Social Network Analysis of the Planetary Data System

Phase II Presentation

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Advanced System Architecture

Overview

1. Bipartite Networks
2. Basic Author 1-Mode Projection
3. PDS Node 1-Mode Projection
4. Instrument Host Author 1-Mode
5. Conclusions and Next Steps

Planetary Data System

PDS nodes	9
Datasets	1046
Authors	439
Instrument hosts	103
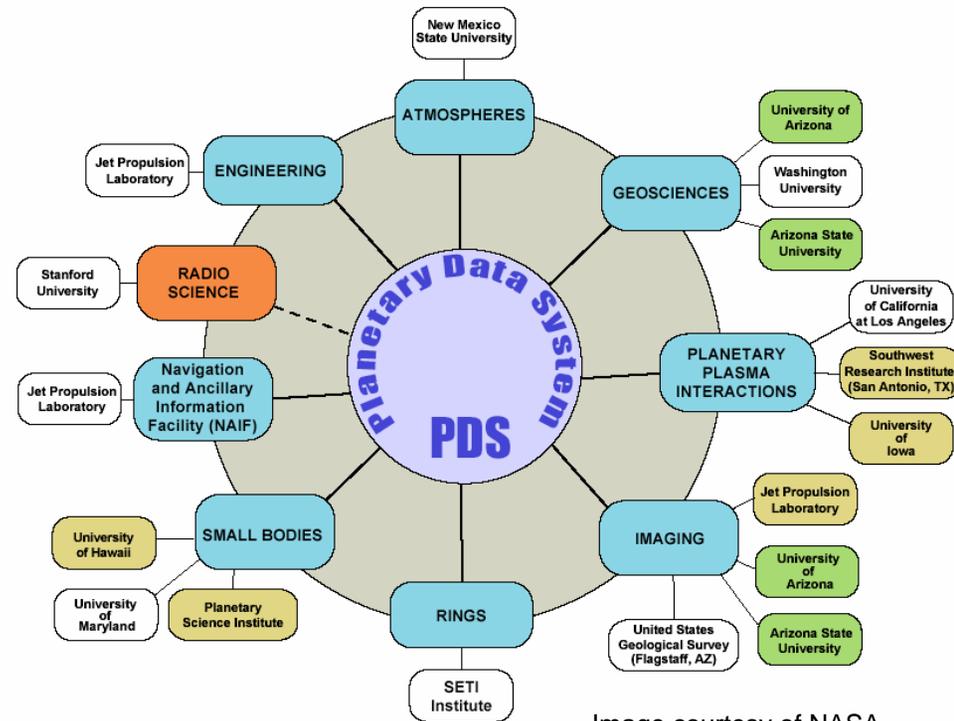
Image courtesy of NASA.

Bipartite Networks of the Planetary Data System
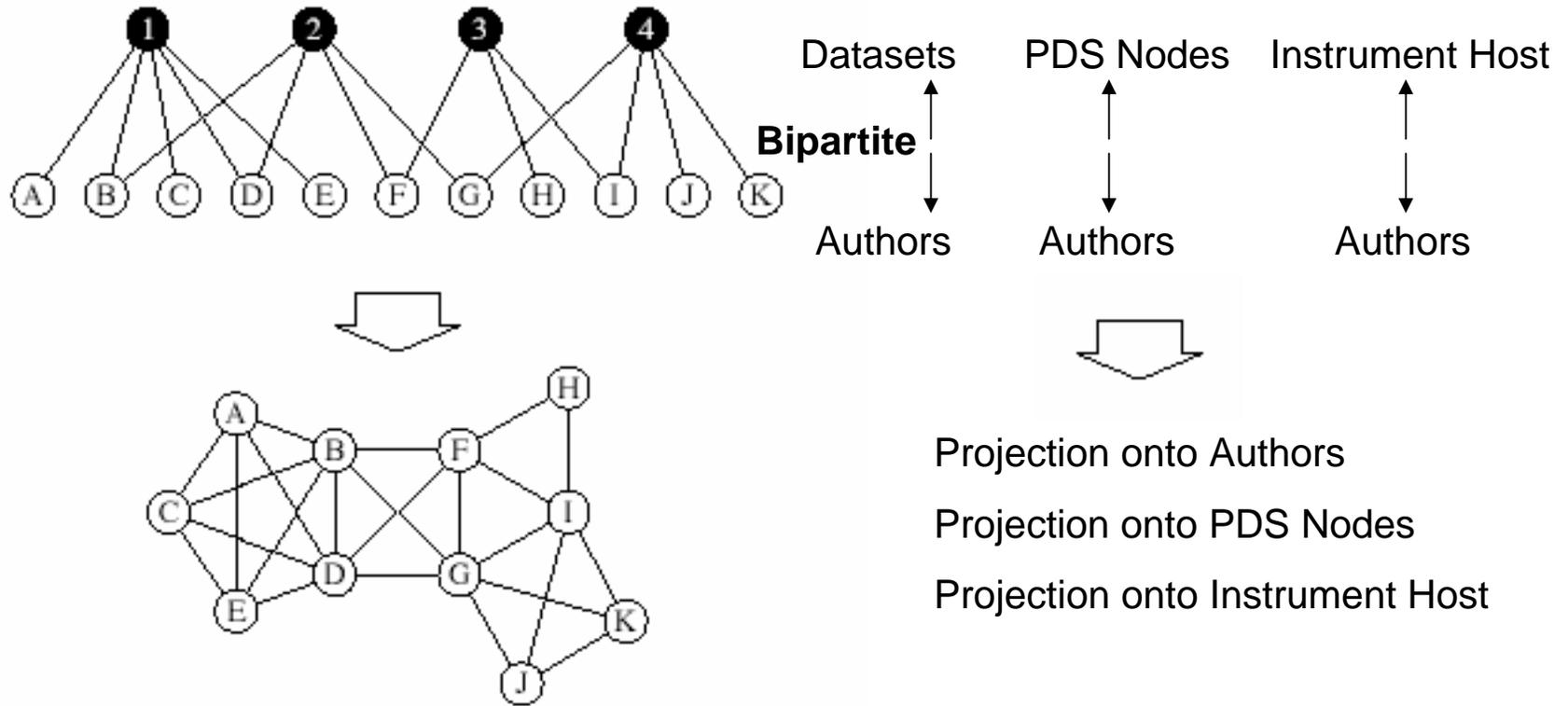
Datasets   PDS Nodes   Instrument Host

Bipartite

Authors   Authors   Authors

Projection onto Authors

Projection onto PDS Nodes

Projection onto Instrument Host

Author single mode network
Nodes: Authors & Edges: Datasets

| n	m	mean degree	median degree	average path length	C	r
439	6484	15	6	2.8	0.74	0.96
Rough lit review of scientific collaboration networks		4 to 16		6	0.5	0.3

M.E.J. Newman (2001), "Scientific Collaboration Networks. I. Network Construction and Fundamental Results," *Phys.Rev.E,* **64**

— (2001) "Scientific Collaboration Networks. II. Shortest Paths, Weighted Networks, and Centrality," *Phys.Rev.E,* **64**
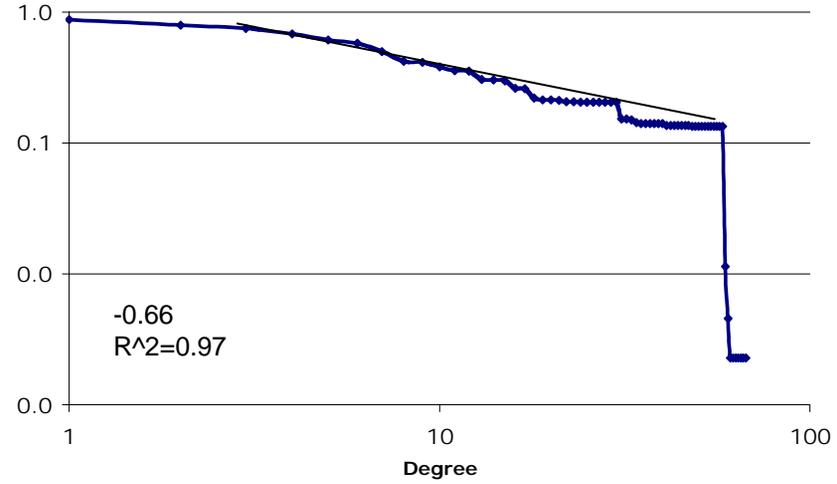
Author single mode network
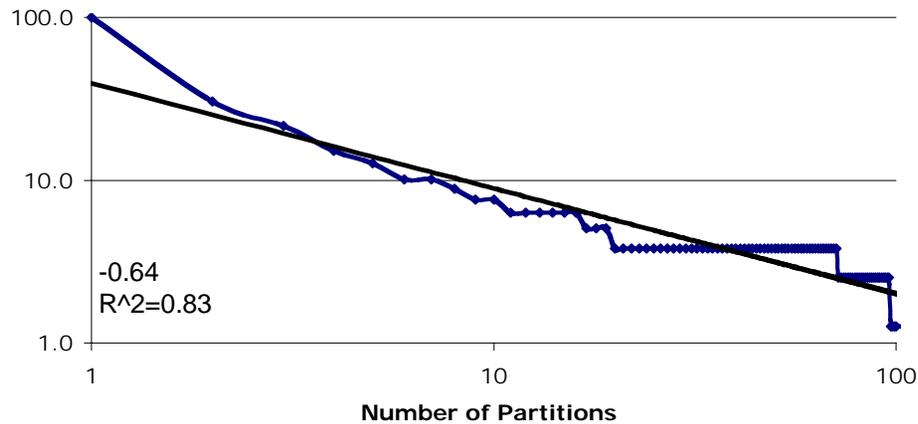*Nodes: Authors & Edges: Datasets*
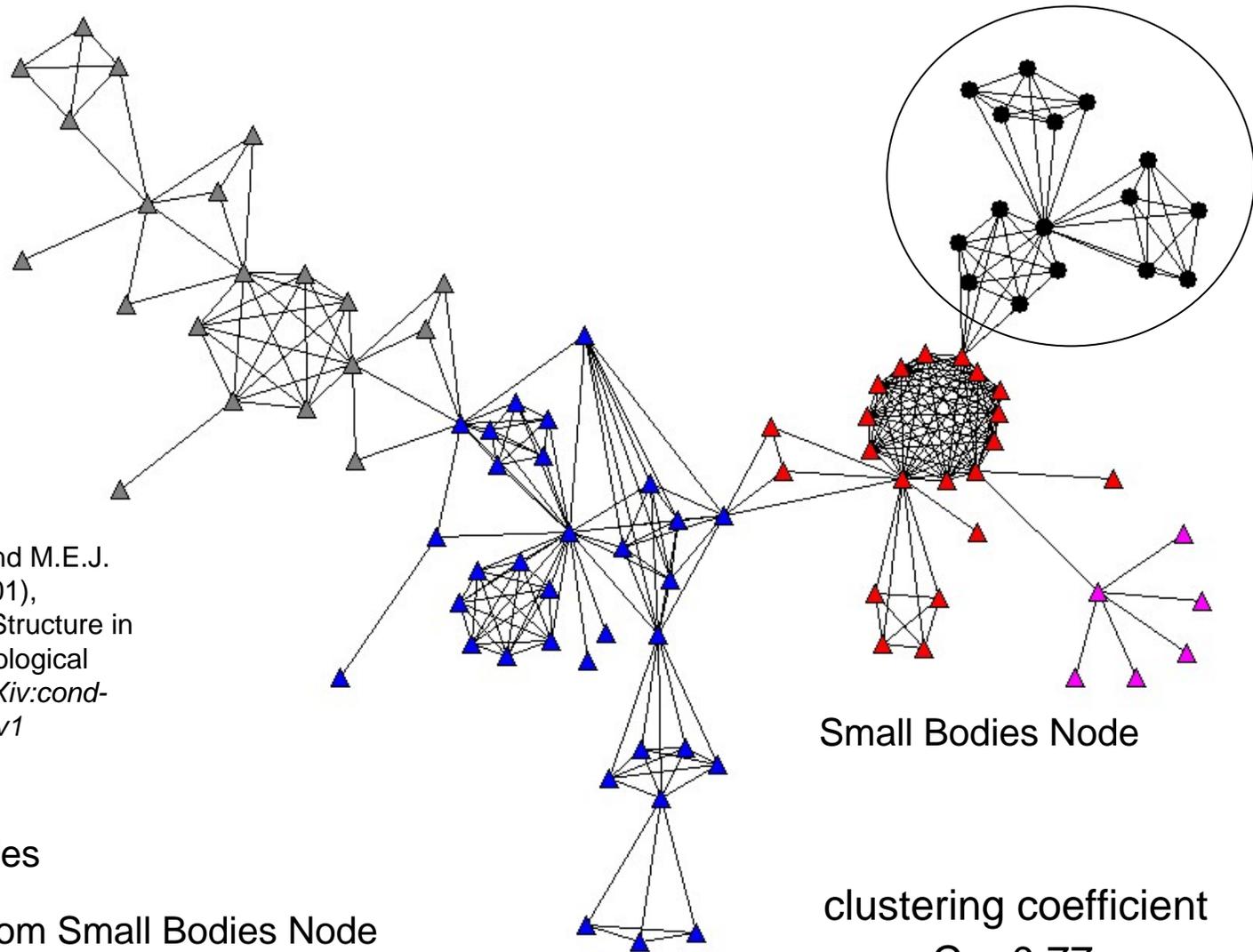

Degree Distribution
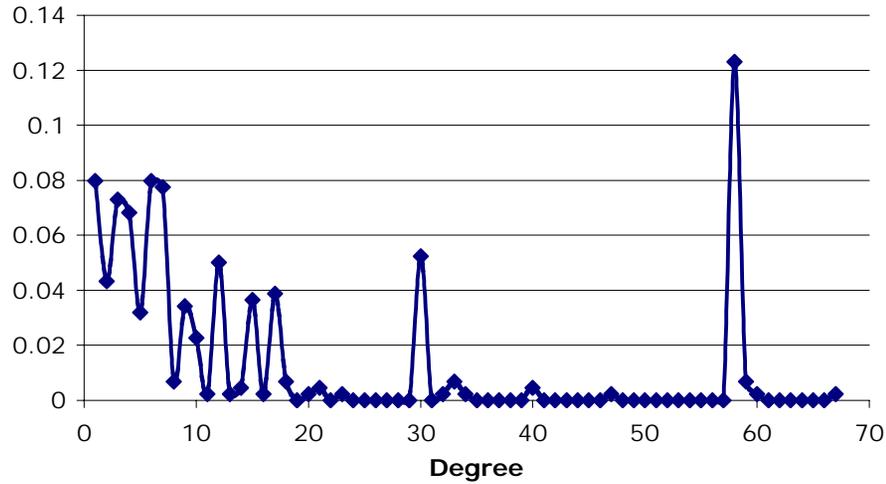
Cumulative Degree Distribution

-0.66
R^2=0.97

Partition of Author Network

-0.64
R^2=0.83

Author single mode network
Nodes: Authors & Edges: Datasets

Geosciences

Girvan, M. and M.E.J. Newman (2001), "Community Structure in Social and Biological Networks" *arXiv:cond-mat/0112110v1*

Small Bodies Node

96 nodes

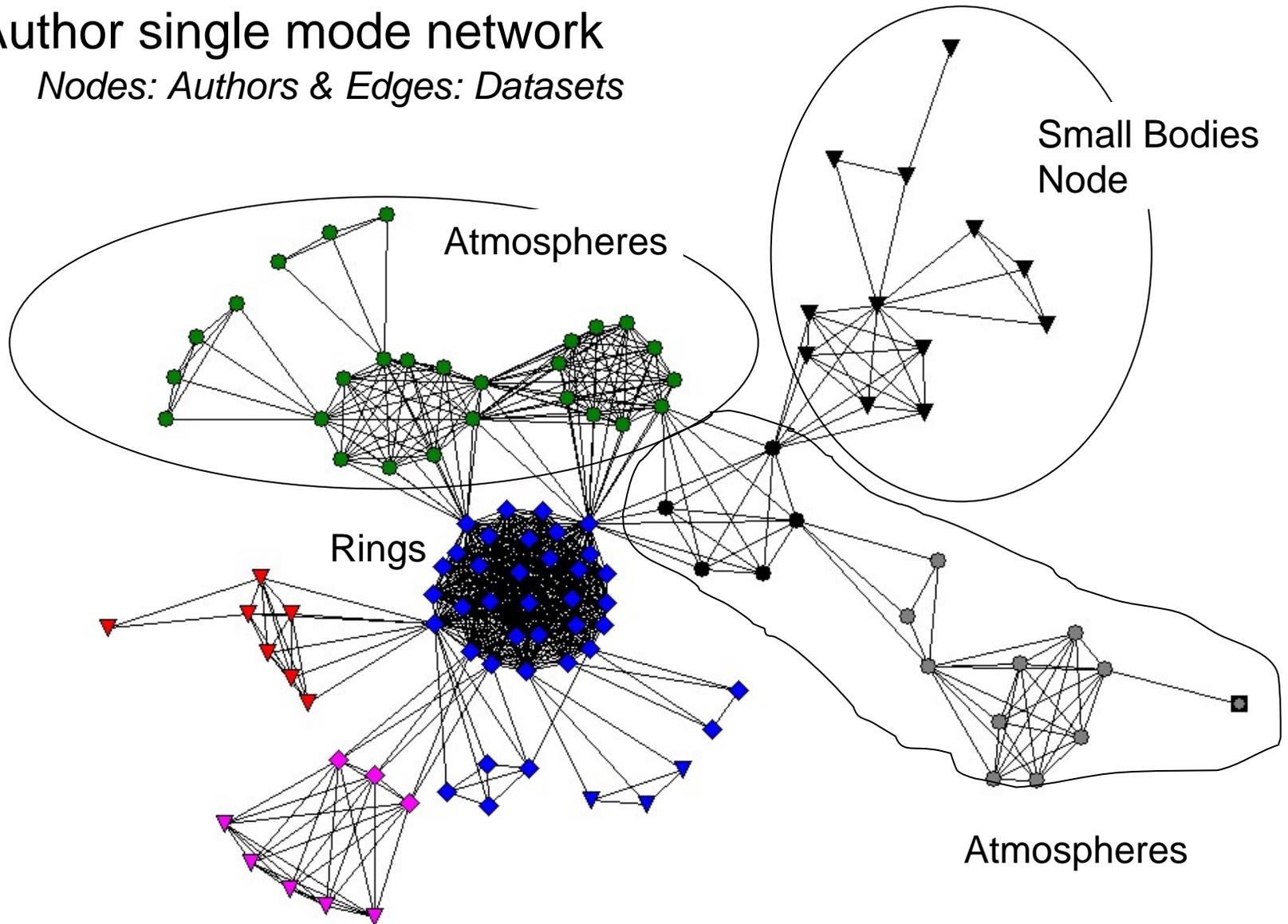80% from Small Bodies Node
Instruments: 10% from NEAR, 10% from PUBLIT

clustering coefficient
C = 0.77

Author single mode network
Nodes: Authors & Edges: Datasets

Small Bodies Node
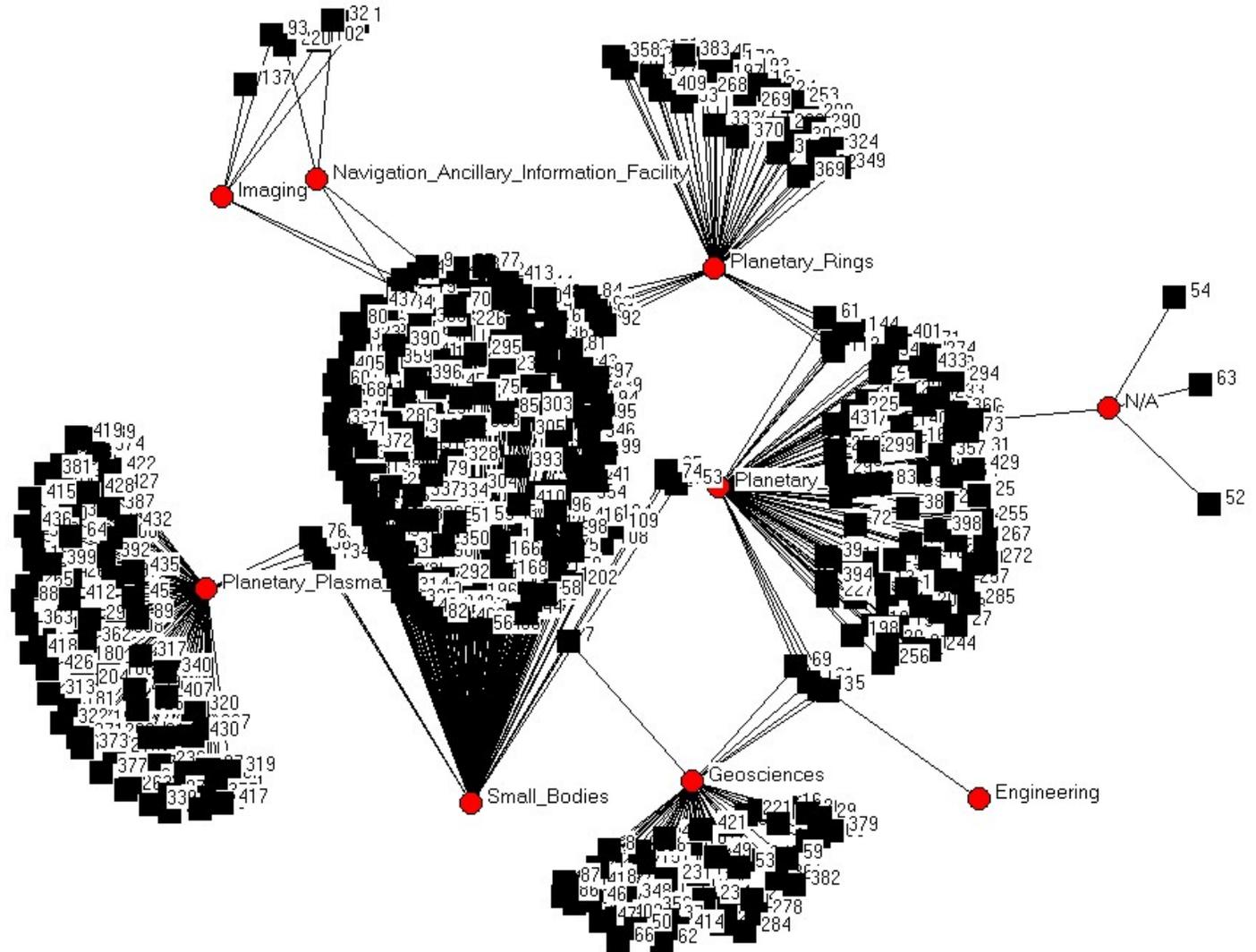
Atmospheres

Rings

Atmospheres

110 nodes
37% from Atmospheres, 29% from Small Bodies Node,
32% from Rings -- Instruments: 33% from HST

clustering coefficient
C = 0.90

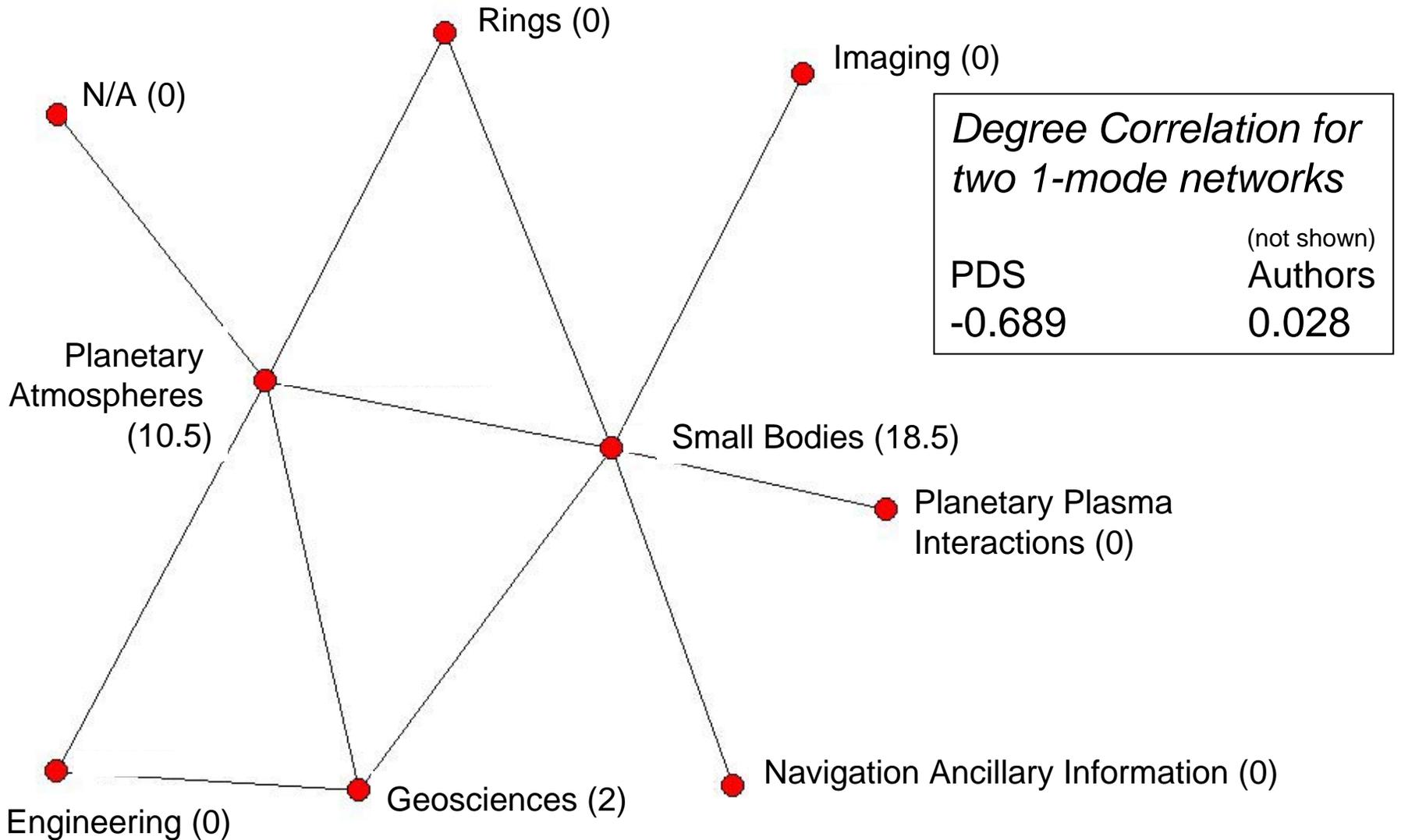# PDS Nodes Bipartite Network
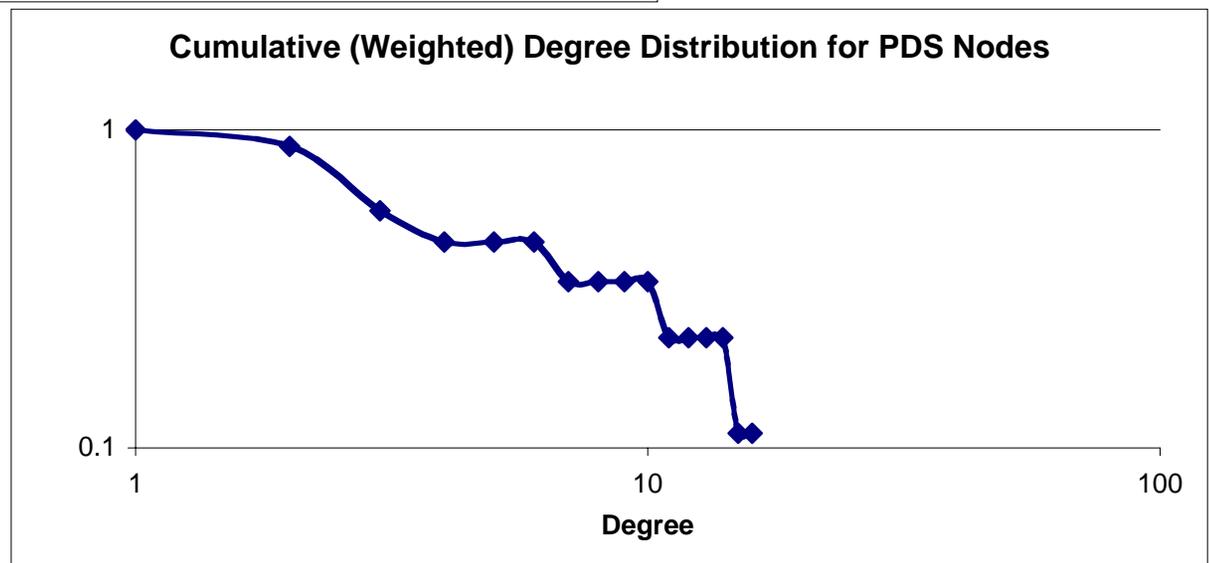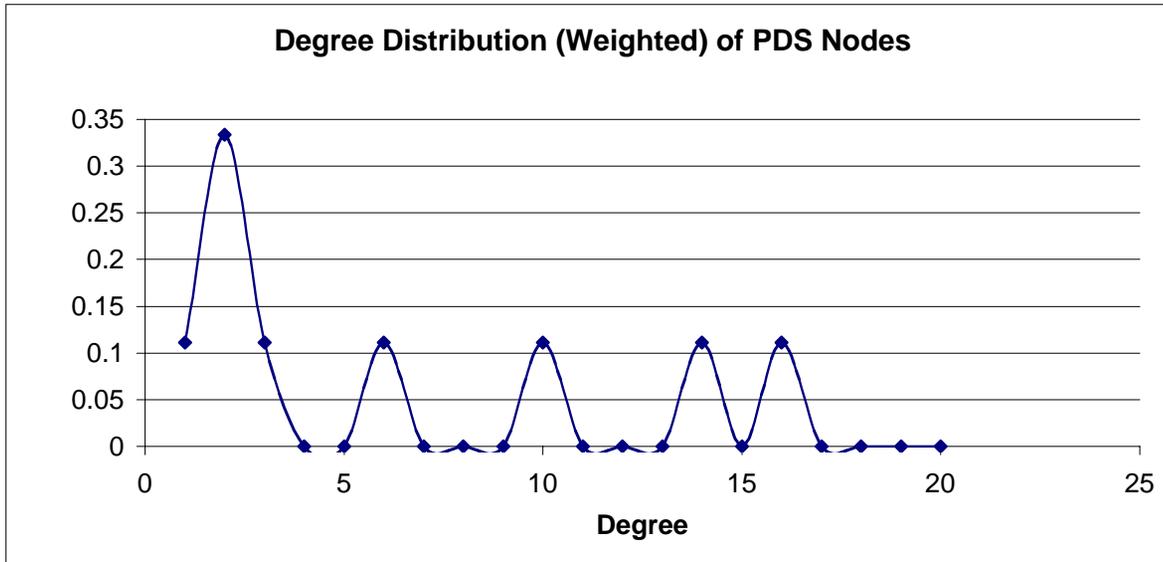
Links Between Nodes and Authors

PDS single mode network
Nodes: PDS nodes & Edges: Authors (Point Betweenness)

Rings (0)

Imaging (0)

N/A (0)

Planetary Atmospheres (10.5)

Small Bodies (18.5)

Planetary Plasma Interactions (0)

Engineering (0)

Geosciences (2)

Navigation Ancillary Information (0)

Degree Correlation for two 1-mode networks

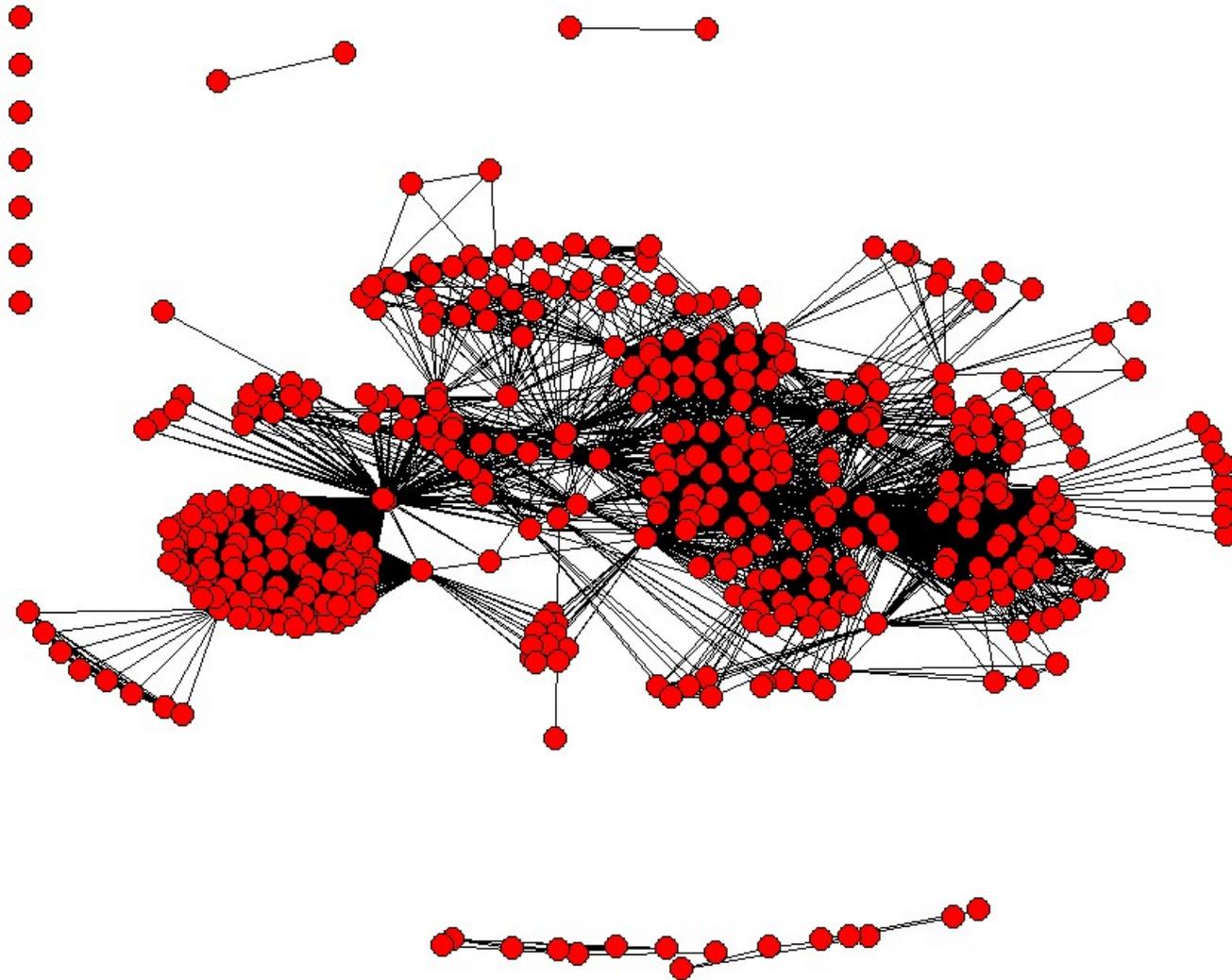|	(not shown)
PDS	Authors
-0.689	0.028

PDS single mode network
Nodes: PDS nodes & Edges: Authors

Author single mode network
Nodes: Authors & Edges: Instrument Hosts

Component	Nodes
1	413
2	3
3	2
4	3
5	1
6	1
7	1
8	1
9	2
10	1
11	2
12	2
13	1
14	5
15	1

Author single mode network
Nodes: Authors & Edges: Instrument Hosts

Degree Distribution of Authors By Instrument Node
^(Weighted)

Cumulative (Weighted) Degree Distribution for Authors by Instrument Host
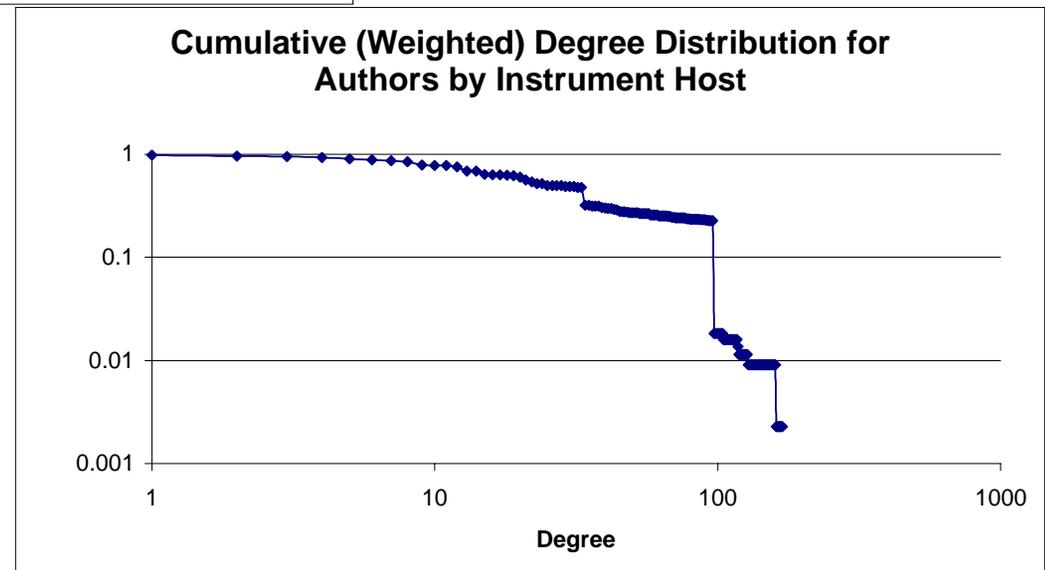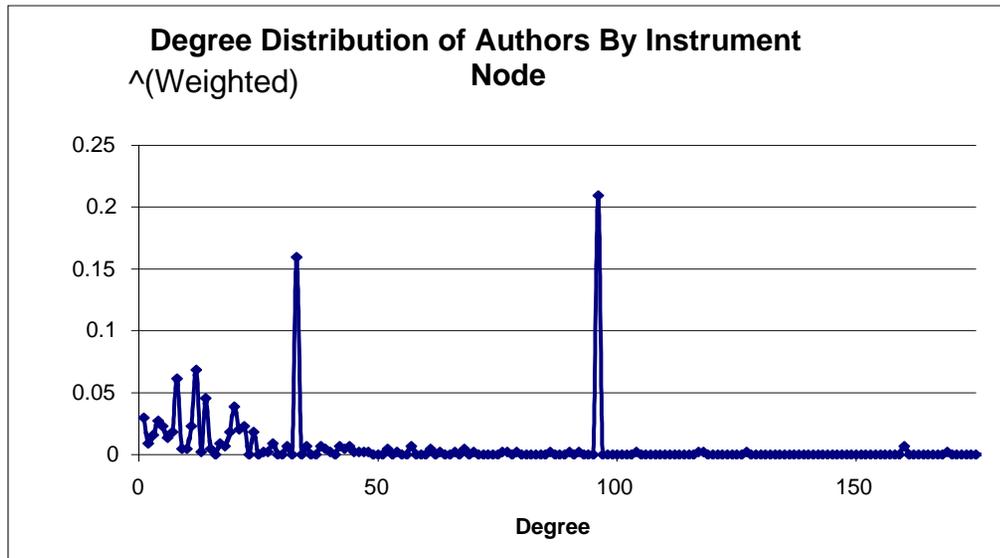
Some Next Steps

Bipartite-Specific Data Analysis

1. Scaling Factor Analysis
2. Singular Value Decomposition

1-Mode Data Analysis

1. Degree Distributions
2. Compare Related Degree Correlations
3. Clustering Coefficients for all 1-Mode Networks
4. More Detailed Analysis of Community Structure
5. Hierarchies and Cliques

Political Forces

Understand mapping of politics/funding to PDS network analysis