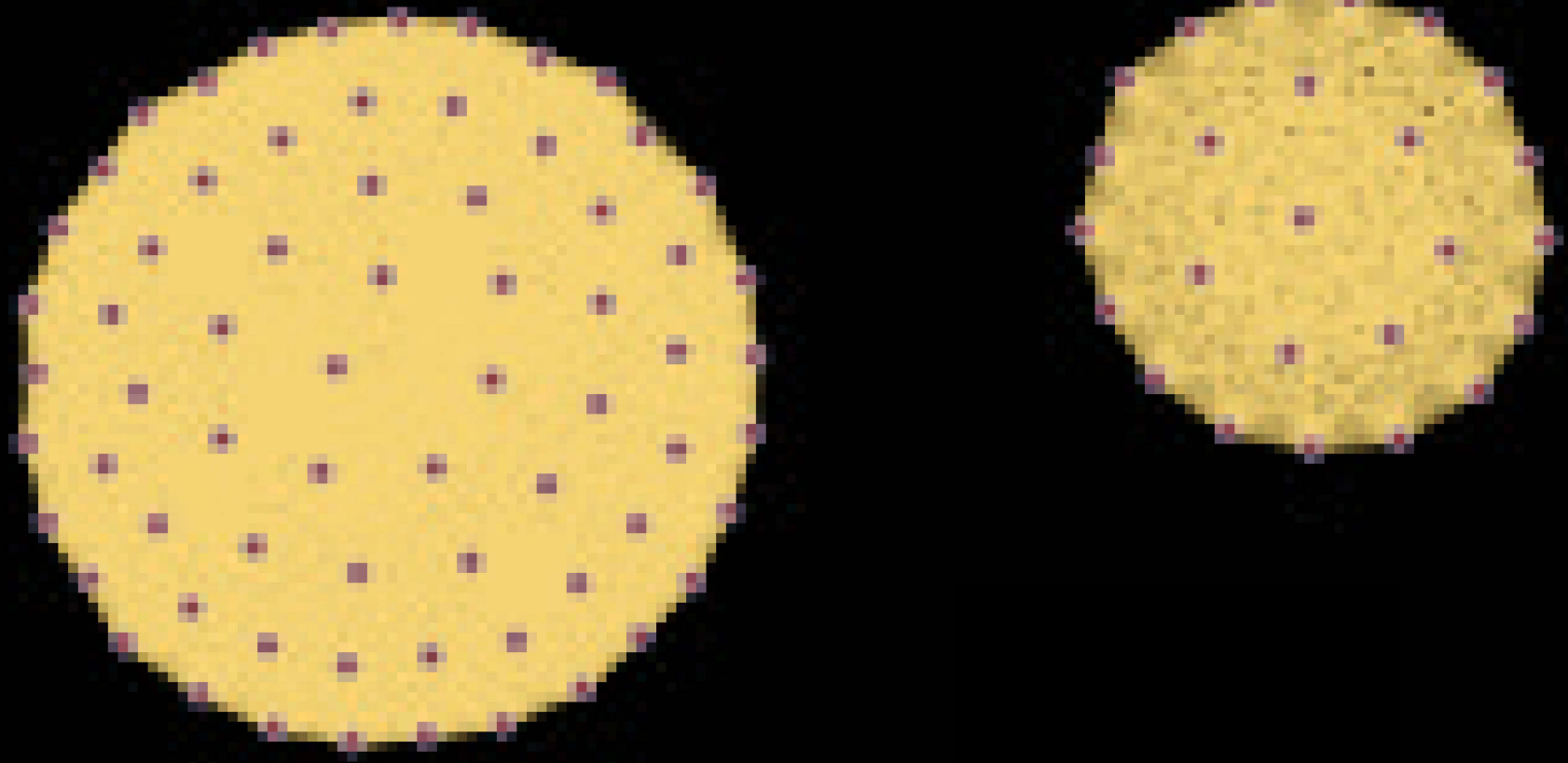
- 715 datasets cited in papers belonging to more than one discipline
  - Mean: 2.81; median: 2

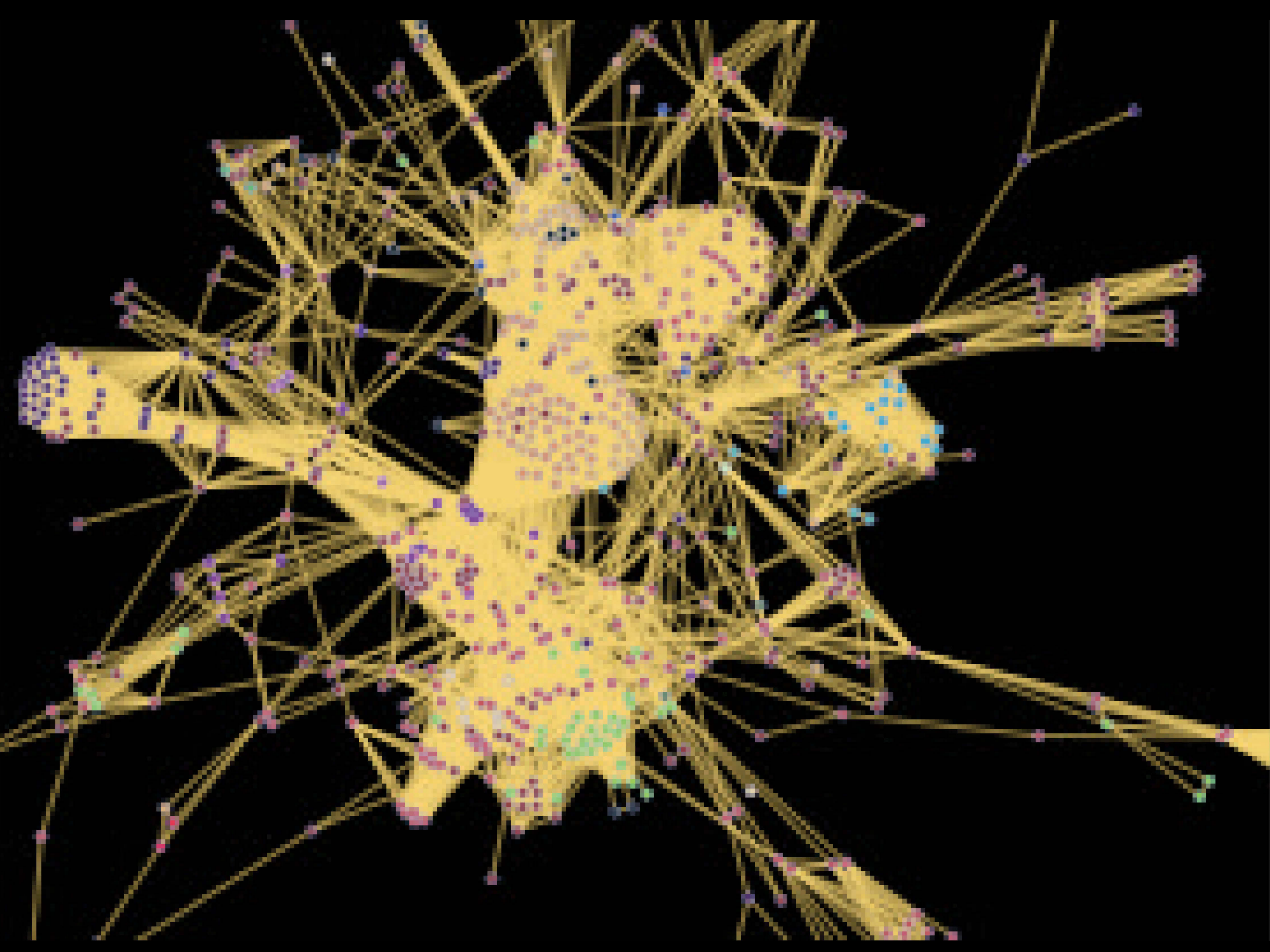


Findings: Multidisciplinary reuse

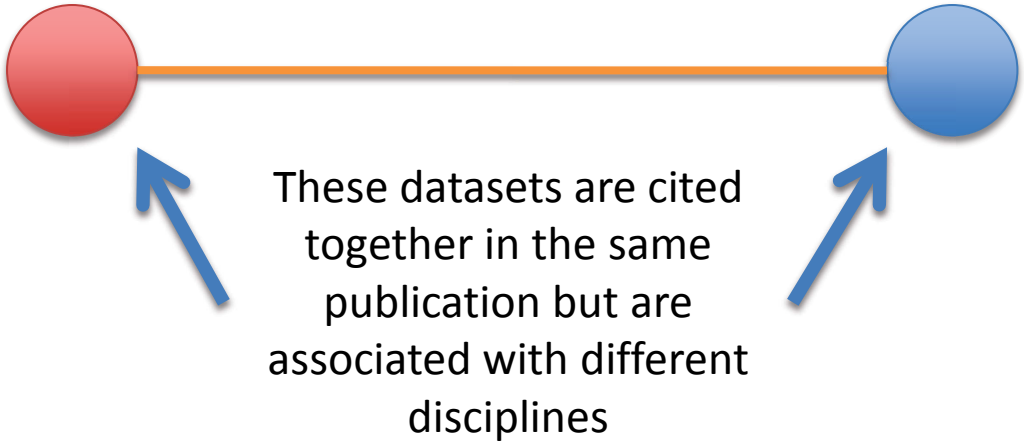
Dataset ID	Dataset Name	Total Degree	Multi-disciplinarity Index
D3202	Panel Study of Income Dynamics, 1968-1999: Supplemental Files	19	10
D2521	Monitoring the Future: A Continuing Study of American Youth (8th- and 10th-Grade Surveys), 1991	19	9
D4075	Early Childhood Longitudinal Study [United States]: Kindergarten Class of 1998-1999, Third Grade	15	9
D8506	National Youth Survey [United States]: Wave III, 1978	20	9
D3672	Treatment Episode Data Set -- Admissions (TEDS-A), 2000	17	8
D3884	Treatment Episode Data Set -- Admissions (TEDS-A), 2001	17	8
D3894	Survey of Income and Program Participation (SIPP) 2001 Panel	15	8





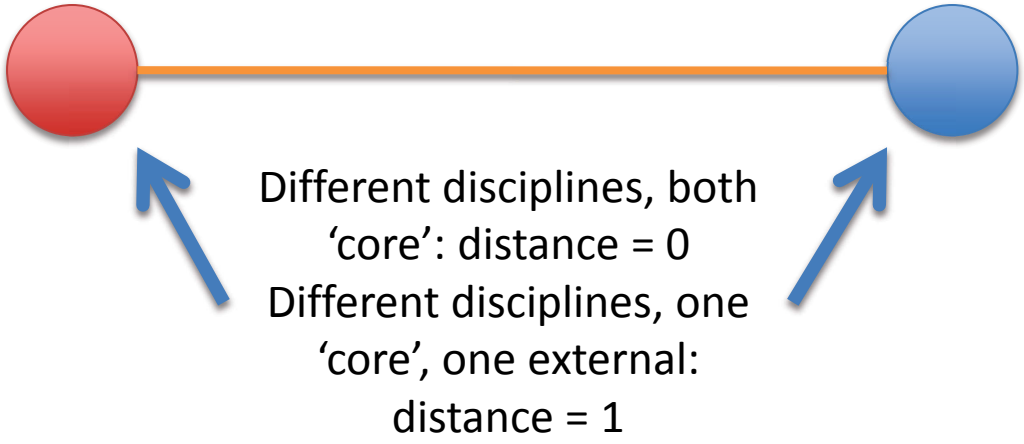


Findings: Integrative reuse of datasets from different disciplines



- 657 datasets have been co-cited with at least one other dataset
- On average, 43% of a dataset's edges are interdisciplinary

Findings: Distance



- Average distance between disciplines involved in interdisciplinary reuse is 0.07

Discussion

- High level of multidisciplinary reuse
  - 42.5% of datasets receive citations from two or more disciplines
- Integrative reuse is also common (but probably not as common as it looks here)

Discussion

- But reuse tends to be local, especially for integrative reuse
  - 59% of multidisciplinary citations are to core disciplines
  - 93% of integrative citations are to core disciplines

Wrap-up

- Multidisciplinary data reuse is an established practice
  - Datasets with many multidisciplinary citations may be exemplars for curating data for reuse in multiple communities
- Integrative reuse may still be a challenge
- Good data citation practices enable new (and maybe interesting) research

Future work

- Solving problems: separating reuse from courtesy/review citations; better assignment of discipline; strengthen metrics

- What are the primary characteristics of datasets associated with high multidisciplinarity scores? What makes a dataset more likely to be integrated with another?

- How does the network evolve over time?

Thank you!

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  - paper chain: http://www.flickr.com/photos/caroslines/5534432762/
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