

Network Visualization

Siyun Jiang¹

¹GOVERNMENT
THE UNIVERSITY OF TEXAS AT AUSTIN

February 16, 2017
Network Analysis Research Group Weekly Meeting

Roadmap

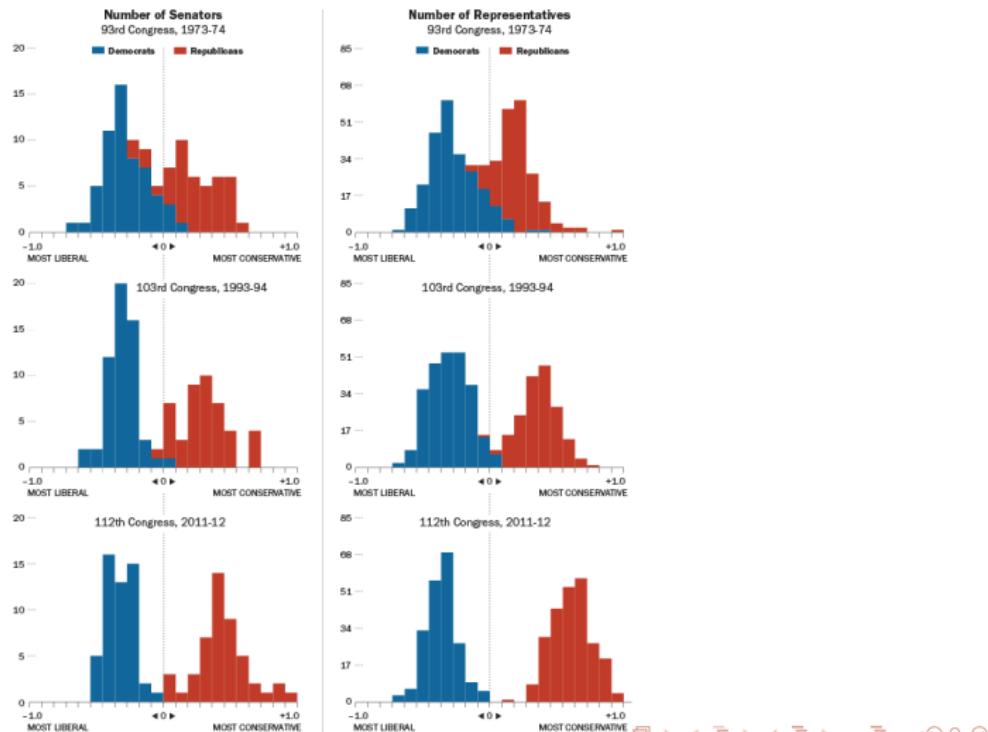
1 Motivation

2 Plotting Networks

3 Art Appreciation

Senate Voting Relationships

- One example of visualizing Congress polarization from Pew Research Center: a widening gap between Democratic and Republican senators



Senate Voting Relationships

- How does network analysis address the same question?

Senate Voting Relationships

- Voting data from the 101st Congress through the 113th Congress
- In each graph, edge (u, v) is assigned weight equal to the number of times Senator u and Senator v voted the same way, either Yea or Nay.
- Nodes connected by heavier edges are pulled together more tightly. These lighter edges generally indicate agreement on procedural votes.
- More bipartisan senators are pushed closer to the center of the graph, near the party divide, while less bipartisan senators are repelled outwards toward the perimeter of the graph, furthest from the party divide.

Roadmap

1 Motivation

2 Plotting Networks

3 Art Appreciation

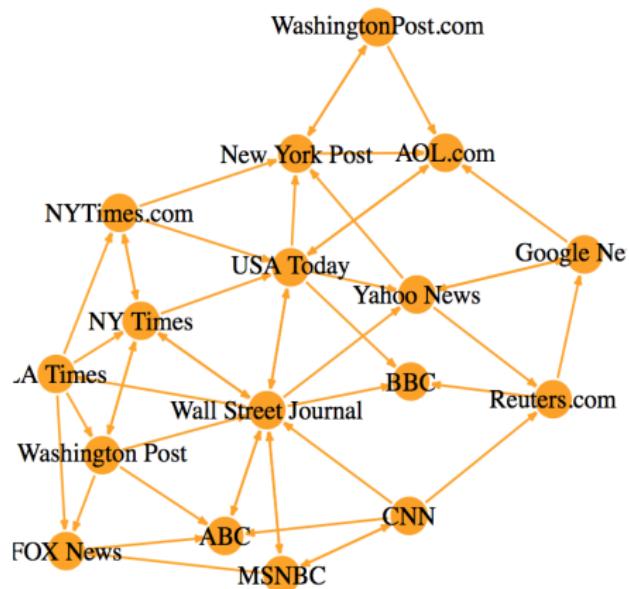
Network Visualization Goals

- ***Node attributes*** Category, Amount, Centrality of node/ego/vertex
- ***Relation properties*** Strength, Direction, Density
- ***Location, location, location*** Communities, Structure, Pattern, Layout aesthetics
- ***Highlighting parts of the network*** Important Node, Cluster, Path

Node Attributes & Relation Properties

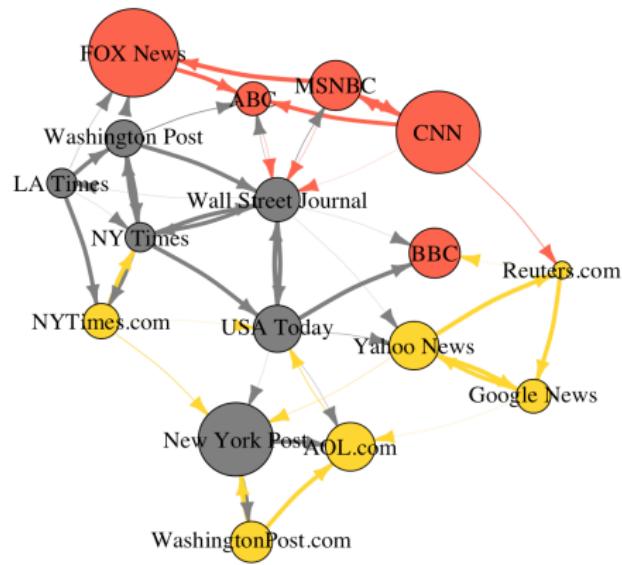
- Category and Label

```
plot(net, edge.arrow.size=.2, edge.color="orange",
      vertex.color="orange", vertex.frame.color="#ffffff",
      vertex.label=V(net)$media, vertex.label.color="black")
```



Node Attributes & Relation Properties

- ***Update Color, Shape and Size of Nodes*** Generate colors base on media type ⇒ Compute node degree (#links) and use it to set node size
 - ***Update strength and direction of Edges*** Setting Labels to NA ⇒ Set edge width based on weight ⇒ Change edge color based on their source node color



Location

- Randomly placed vertices; Circle layout; 3D sphere layout;
Force-directed layouts Kamada Kawai (Edges are similar in length and cross each other as little as possible.)
- Igraph automatically selects an appropriate layout algorithm based on the properties (size and connectedness) of the graph.

Location

- Randomly placed vertices; Circle layout; 3D sphere layout;
Force-directed layouts Kamada Kawai (Edges are similar in length and cross each other as little as possible.)
- Igraph automatically selects an appropriate layout algorithm based on the properties (size and connectedness) of the graph.

Highlight Parts

- ***Extract the key edges*** The links are too dense to interpret.
Sparsify the network, keeping only the most important ties and discarding the rest;
Keep ones that have weight higher than the mean for the network;
Plot the two tie types (hyperlink & mention) separately.
- ***Highlighting specific nodes or links***
Distance (No.of Edges);
Neighbourhood (directly linked);
Mark a group of Nodes;
Highlight a path in the network

Highlight Parts

- ***Extract the key edges*** The links are too dense to interpret.
Sparsify the network, keeping only the most important ties and discarding the rest;
Keep ones that have weight higher than the mean for the network;
Plot the two tie types (hyperlink & mention) separately.
- ***Highlighting specific nodes or links***
Distance (No.of Edges);
Neighbourhood (directly linked);
Mark a group of Nodes;
Highlight a path in the network

Highlight Parts

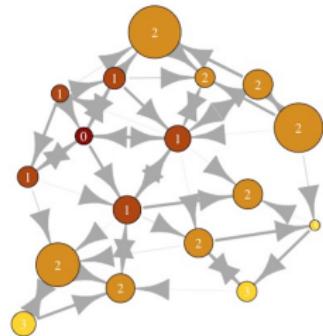


Figure: Distance

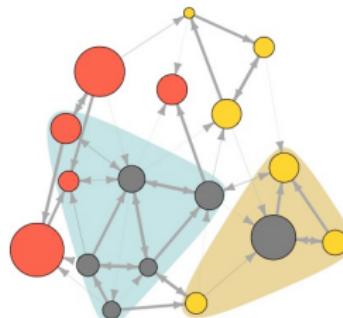


Figure: Group

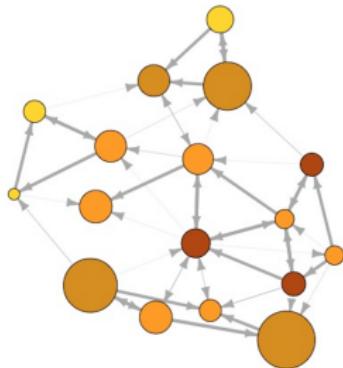


Figure: Neighbourhood

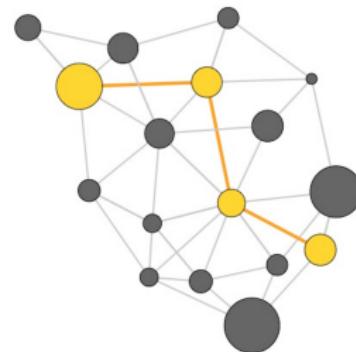


Figure: Path

Roadmap

1 Motivation

2 Plotting Networks

3 Art Appreciation

Examples of Network Visualization

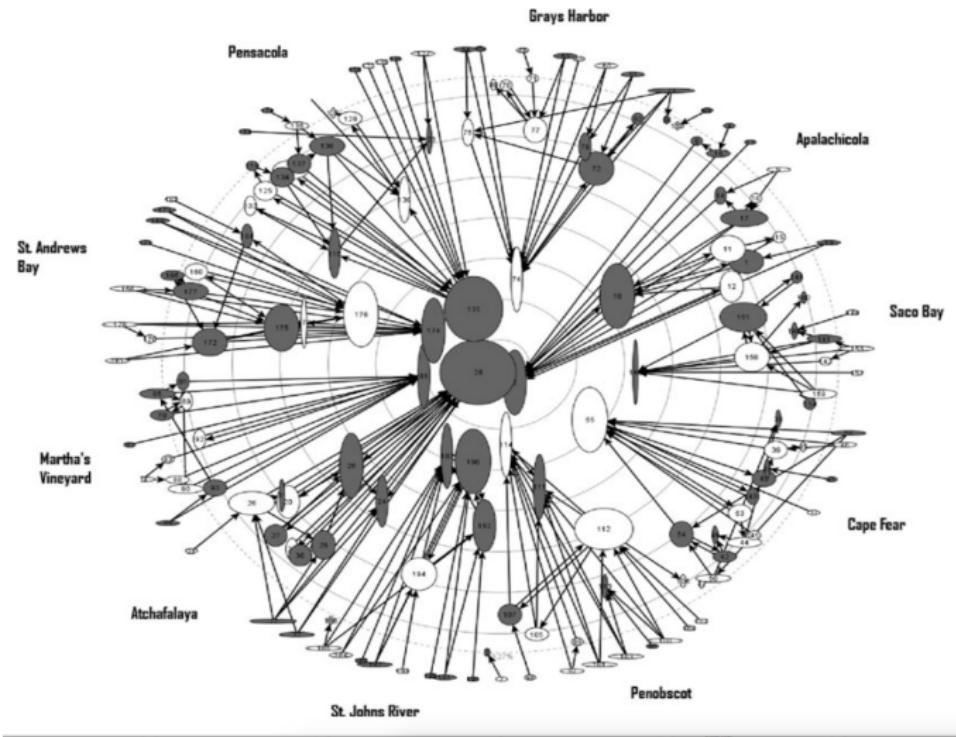


Figure: Sociograms for 10 Estuaries in 1999

Examples of Network Visualization

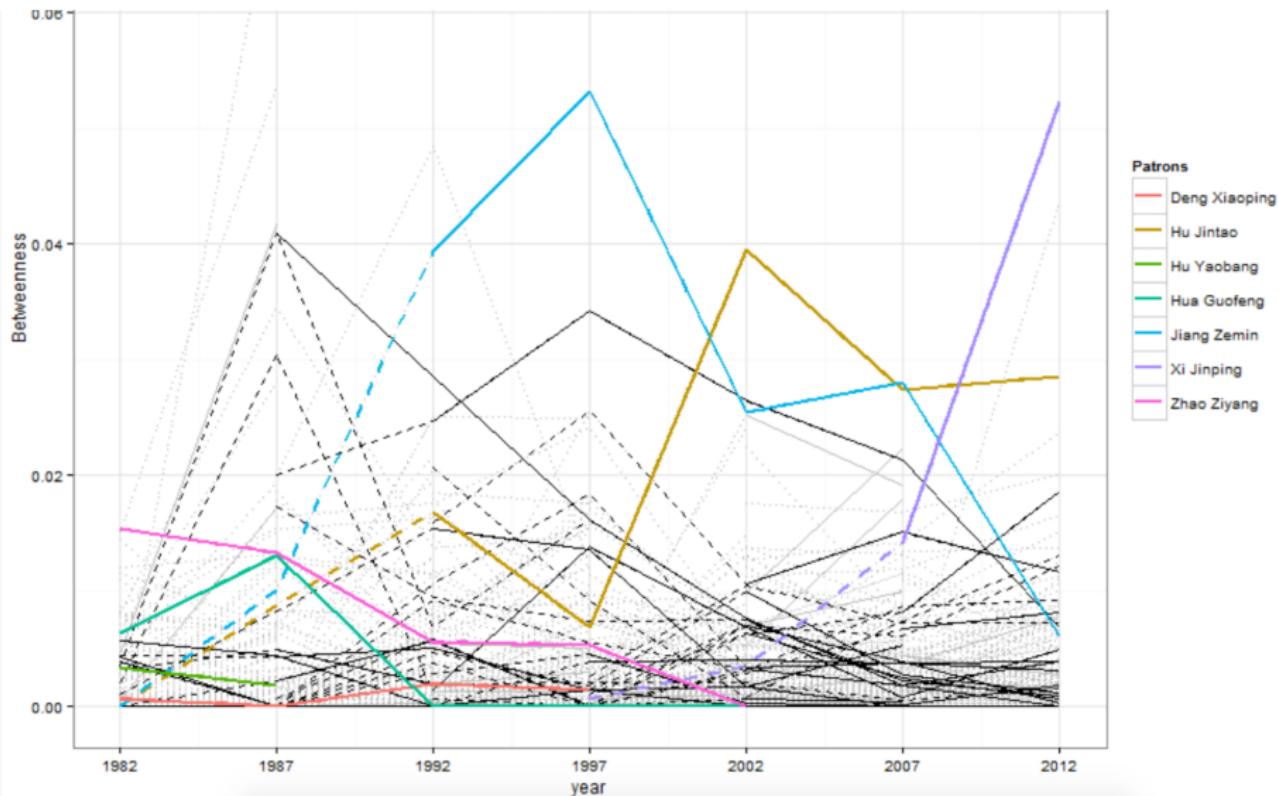


Figure: Chinese Leaders' Betweenness Over Time

Examples of Network Visualization

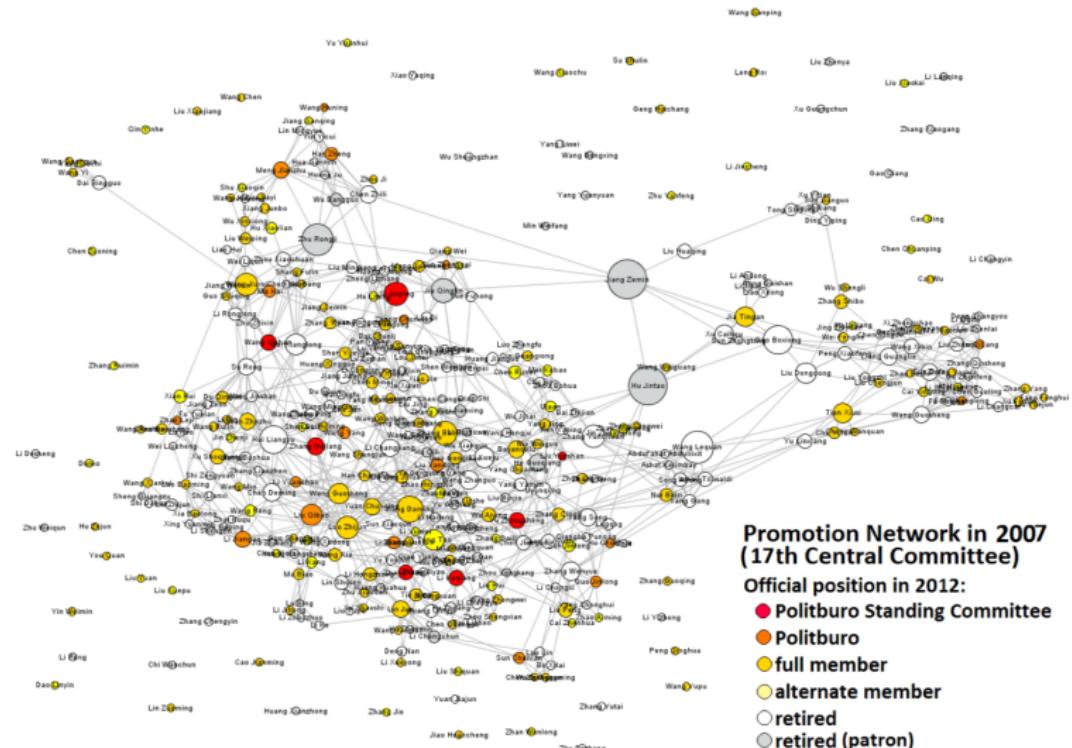


Figure: Promotion Network of Chinese Top Officials in 2007