

大數據行銷研究

Big Data Marketing Research



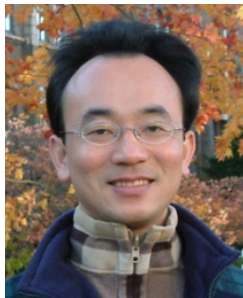
Tamkang  
University  
淡江大學

# 社會網路分析 (Social Network Analysis)

1051BDMR09

MIS EMBA (M2262) (8638)

Thu, 12,13,14 (19:20-22:10) (D409)



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<http://mail.tku.edu.tw/myday/>

2016-12-02



# 課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
1	2016/09/16	中秋節 (調整放假一天) (Mid-Autumn Festival Holiday)(Day off)
2	2016/09/23	大數據行銷研究課程介紹 (Course Orientation for Big Data Marketing Research)
3	2016/09/30	資料科學與大數據行銷 (Data Science and Big Data Marketing)
4	2016/10/07	大數據行銷分析與研究 (Big Data Marketing Analytics and Research)
5	2016/10/14	測量構念 (Measuring the Construct)
6	2016/10/21	測量與量表 (Measurement and Scaling)

# 課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
7	2016/10/28	大數據行銷個案分析 I (Case Study on Big Data Marketing I)
8	2016/11/04	探索性因素分析 (Exploratory Factor Analysis)
9	2016/11/11	確認性因素分析 (Confirmatory Factor Analysis)
10	2016/11/18	期中報告 (Midterm Presentation)
11	2016/11/25	社群運算與大數據分析 (Social Computing and Big Data Analytics)
12	2016/12/02	社會網路分析 (Social Network Analysis)

# 課程大綱 (Syllabus)

週次 (Week)	日期 (Date)	內容 (Subject/Topics)
13	2016/12/09	大數據行銷個案分析 II (Case Study on Big Data Marketing II)
14	2016/12/16	社會網絡分析量測與實務 (Measurements and Practices of Social Network Analysis)
15	2016/12/23	大數據情感分析 (Big Data Sentiment Analysis)
16	2016/12/30	金融科技行銷研究 (FinTech Marketing Research)
17	2017/01/06	期末報告 I (Term Project Presentation I)
18	2017/01/13	期末報告 II (Term Project Presentation II)



# **Social Network Analysis (SNA)**

# Social Computing

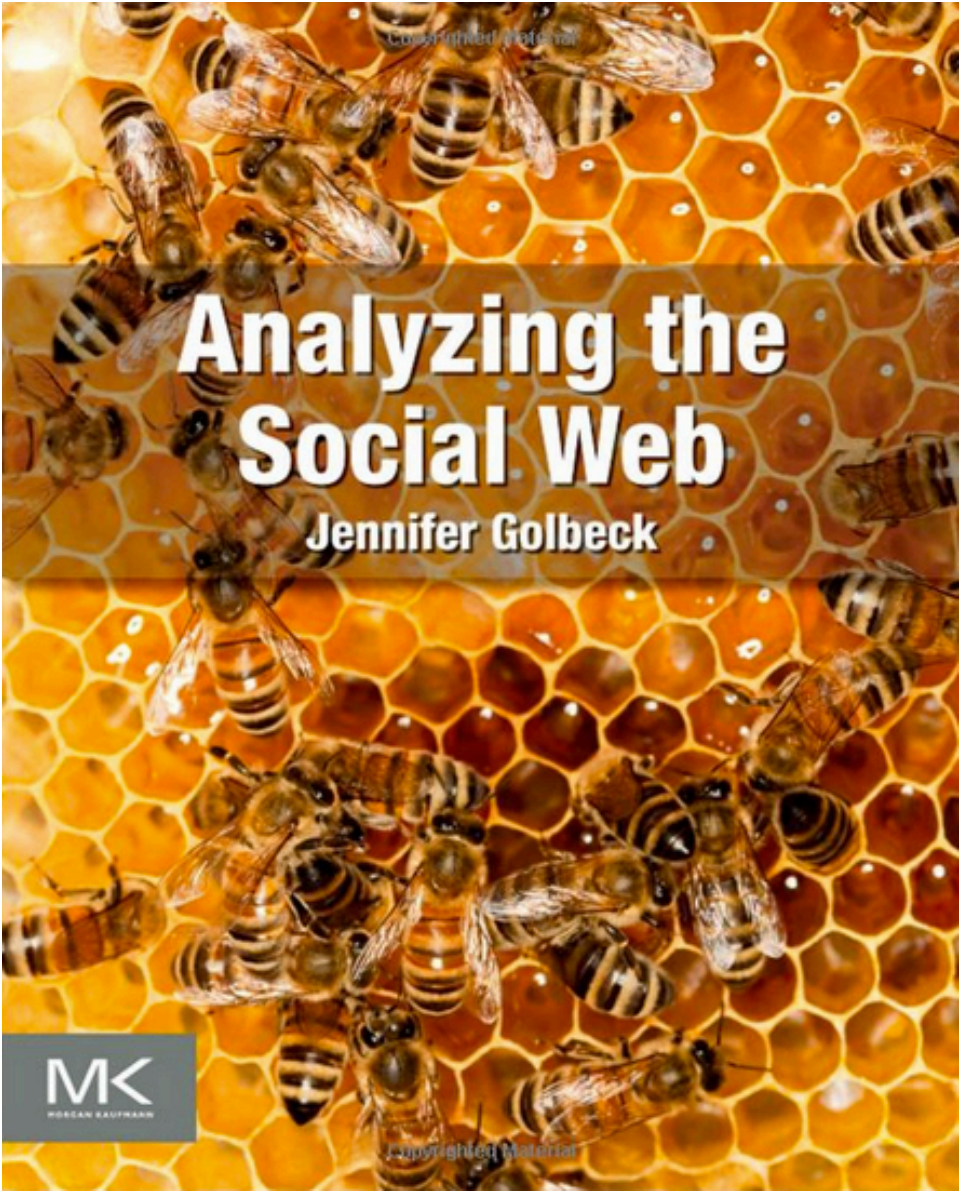
# Social Computing

- Social Network Analysis
- Link mining
- Community Detection
- Social Recommendation

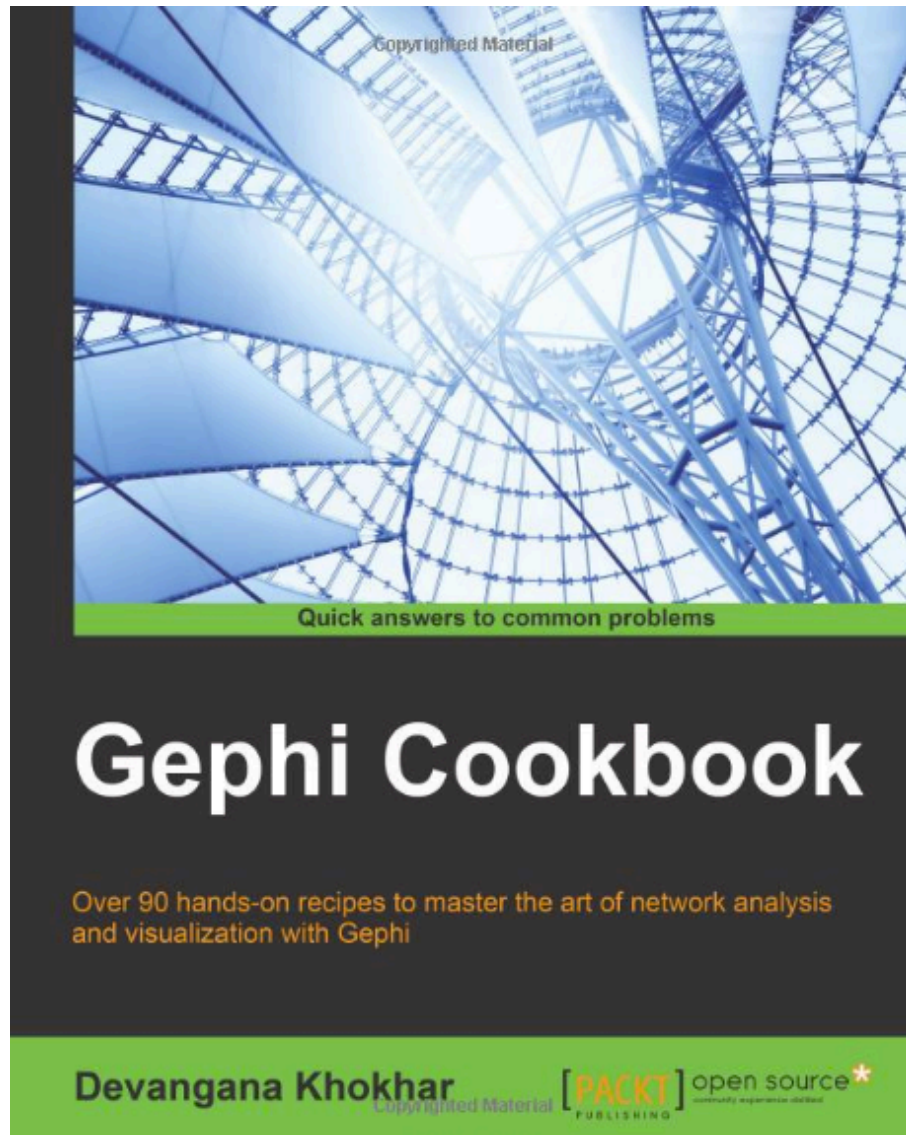
# Business Insights with Social Analytics

# Analyzing the Social Web: Social Network Analysis

Jennifer Golbeck (2013), **Analyzing the Social Web**, Morgan Kaufmann



# Devangana Khokhar (2015), Gephi Cookbook, Packt Publishing





# Social Network Analysis (SNA)

## Facebook TouchGraph

TouchGraph Photos x

box.touchgraph.com/facebook/TGFacebookBrowser.php?&signed\_request=Gi-L3\_6HrZ0S3SjxAXGdHR0rhMzqBjUnvFJ9vE4W6vg.eyJhbGdvcm00aG0iOiJITUFDI☆

Profiles Networks

Show Top 100 Friends Show All Friends Upload Advanced Restart

Zoom: Spacing:

Min-Yuh Day  
 Networks: None  
 Mutual Friends: 681

Facebook Profile

Network All All List Photo

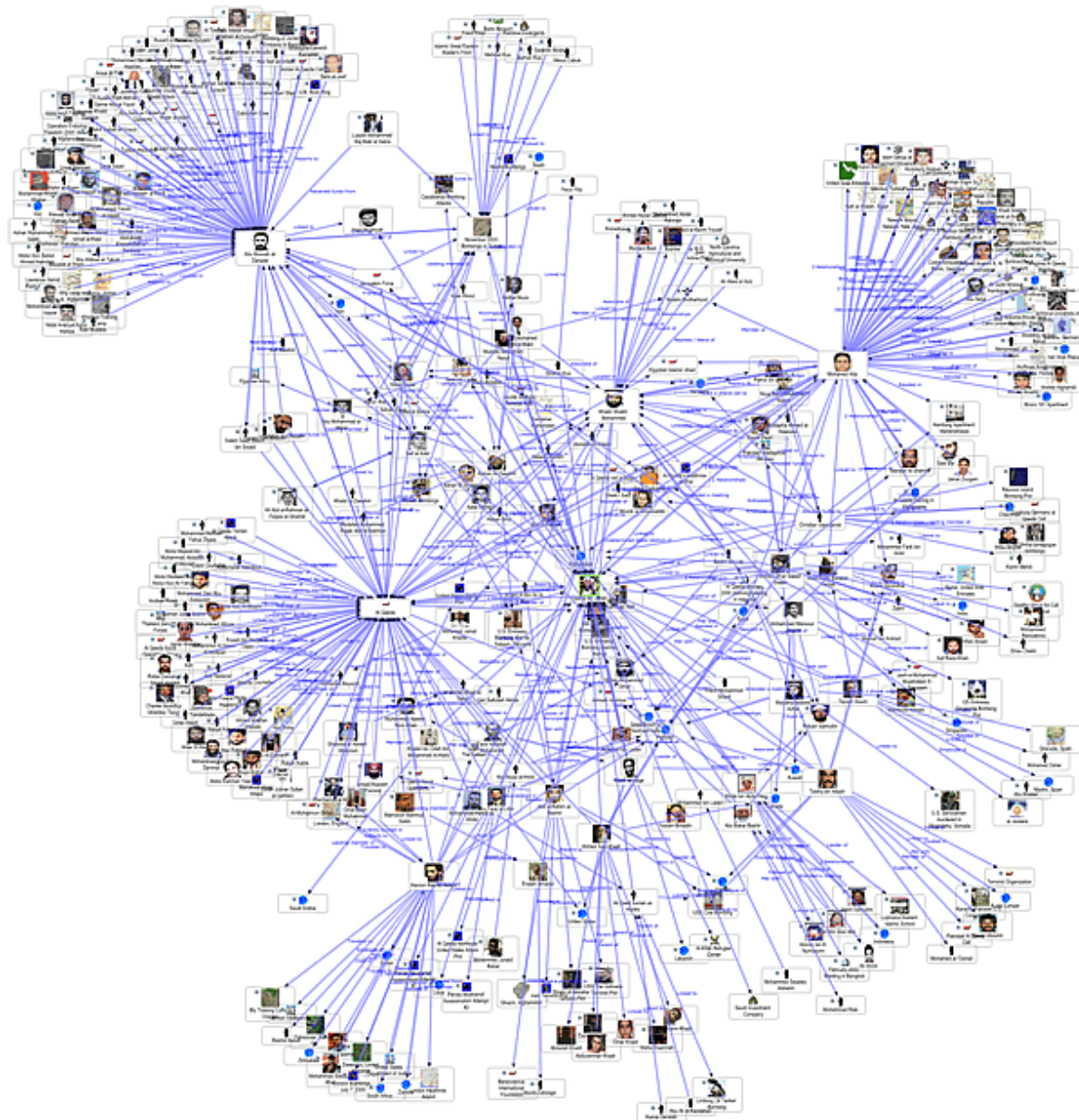
Name	Rank #	Friend #	民
Min-Yuh Day	1	681	
Gladys Hsieh	2	85	
黃西田	3	74	
施盛賓	4	67	
John Lee	5	104	
Kevin Tu	6	61	
Yung Yu Shih	7	45	
Wei Chen	8	107	
Chichang Jou	9	50	
Allen Green	10	81	
黃煒勳	11	65	
梁德昭	12	44	
Eric Chen	13	51	
吳錦波	14	39	
Jessica Tien	15	49	
蔡名宜	16	112	
Enrico Lu	17	59	
YaHan Hsieh	18	64	
王慧雯	19	56	
薛聖譚	20	80	
蝦米	21	73	

ICCU

powered by TouchGraph



# Social Network Analysis



# Social Network Analysis

- A **social network** is a social structure of people, related (**directly** or **indirectly**) to each other through a common relation or interest
- **Social network analysis (SNA)** is the study of social networks to understand their **structure** and **behavior**

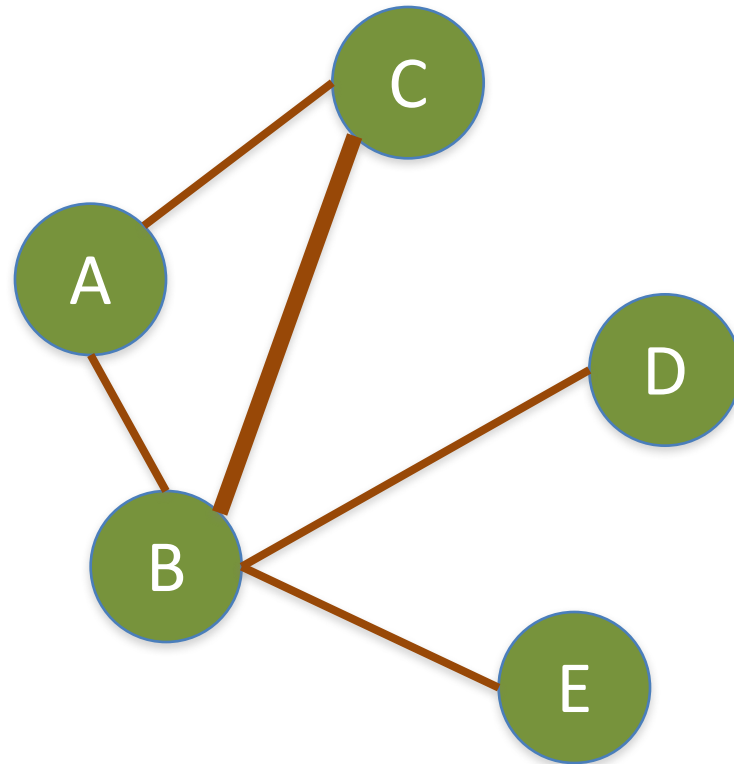
# Social Network Analysis (SNA)

**Centrality**

**Prestige**

# Graph Theory

# Graph



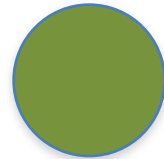
# Graph

$$g = (V, E)$$

# Vertex (Node)



# Vertices (Nodes)

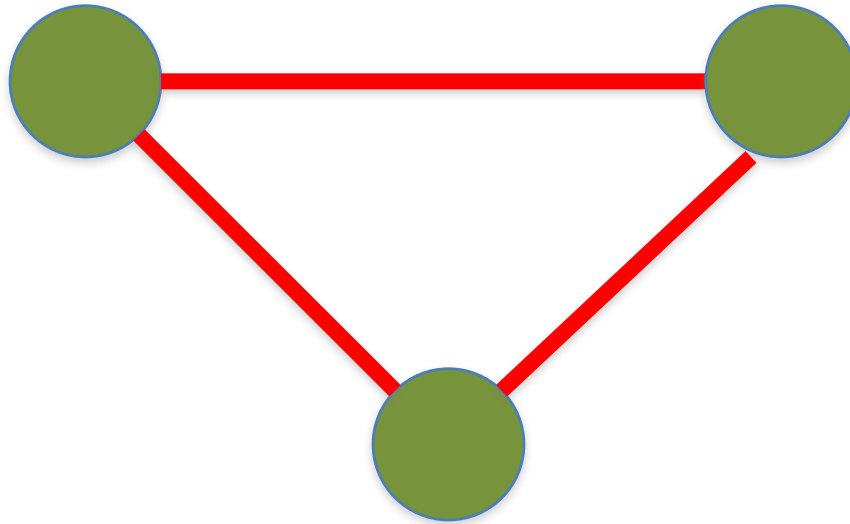




# Edge



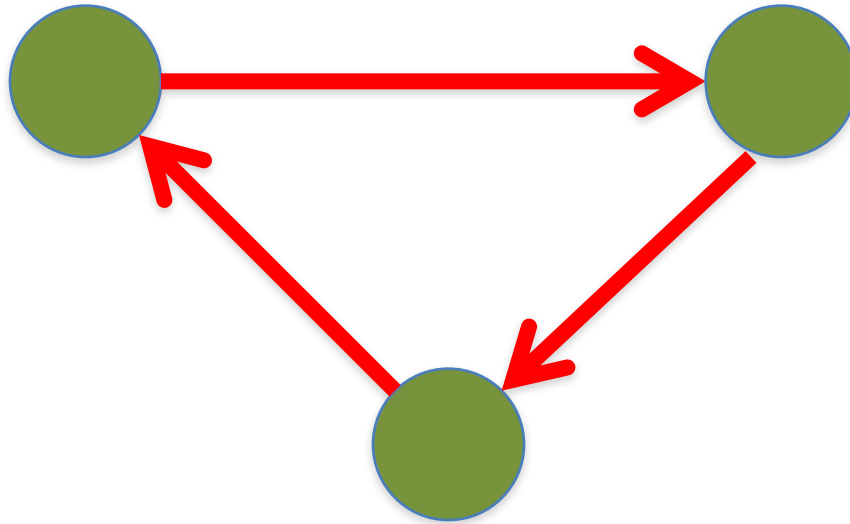
# Edges



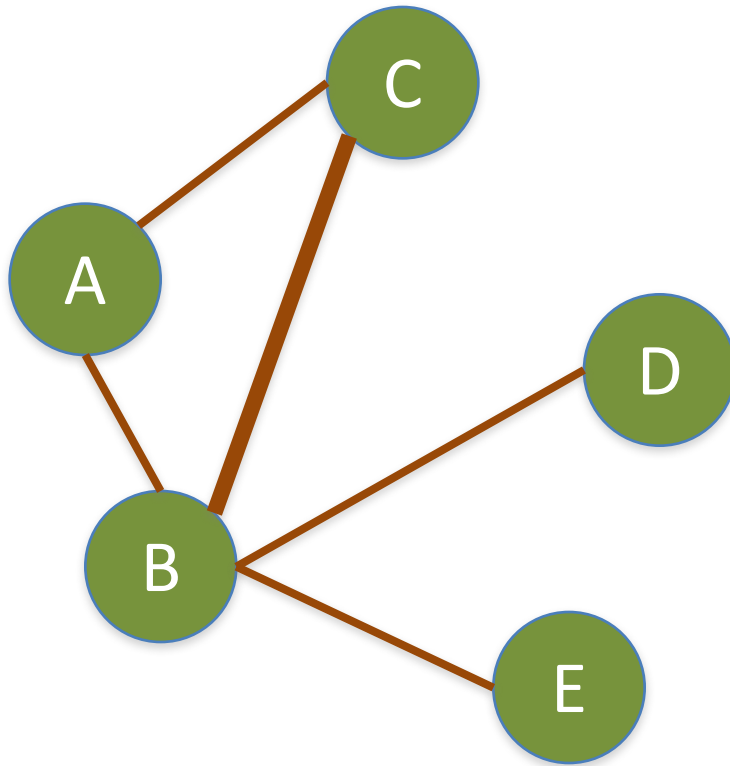
# Arc



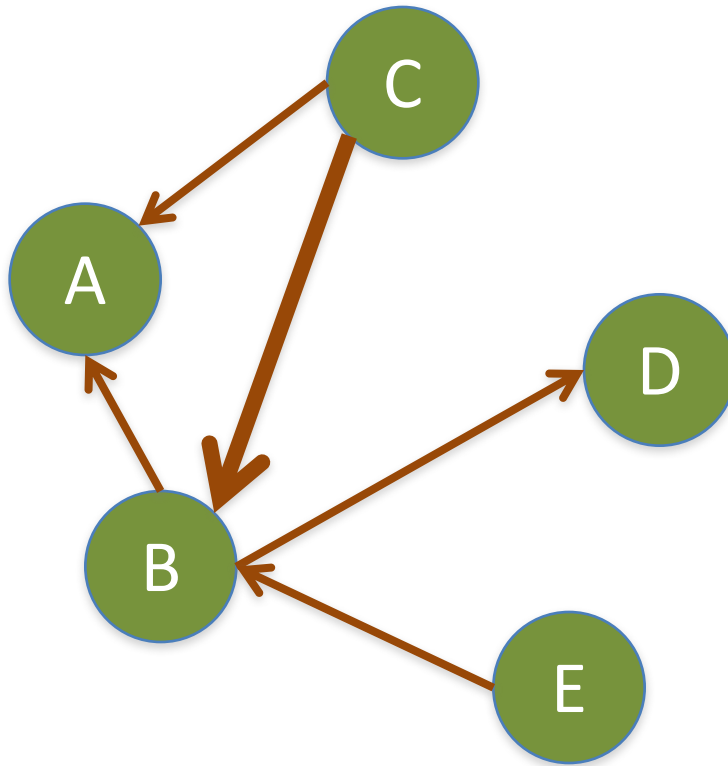
# Arcs



# Undirected Graph

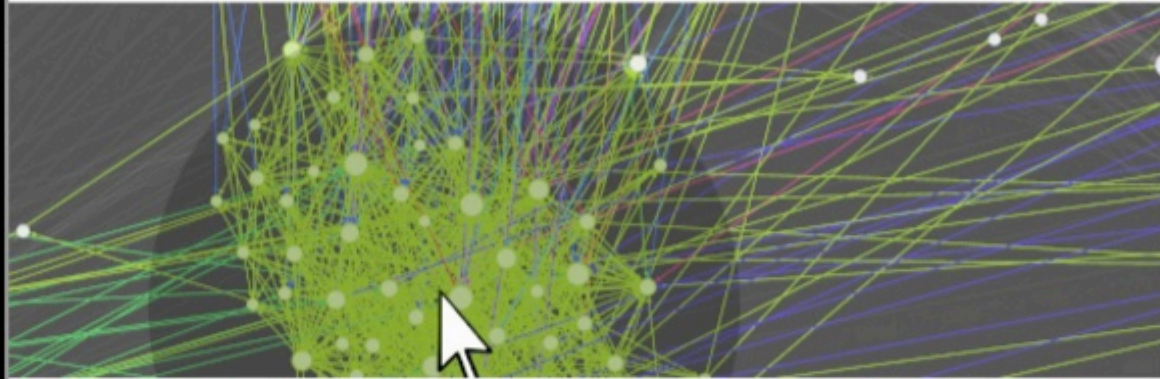
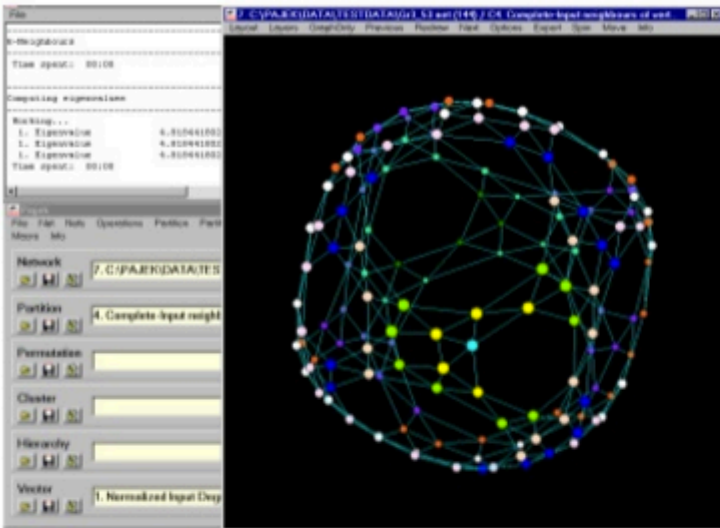


# Directed Graph



# Measurements of Social Network Analysis

# Exploratory Network Analysis



## 1 see the network

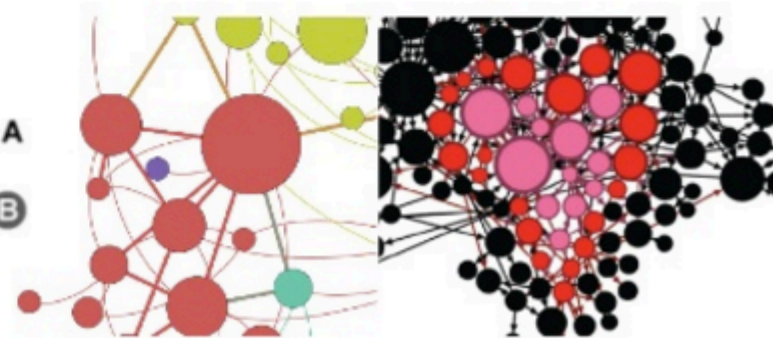
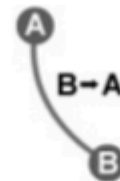
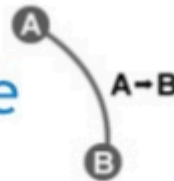
1st graph viz tool: Pajek (1996)  
Vladimir Batagelj, Andrej Mrvar

## 2 interact in real time

Gephi prototype (2008)  
group, filter, compute metrics...

## 3 build a visual language

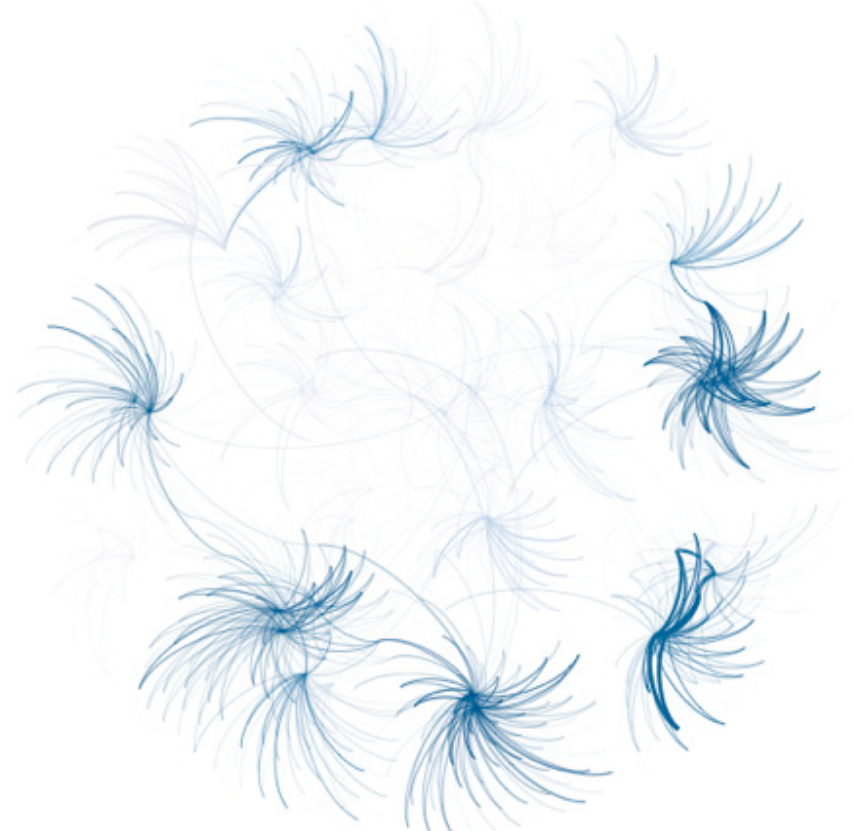
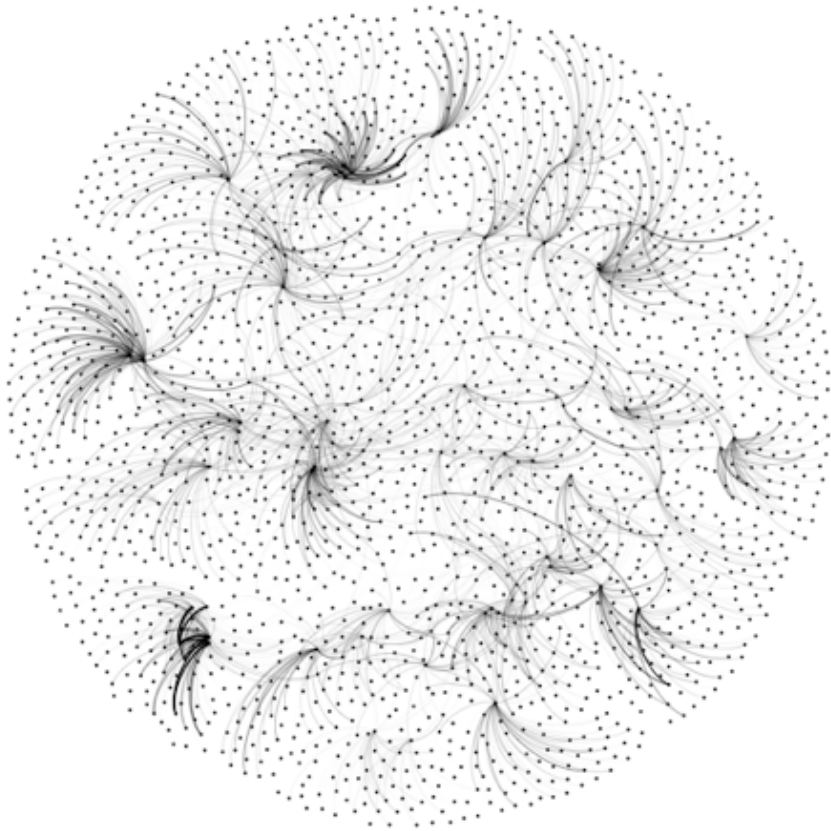
size by rank, color by partition,  
label, curved edges, thickness...





# Looking for a “Simple Small Truth”?

## What Data Visualization Should Do?



1. Make complex things **simple**
2. Extract **small** information from large data
3. Present **truth**, do not deceive

# Measurements

# Looking for Orderness in Data

Make varying 3 cursors simultaneously to extract meaningful patterns



*at different levels*



*on multiple dimensions*

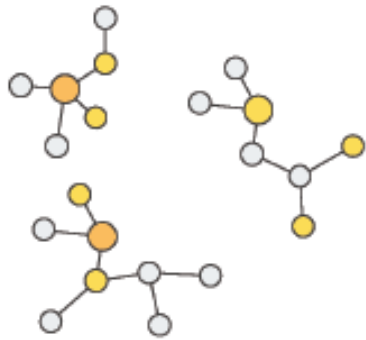


*at time scale*

# “Zoom” cursor on Quantitative Data

MICRO level

MACRO level



## Global

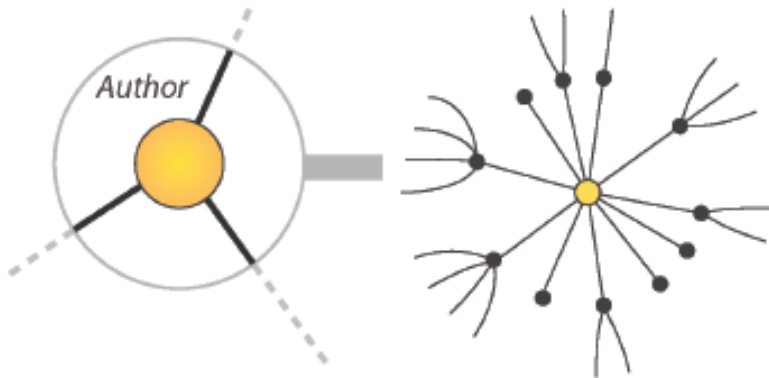
- connectivity
- density
- centralization

## Local

- communities
- bridges between communities
- local centers vs periphery

## Individual

- centrality
- distances
- neighborhood
- location
- local authority vs hub



# “Crossing” cursor on Quantitative Data



## Social

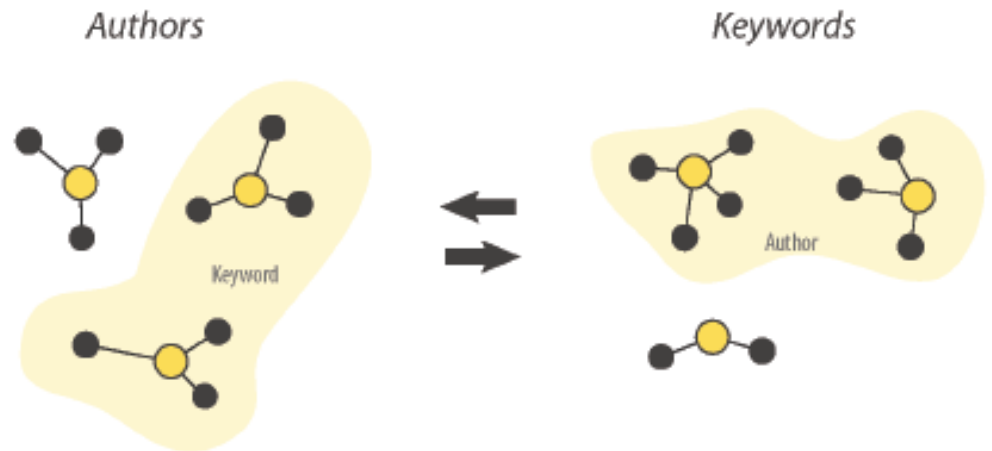
- who with whom
- communities
- brokerage
- influence and power
- homophily

## Semantic

- topics
- thematic clusters

## Geographic

- spatial phenomena



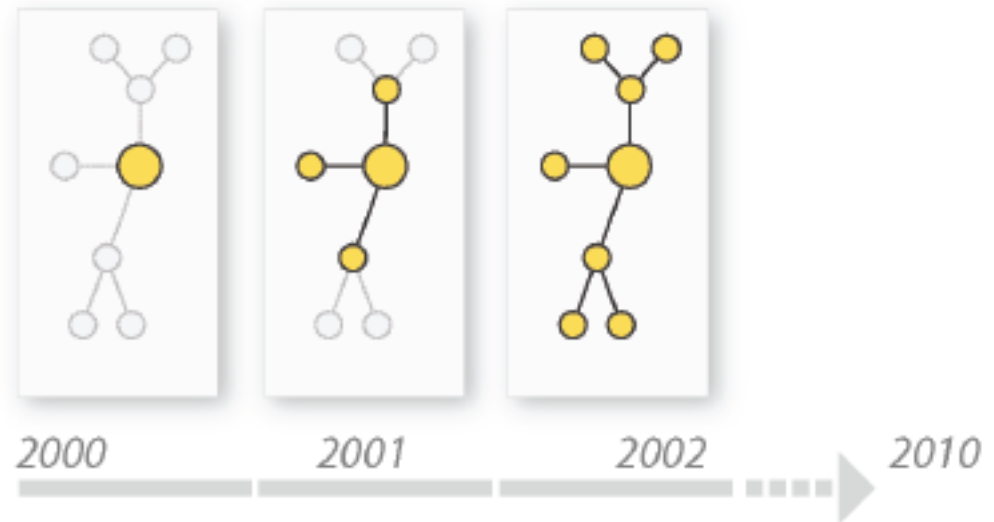
# “Timeline” cursor on Temporal Data



Evolution of social ties

Evolution of communities

Evolution of topics



# SNA Guideline

## # nodes

---

1 - 100

lists + edges in bonus, focus on qualitative data

100 - 1,000

### How attributes explain the structure?

- easy to read, “obvious” patterns
- focus on entities (in context)
- metrics are tools to describe the graph (centrality, bridging...)
- links help to build and interpret categories of entities

**challenge: mix attribute crossing and connectivity**

1,000 - 50,000

### How the structure explains attributes?

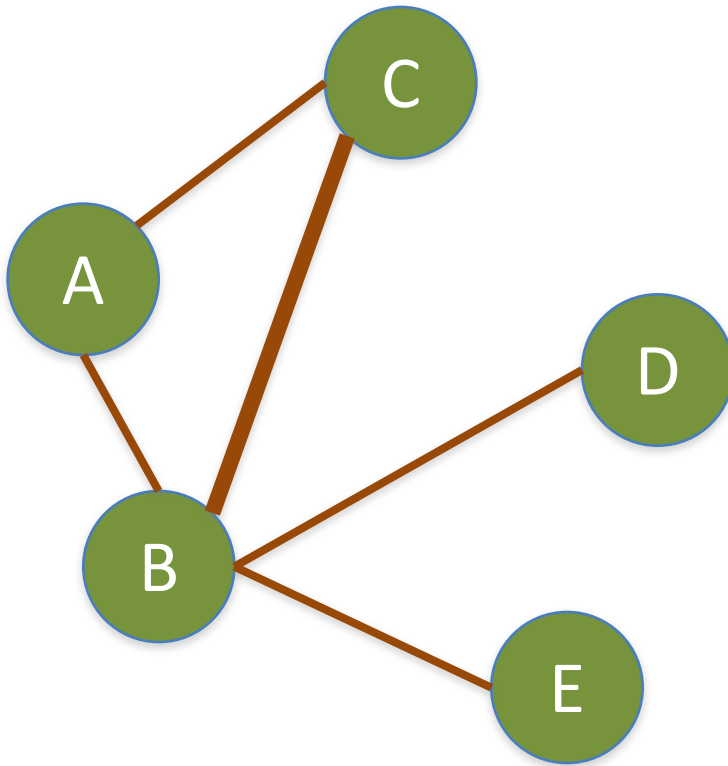
- hard to read, problem of “hidden signals”:  
track patterns with various layouts and filtering
- focus on structures
- metrics are tools to build the graph (cosine similarity...)
- categories help to understand the structure

**challenge: pattern recognition**

> 50,000

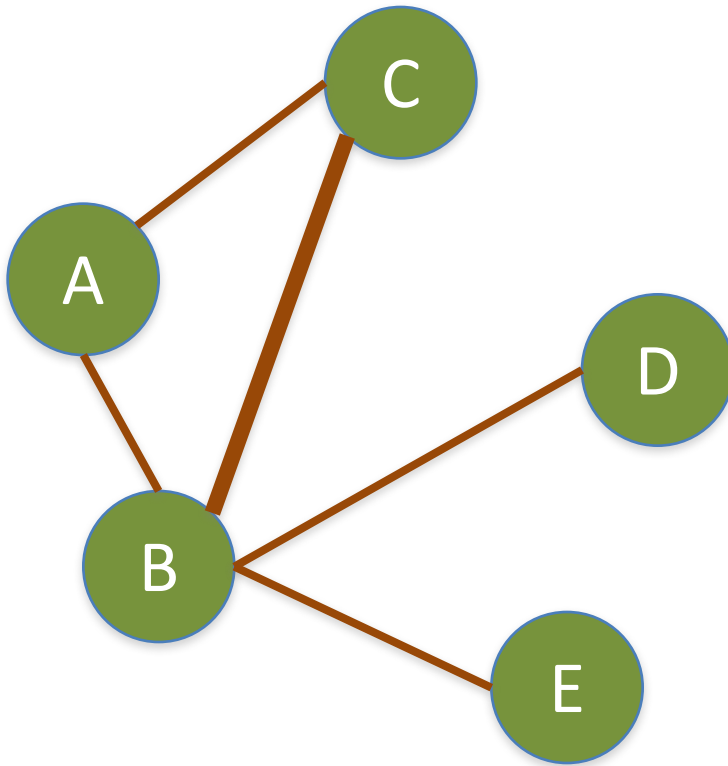
require high computational power

# Degree





# Degree



A: 2

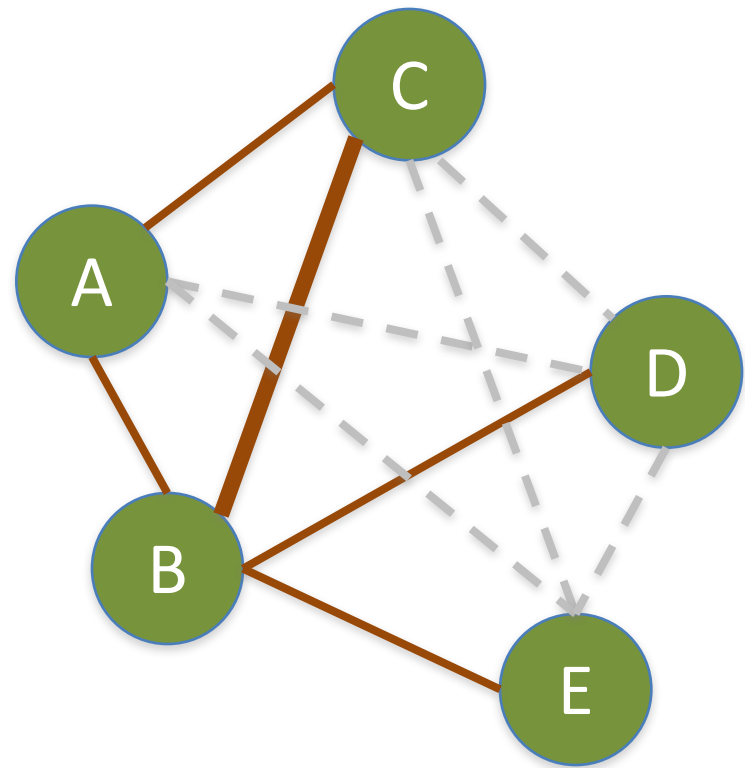
B: 4

C: 2

D: 1

E: 1

# Density

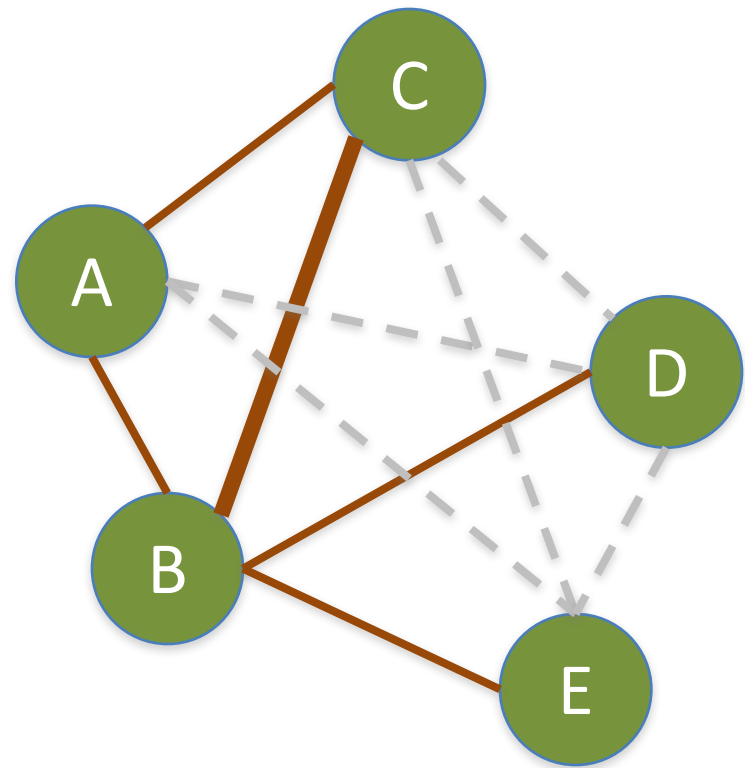


# Density

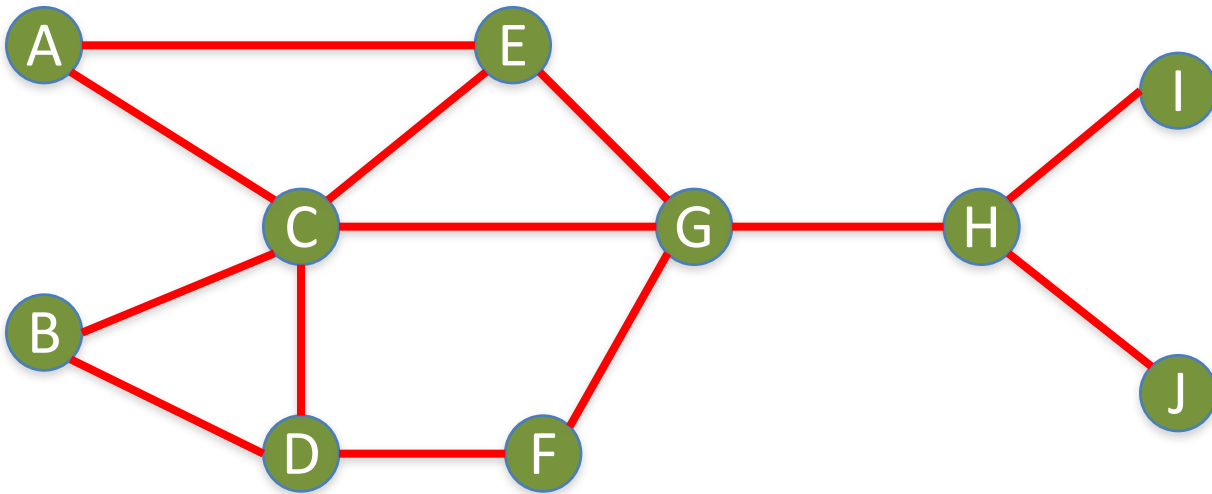
Edges (Links): 5

Total Possible Edges: 10

Density:  $5/10 = 0.5$



# Density



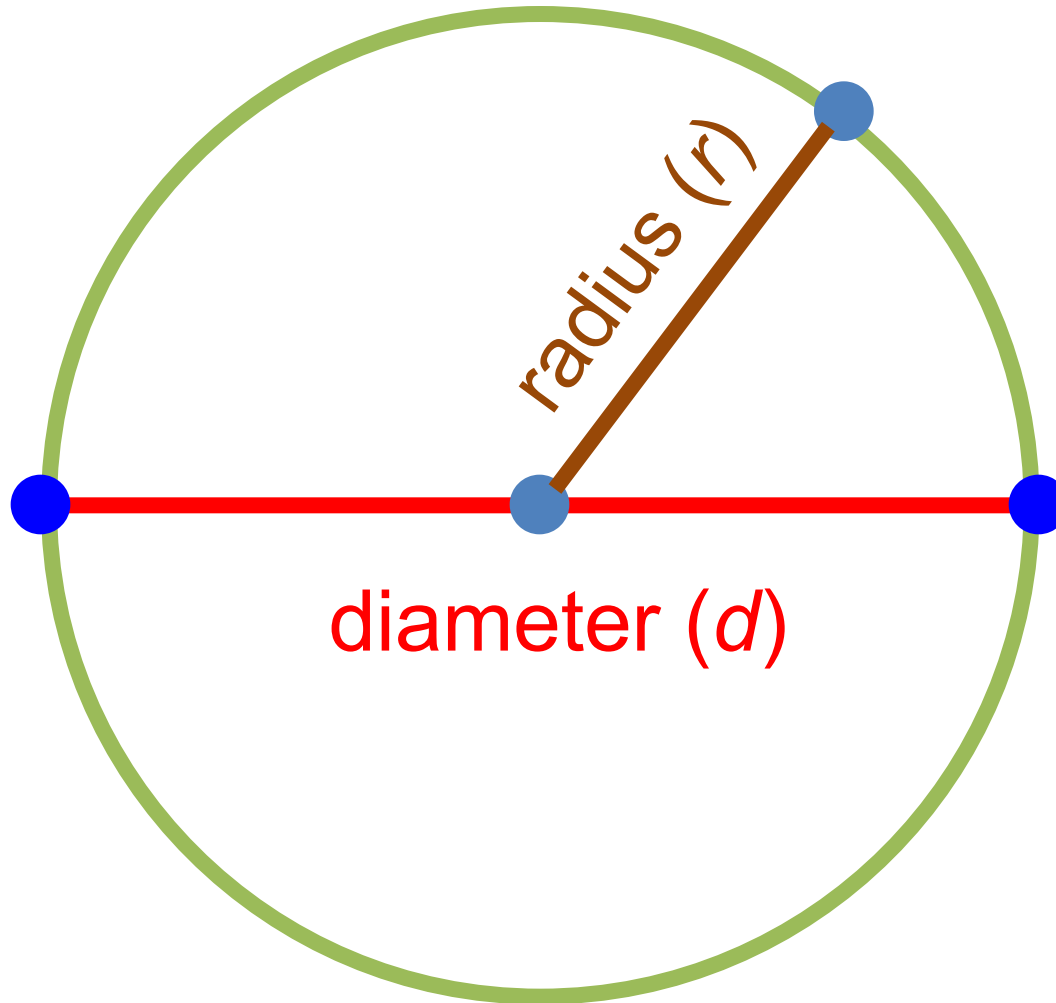
Nodes (n): 10

Edges (Links): 13

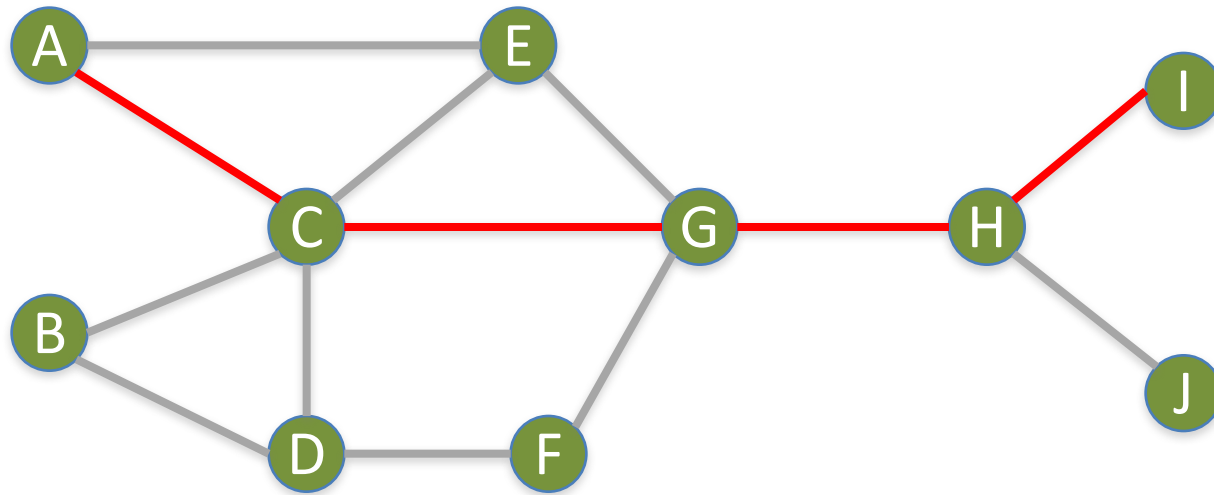
Total Possible Edges:  $(n * (n-1)) / 2 = (10 * 9) / 2 = 45$

Density:  $13/45 = 0.29$

# Diameter

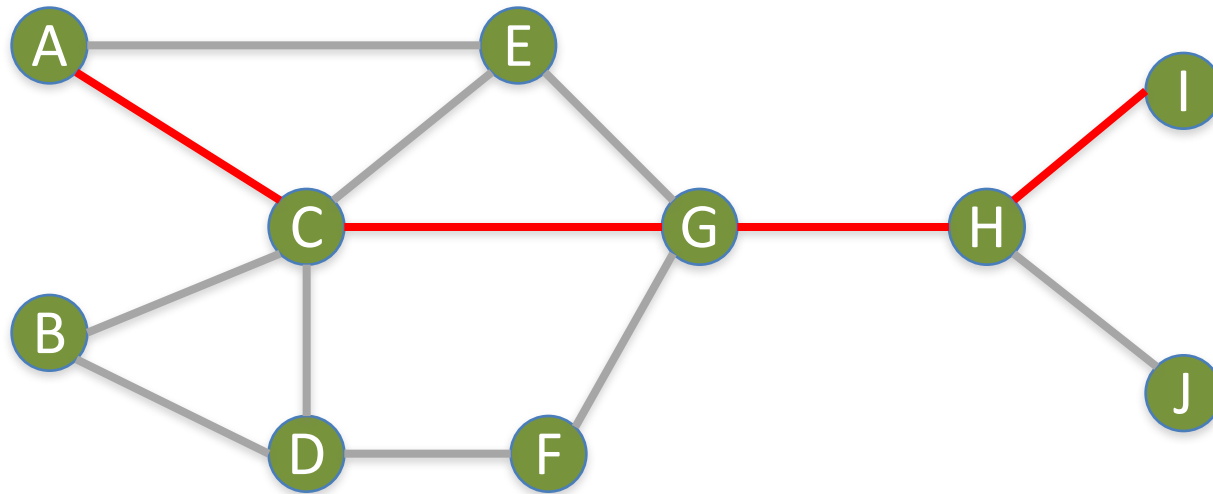


# Diameter



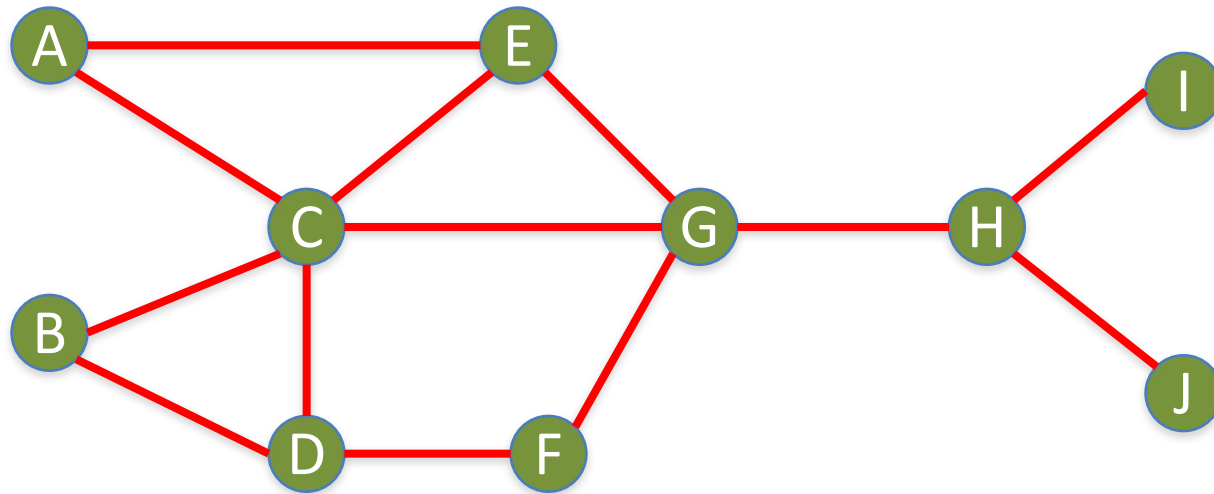
# Diameter

## Geodesic Path (Shortest Path)



**A → I : Diameter = 4**

# Which Node is Most **Important**?





# Centrality

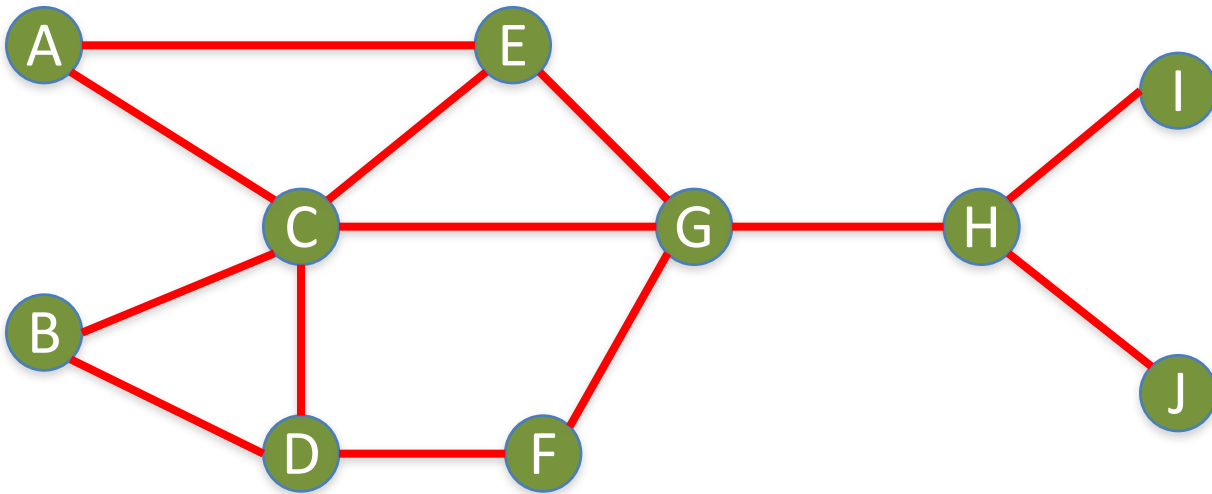
- **Important or prominent actors** are those that are linked or involved with other actors extensively.
- A person with extensive contacts (links) or communications with many other people in the organization is considered more important than a person with relatively fewer contacts.
- The links can also be called **ties**.  
A **central actor** is one involved in many ties.

# Social Network Analysis (SNA)

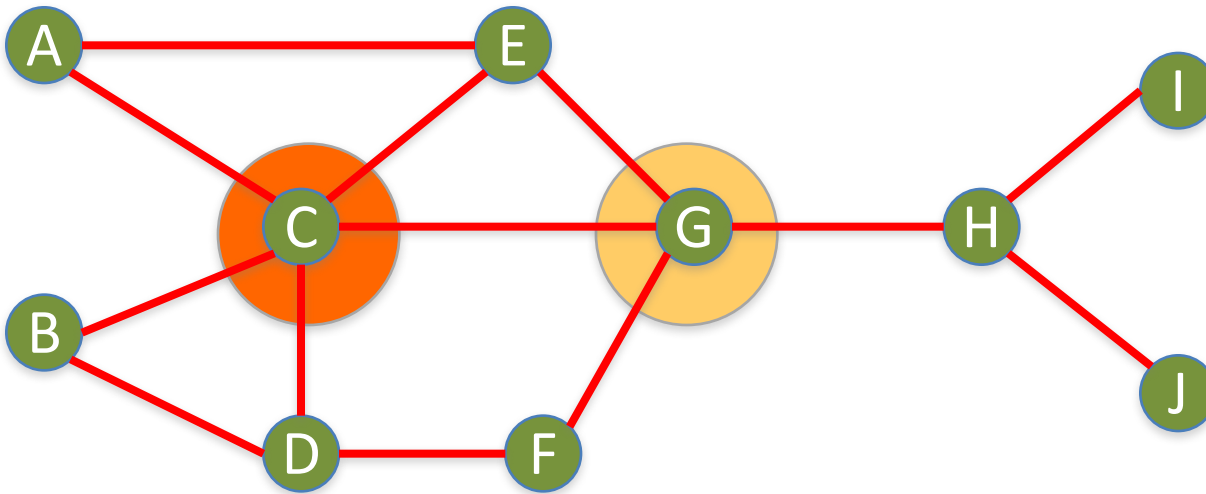
- Degree Centrality
- Betweenness Centrality
- Closeness Centrality

# Degree Centrality

# Social Network Analysis: Degree Centrality



# Social Network Analysis: Degree Centrality



Node	Score	Standardized Score
A	2	$2/10 = 0.2$
B	2	$2/10 = 0.2$
<b>C</b>	<b>5</b>	<b><math>5/10 = 0.5</math></b>
D	3	$3/10 = 0.3$
E	3	$3/10 = 0.3$
F	2	$2/10 = 0.2$
<b>G</b>	<b>4</b>	<b><math>4/10 = 0.4</math></b>
H	3	$3/10 = 0.3$
I	1	$1/10 = 0.1$
J	1	$1/10 = 0.1$

# Betweenness Centrality

**Betweenness centrality:**

# **Connectivity**

Number of shortest paths  
going through the actor

# Betweenness Centrality

$$C_B(i) = \sum_{j < k} g_{ik}(i) / g_{jk}$$

Where  $g_{jk}$  = the number of shortest paths connecting  $jk$   
 $g_{jk}(i)$  = the number that actor  $i$  is on.

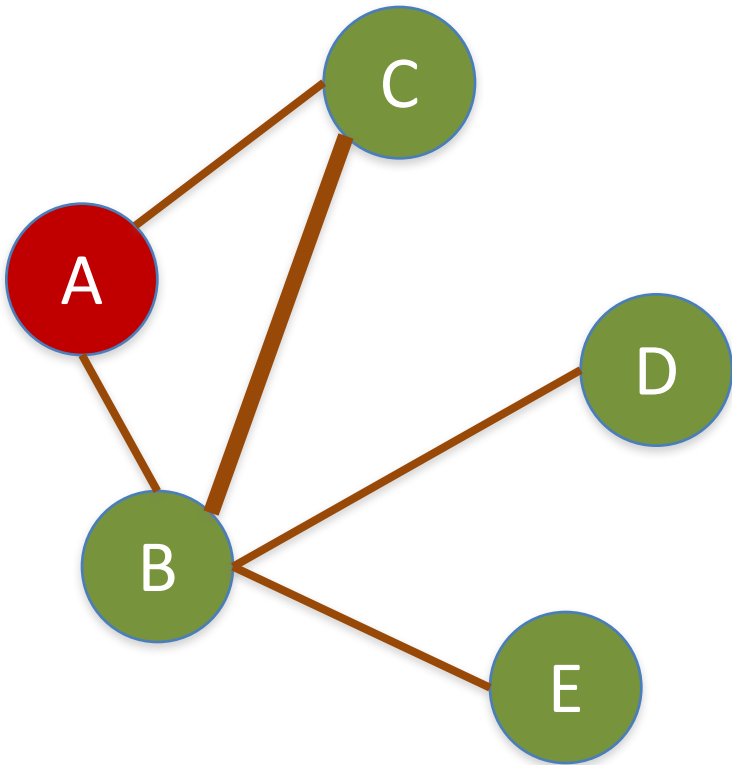
## Normalized Betweenness Centrality

$$C'_B(i) = C_B(i) / [(n-1)(n-2) / 2]$$

**Number of pairs of vertices  
excluding the vertex itself**



# Betweenness Centrality



A:

$$B \rightarrow C: 0/1 = 0$$

$$B \rightarrow D: 0/1 = 0$$

$$B \rightarrow E: 0/1 = 0$$

$$C \rightarrow D: 0/1 = 0$$

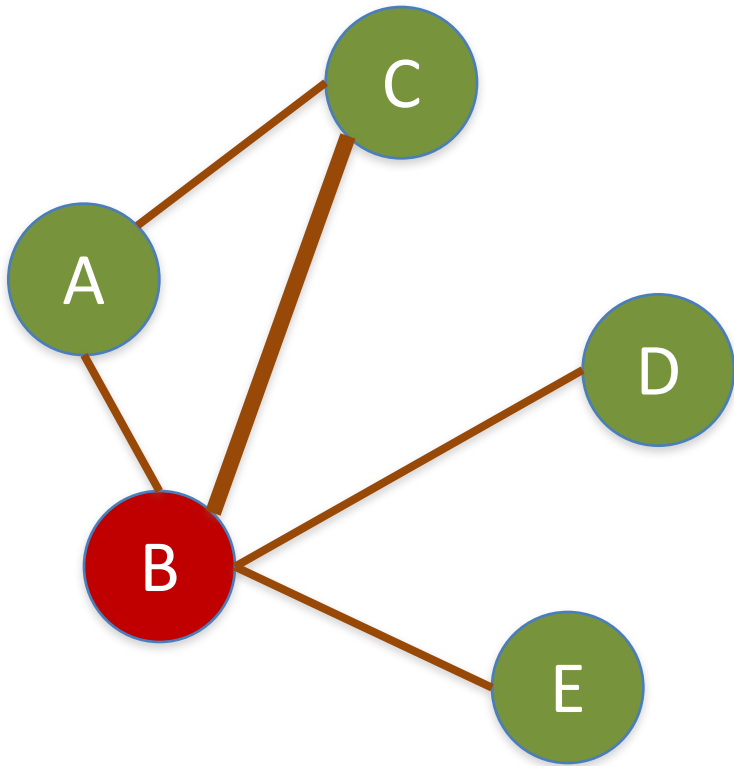
$$C \rightarrow E: 0/1 = 0$$

$$D \rightarrow E: 0/1 = 0$$

**Total:** 0

**A: Betweenness Centrality = 0**

# Betweenness Centrality



B:

$$A \rightarrow C: 0/1 = 0$$

$$A \rightarrow D: 1/1 = 1$$

$$A \rightarrow E: 1/1 = 1$$

$$C \rightarrow D: 1/1 = 1$$

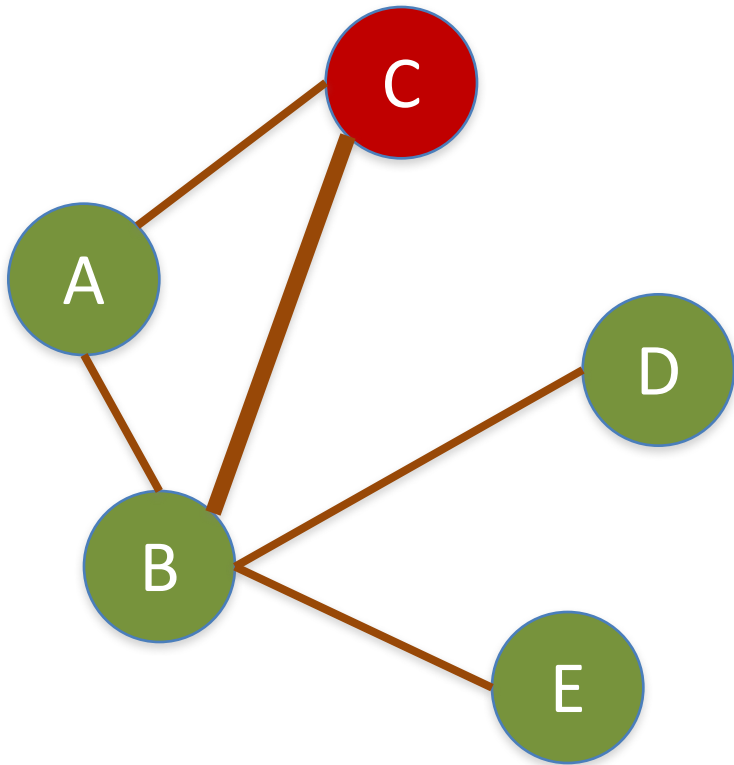
$$C \rightarrow E: 1/1 = 1$$

$$D \rightarrow E: 1/1 = 1$$

**Total:** 5

**B: Betweenness Centrality = 5**

# Betweenness Centrality



C:

$$A \rightarrow B: 0/1 = 0$$

$$A \rightarrow D: 0/1 = 0$$

$$A \rightarrow E: 0/1 = 0$$

$$B \rightarrow D: 0/1 = 0$$

$$B \rightarrow E: 0/1 = 0$$

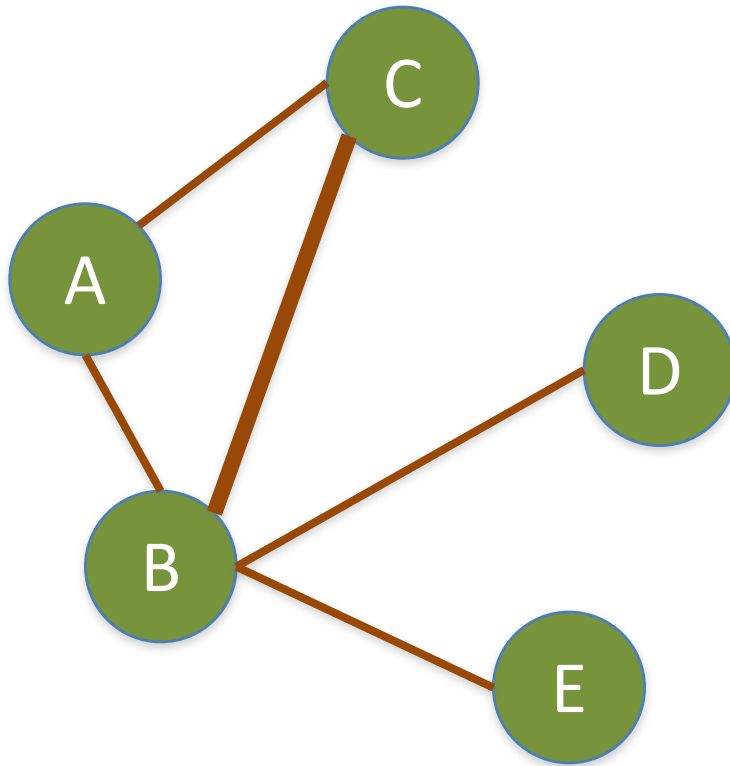
$$D \rightarrow E: 0/1 = 0$$

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$$\text{Total: } \quad \quad \quad \underline{\quad 0 \quad}$$

**C: Betweenness Centrality = 0**

# Betweenness Centrality



A: 0

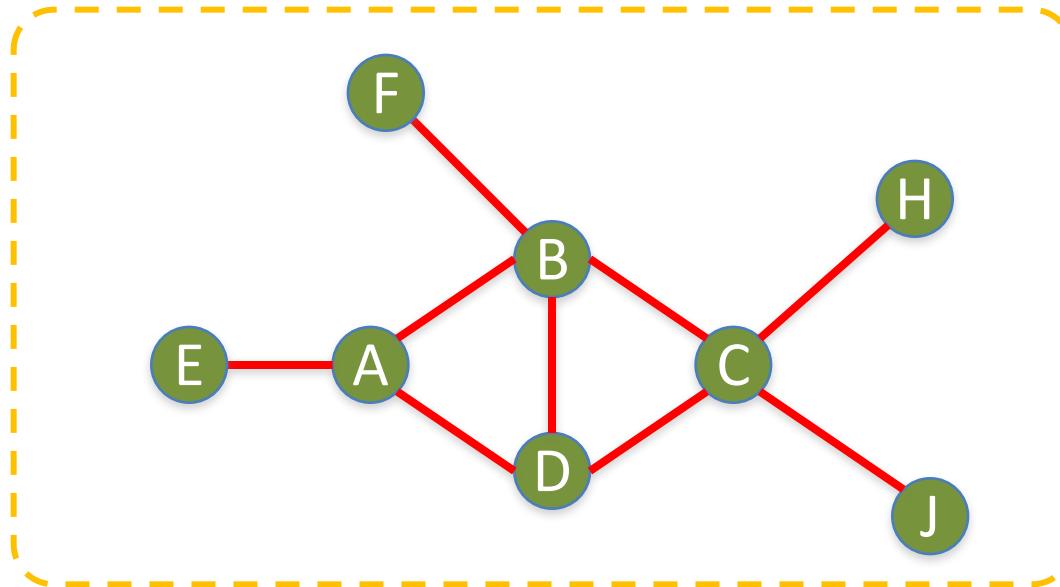
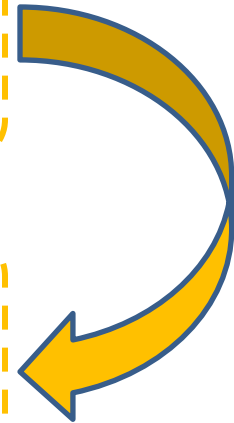
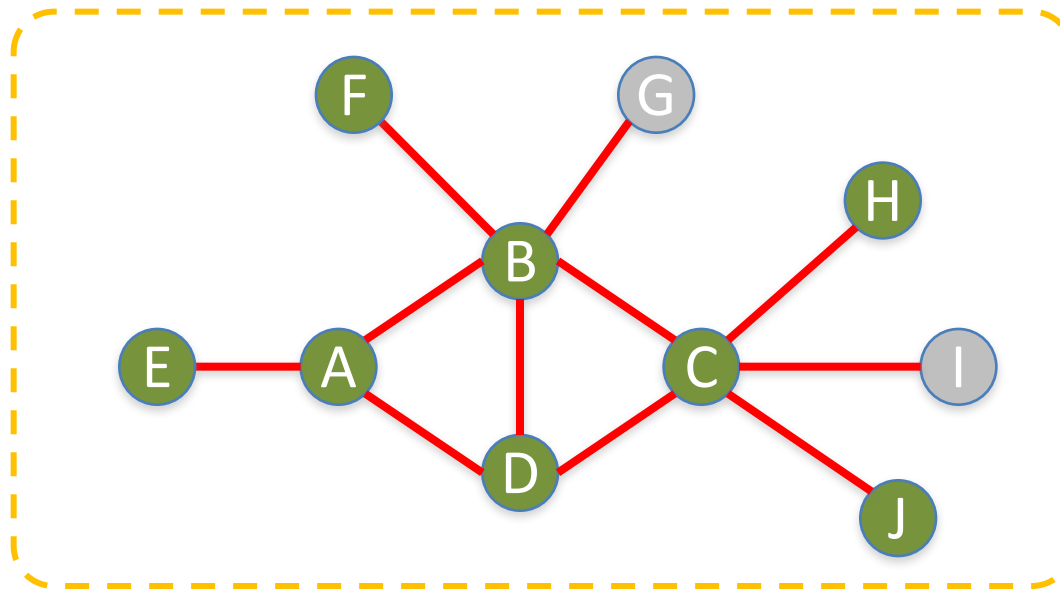
**B: 5**

C: 0

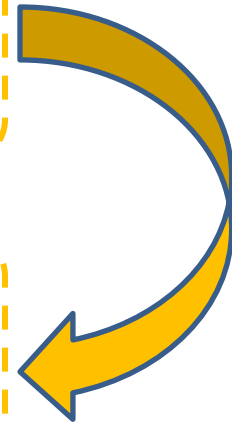
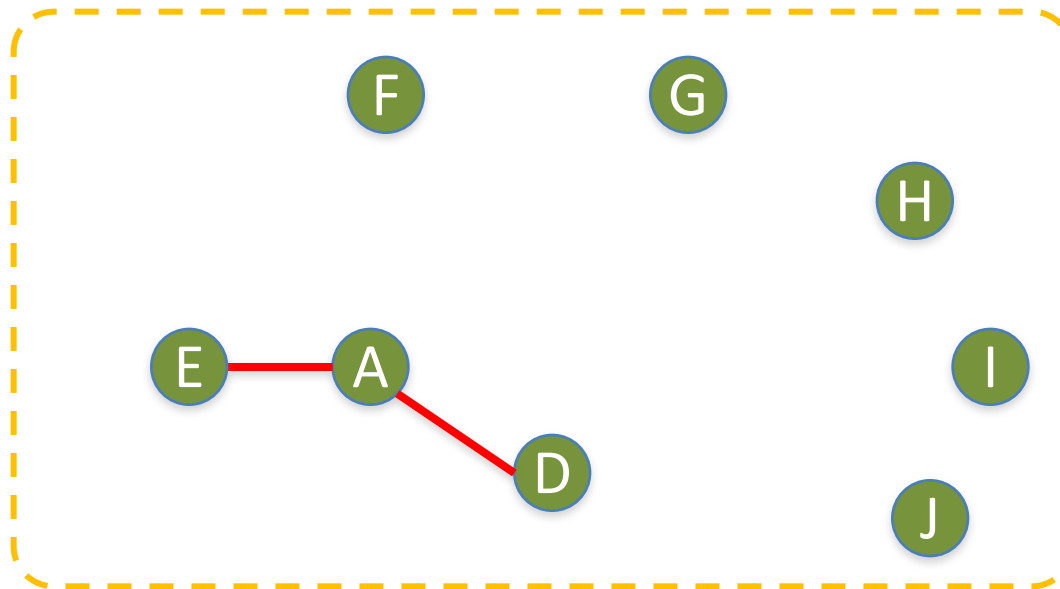
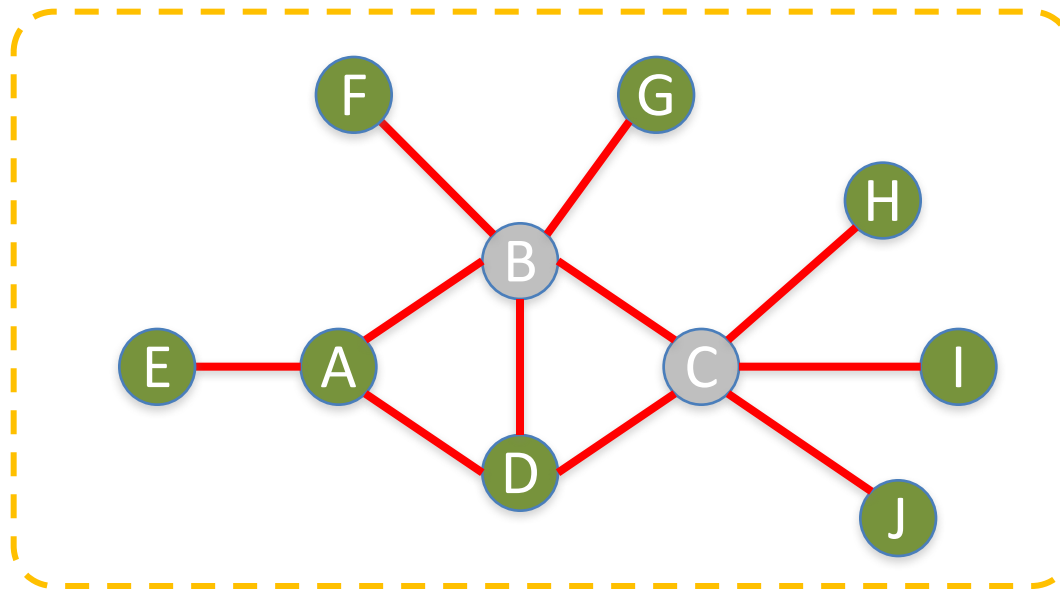
D: 0

E: 0

# Which Node is Most **Important**?

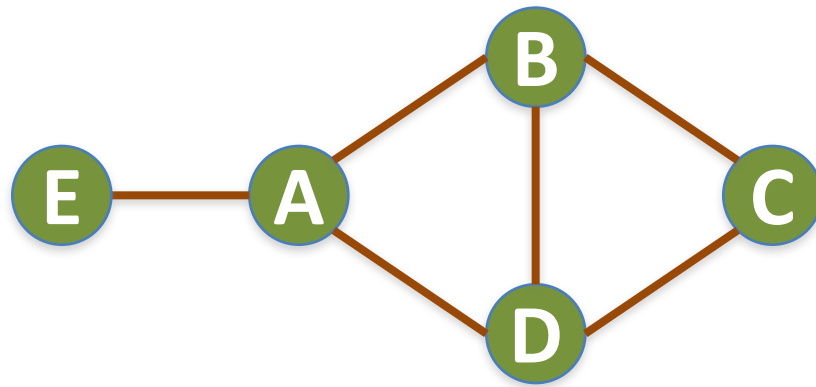


# Which Node is Most **Important**?

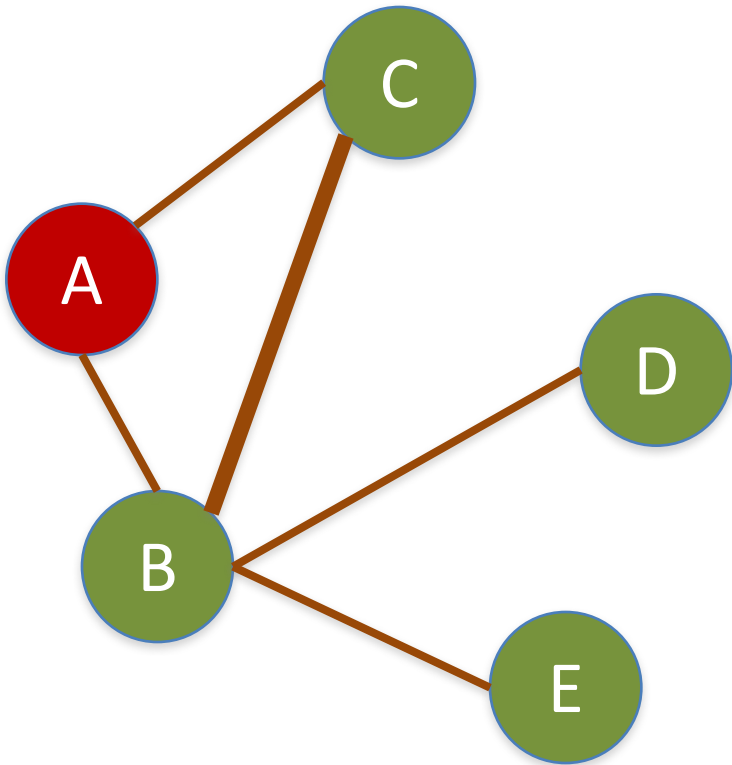


# Betweenness Centrality

$$C_B(i) = \sum_{j < k} g_{ik}(i) / g_{jk}$$



# Betweenness Centrality



A:

$$B \rightarrow C: 0/1 = 0$$

$$B \rightarrow D: 0/1 = 0$$

$$B \rightarrow E: 0/1 = 0$$

$$C \rightarrow D: 0/1 = 0$$

$$C \rightarrow E: 0/1 = 0$$

$$D \rightarrow E: 0/1 = 0$$

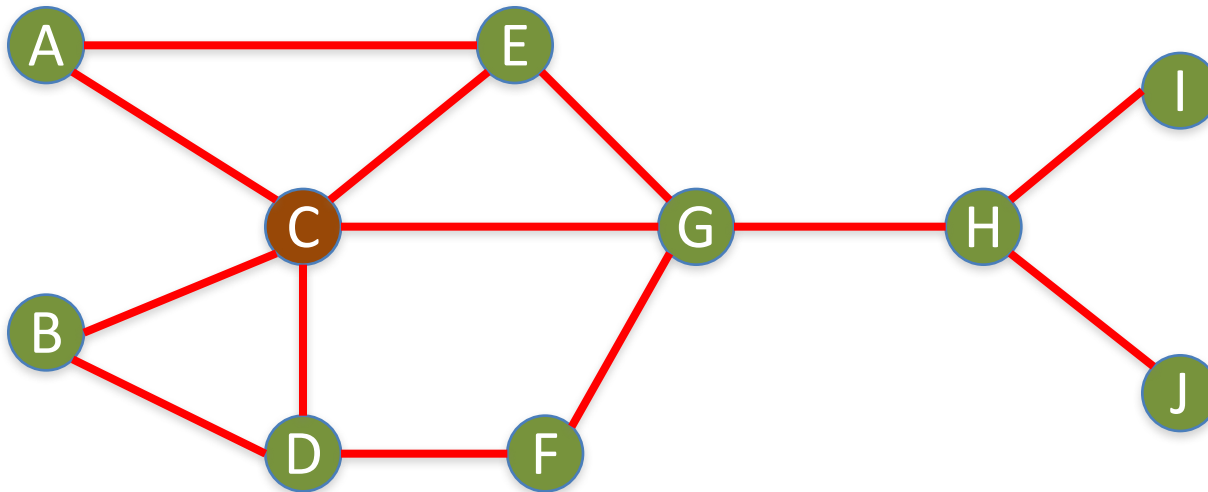
**Total:** 0

**A: Betweenness Centrality = 0**



**Closeness**  
**Centrality**

# Social Network Analysis: Closeness Centrality



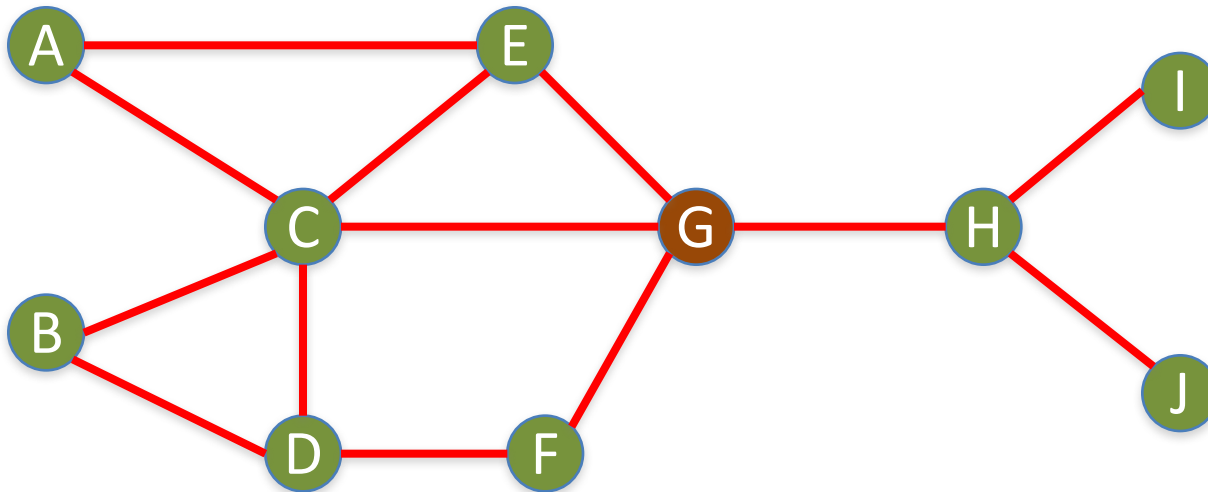
C→A: 1  
C→B: 1  
C→D: 1  
C→E: 1  
C→F: 2  
C→G: 1  
C→H: 2  
C→I: 3  
C→J: 3

---

Total=15

**C: Closeness Centrality =  $15/9 = 1.67$**

# Social Network Analysis: Closeness Centrality



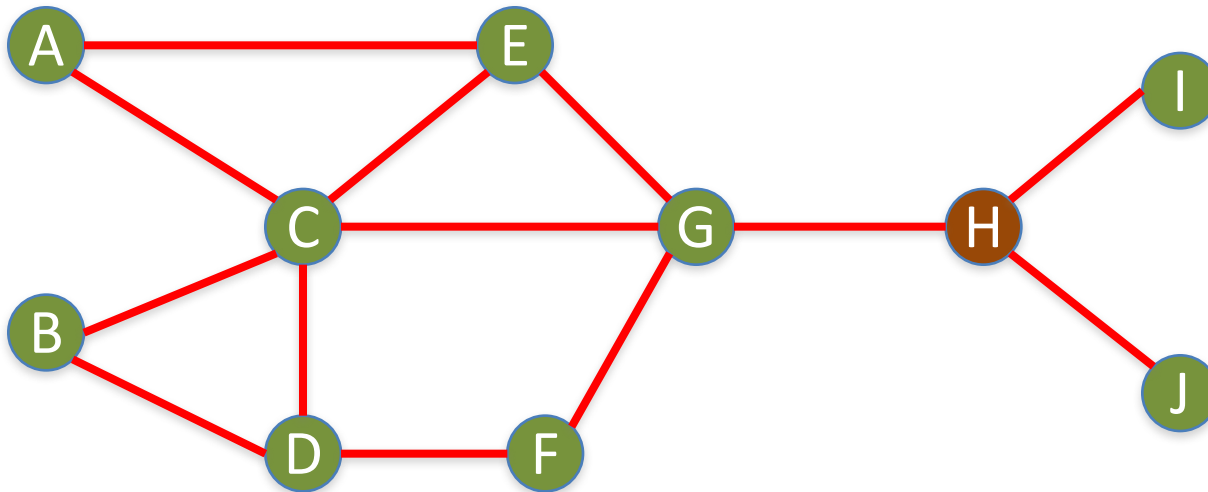
G→A: 2  
G→B: 2  
G→C: 1  
G→D: 2  
G→E: 1  
G→F: 1  
G→H: 1  
G→I: 2  
G→J: 2

---

Total=14

**G: Closeness Centrality =  $14/9 = 1.56$**

# Social Network Analysis: Closeness Centrality



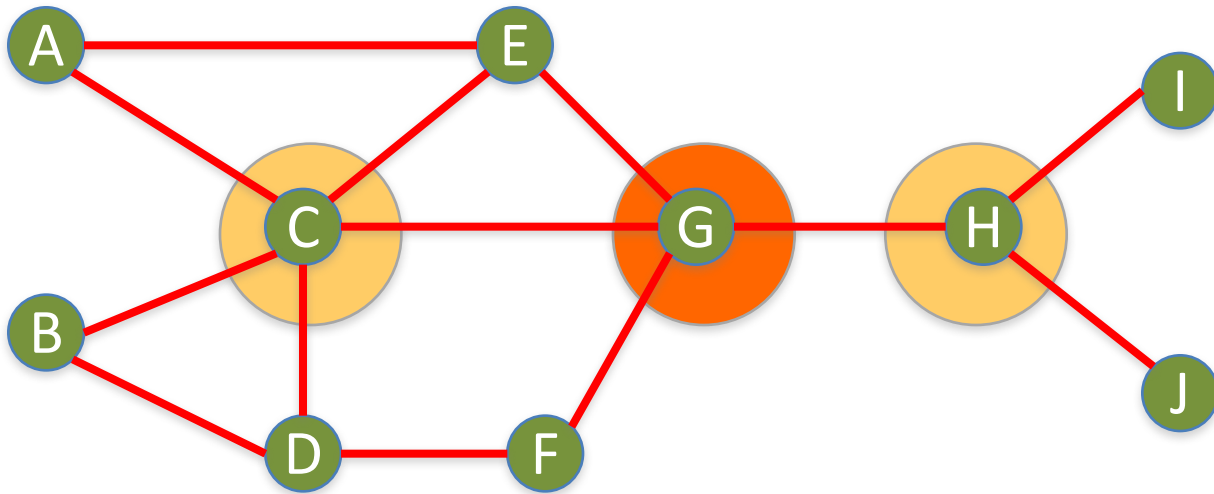
H→A: 3  
H→B: 3  
H→C: 2  
H→D: 2  
H→E: 2  
H→F: 2  
H→G: 1  
H→I: 1  
H→J: 1

---

Total=17

**H: Closeness Centrality =  $17/9 = 1.89$**

# Social Network Analysis: Closeness Centrality



G: Closeness Centrality =  $14/9 = 1.56$  ①

C: Closeness Centrality =  $15/9 = 1.67$  ②

H: Closeness Centrality =  $17/9 = 1.89$  ③

# Social Network Analysis (SNA)

**importance of neighbors**

**Eigenvector centrality**

# **Eigenvector centrality:**

Importance of a node  
depends on  
the importance of its neighbors

# Social Network Analysis: Closeness Centrality

Sum of the reciprocal distances

$$C_C(p_k) = \sum_{i=1}^n d(p_i, p_k)^{-1}$$

where  $d(p_j, p_k)$  is the geodesic distance (shortest paths) linking  $p_j, p_k$



# Social Network Analysis: Betweenness Centrality

$$C_B(p_k) = \sum_{i < j}^n \frac{g_{ij}(p_k)}{g_{ij}}; \quad i \neq j \neq k$$

where  $g_{ij}$  is the geodesic distance (shortest paths) linking  $p_i$  and  $p_j$  and  $g_{ij}(p_k)$  is the geodesic distance linking  $p_i$  and  $p_j$  that contains  $p_k$ .

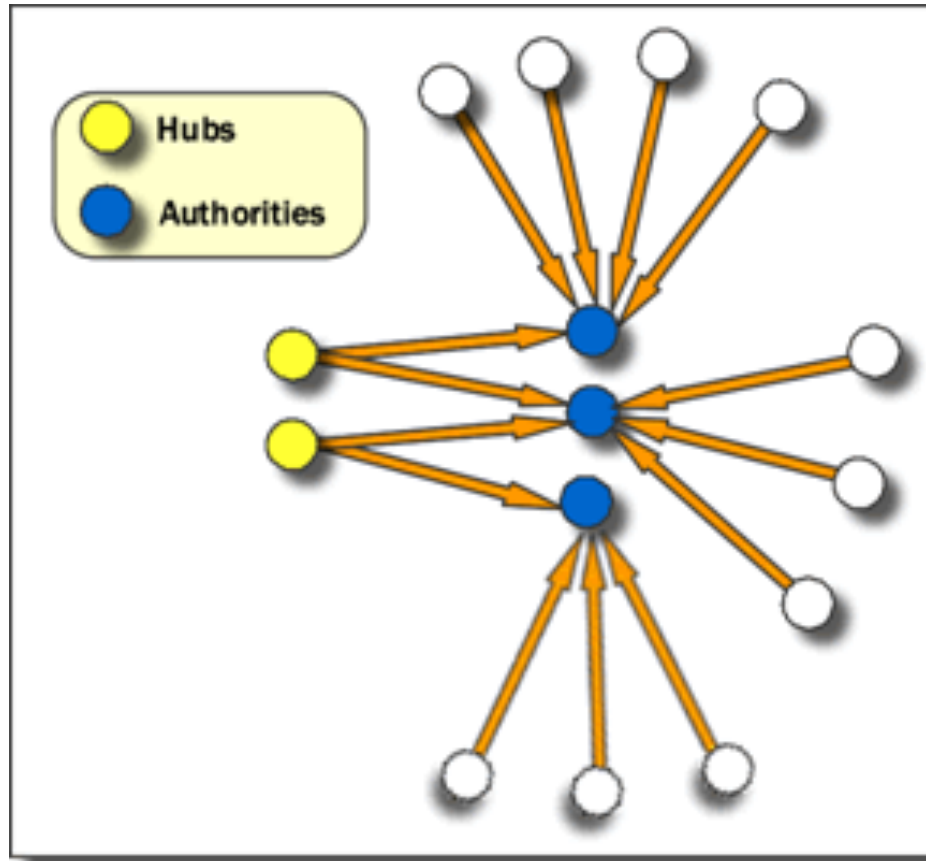
# Social Network Analysis: Degree Centrality

$$C_D(p_k) = \sum_{i=1}^n a(p_i, p_k)$$

where  $a(p_i, p_k) = 1$  if and only if  $p_i$  and  $p_k$  are connected by a line  
0 otherwise

$$C'_D(p_k) = \frac{\sum_{i=1}^n a(p_i, p_k)}{n-1}$$

# Social Network Analysis: Hub and Authority



Hubs are entities that point to a relatively large number of authorities. They are essentially the mutually reinforcing analogues to authorities. Authorities point to high hubs. Hubs point to high authorities. You cannot have one without the other.

# Application of SNA

# Social Network Analysis of Research Collaboration in Information Reuse and Integration

# Example of SNA Data Source


















**dblp**  
computer science bibliography













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## IRI 2010: Las Vegas, NV, USA

-    **Proceedings of the IEEE International Conference on Information Reuse and Integration, IRI 2010, 4-6 August 2010, Las Vegas, Nevada, USA.** IEEE Systems, Man, and Cybernetics Society 2010
-    Reda Alhajj, James B. D. Joshi, Mei-Ling Shyu: **Message from Program Co-Chairs.** 1
-    Stuart Harvey Rubin, Shu-Ching Chen: **Forward.** 1
-    Lotfi A. Zadeh: **Precision of meaning - toward computation with natural language.** 1-4
-    Reda Alhajj, Shu-Ching Chen, Gongzhu Hu, James B. D. Joshi, Gordon K. Lee, Stuart Harvey Rubin, Mei-Ling Shyu, Lotfi A. Zadeh: **Panel title: Critical need for funding of basic and applied research in large-scale computing.** 1

### Automation, Integration and Reuse across Various Apps

-    László István Etesi, André Csillaghy, Lin-Ching Chang: **A message-based interoperability framework with application to astrophysics.** 1-6
-    Awny Alnusair, Tian Zhao, Eric Bodden: **Effective API navigation and reuse.** 7-12
-    Manabu Ohta, Ryohei Inoue, Atsuhiko Takasu: **Empirical evaluation of active sampling for CRF-based analysis of pages.** 13-18
-    Qunzhi Zhou, Viktor K. Prasanna: **Workflow management of simulation based computation processes in transportation domain.** 19-24

Source: <http://www.informatik.uni-trier.de/~ley/db/conf/iri/iri2010.html>

# Research Question

- RQ1: What are the scientific **collaboration patterns** in the IRI research community?
- RQ2: Who are the **prominent researchers** in the IRI community?

# Methodology

- Developed a simple **web focused crawler** program to download literature information about all IRI papers published between **2003 and 2010** from **IEEE Xplore** and **DBLP**.
  - **767** paper
  - **1599** distinct author
- Developed a program to convert the list of coauthors into the **format of a network file** which can be readable by social network analysis software.
- **UCInet** and **Pajek** were used in this study for the social network analysis.

# Top10 prolific authors (IRI 2003-2010)

1. Stuart Harvey Rubin
2. Taghi M. Khoshgoftaar
3. Shu-Ching Chen
4. Mei-Ling Shyu
5. Mohamed E. Fayad
6. Reda Alhajj
7. Du Zhang
8. Wen-Lian Hsu
9. Jason Van Hulse
10. Min-Yuh Day



# Data Analysis and Discussion

- **Closeness Centrality**
  - Collaborated widely
- **Betweenness Centrality**
  - Collaborated diversely
- **Degree Centrality**
  - Collaborated frequently
- **Visualization of Social Network Analysis**
  - Insight into the structural characteristics of research collaboration networks

# Top 20 authors with the highest **closeness** scores

Rank	ID	Closeness	Author
1	3	0.024675	Shu-Ching Chen
2	1	0.022830	Stuart Harvey Rubin
3	4	0.022207	Mei-Ling Shyu
4	6	0.020013	Reda Alhajj
5	61	0.019700	Na Zhao
6	260	0.018936	Min Chen
7	151	0.018230	Gordon K. Lee
8	19	0.017962	Chengcui Zhang
9	1043	0.017962	Isai Michel Lombera
10	1027	0.017962	Michael Armella
11	443	0.017448	James B. Law
12	157	0.017082	Keqi Zhang
13	253	0.016731	Shahid Hamid
14	1038	0.016618	Walter Z. Tang
15	959	0.016285	Chengjun Zhan
16	957	0.016285	Lin Luo
17	956	0.016285	Guo Chen
18	955	0.016285	Xin Huang
19	943	0.016285	Sneh Gulati
20	960	0.016071	Sheng-Tun Li

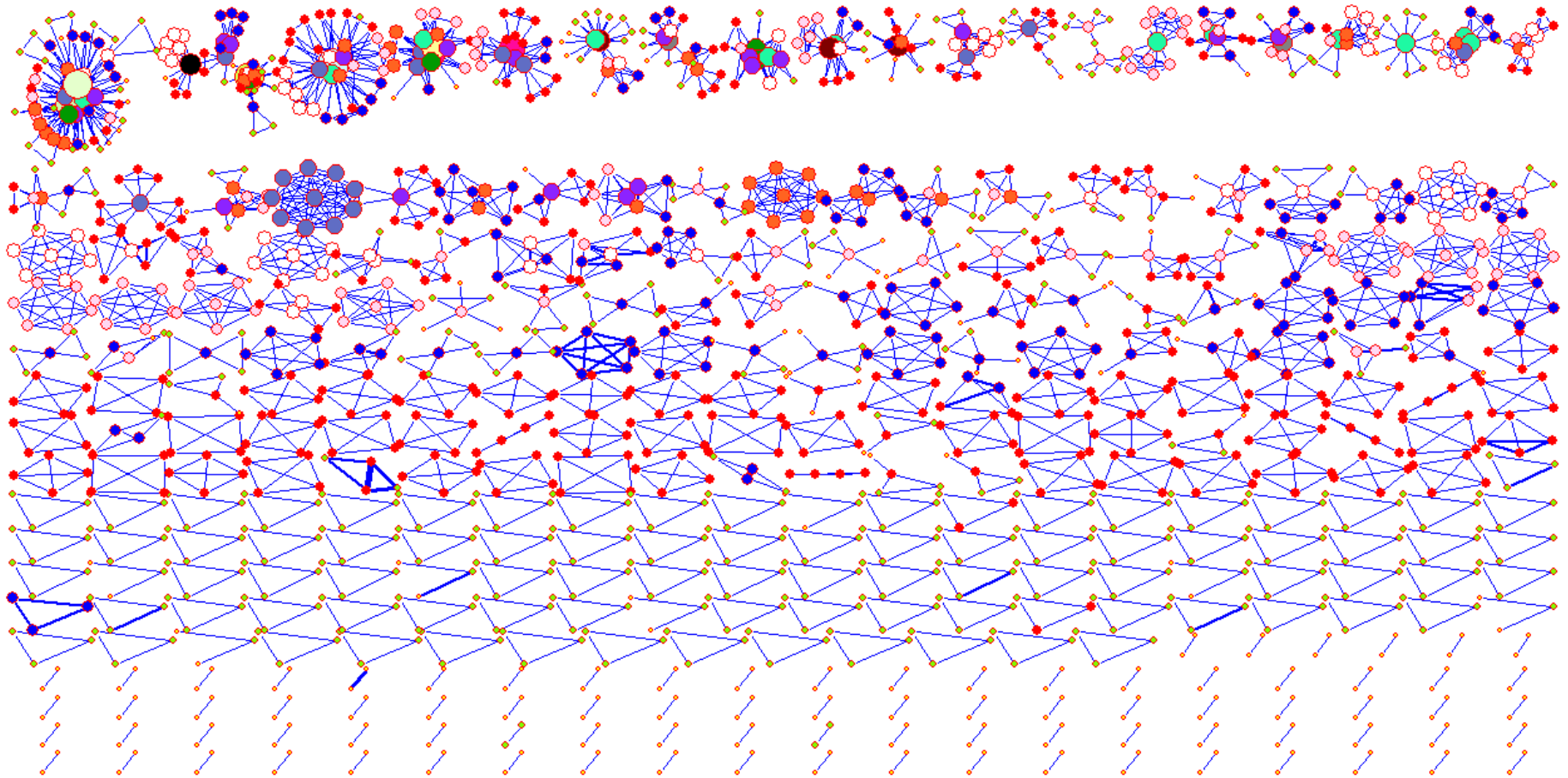
# Top 20 authors with the highest **betweenness** scores

Rank	ID	Betweenness	Author
1	1	0.000752	Stuart Harvey Rubin
2	3	0.000741	Shu-Ching Chen
3	2	0.000406	Taghi M. Khoshgoftaar
4	66	0.000385	Xingquan Zhu
5	4	0.000376	Mei-Ling Shyu
6	6	0.000296	Reda Alhajj
7	65	0.000256	Xindong Wu
8	19	0.000194	Chengcui Zhang
9	39	0.000185	Wei Dai
10	15	0.000107	Narayan C. Debnath
11	31	0.000094	Qianhui Althea Liang
12	151	0.000094	Gordon K. Lee
13	7	0.000085	Du Zhang
14	30	0.000072	Baowen Xu
15	41	0.000067	Hongji Yang
16	270	0.000060	Zhiwei Xu
17	5	0.000043	Mohamed E. Fayad
18	110	0.000042	Abhijit S. Pandya
19	106	0.000042	Sam Hsu
20	8	0.000042	Wen-Lian Hsu

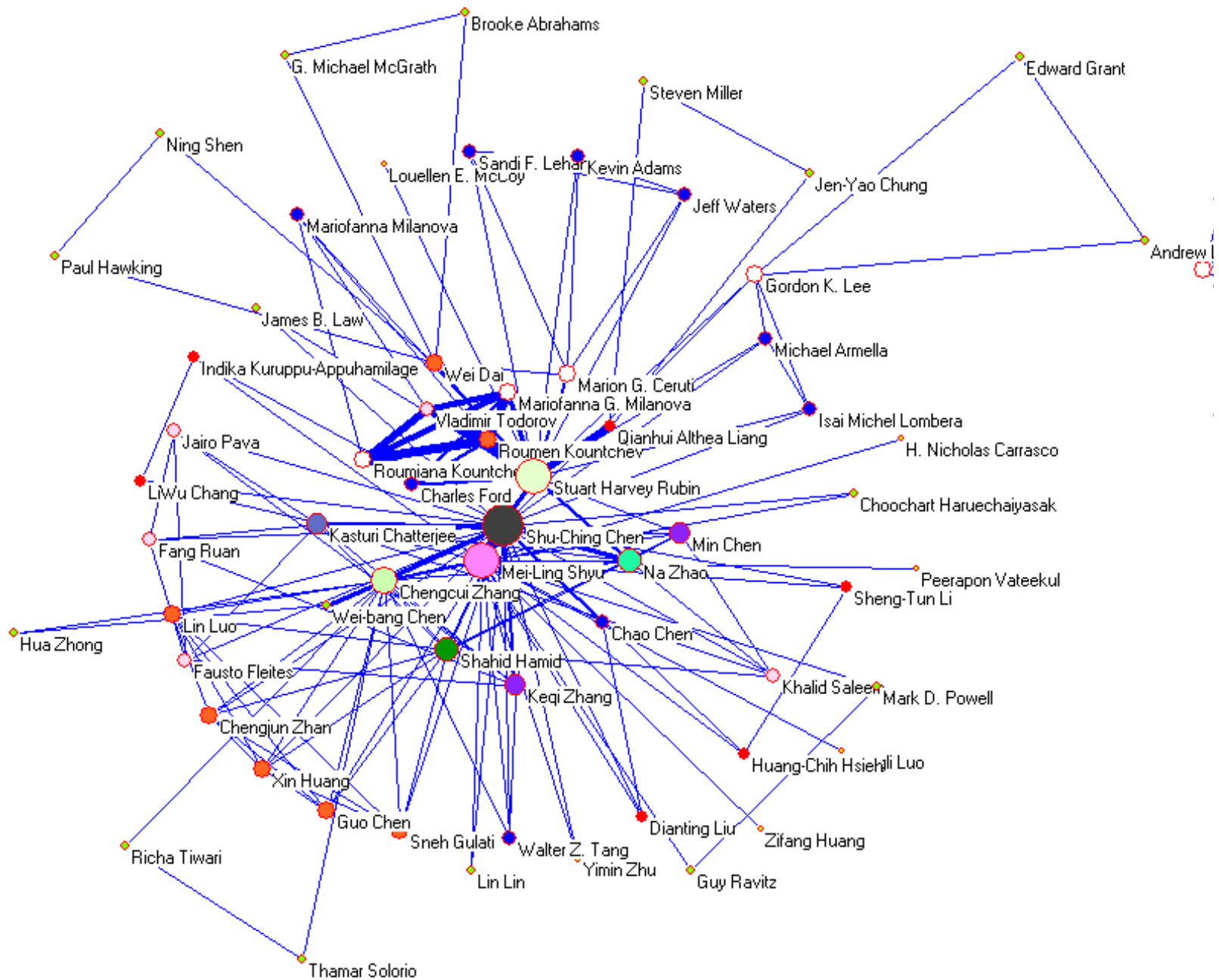
# Top 20 authors with the highest degree scores

Rank	ID	Degree	Author
1	3	0.035044	Shu-Ching Chen
2	1	0.034418	Stuart Harvey Rubin
3	2	0.030663	Taghi M. Khoshgoftaar
4	6	0.028786	Reda Alhajj
5	8	0.028786	Wen-Lian Hsu
6	10	0.024406	Min-Yuh Day
7	4	0.022528	Mei-Ling Shyu
8	17	0.021277	Richard Tzong-Han Tsai
9	14	0.017522	Eduardo Santana de Almeida
10	16	0.017522	Roumen Kountchev
11	40	0.016896	Hong-Jie Dai
12	15	0.015645	Narayan C. Debnath
13	9	0.015019	Jason Van Hulse
14	25	0.013767	Roumiana Kountcheva
15	28	0.013141	Silvio Romero de Lemos Meira
16	24	0.013141	Vladimir Todorov
17	23	0.013141	Mariofanna G. Milanova
18	5	0.013141	Mohamed E. Fayad
19	19	0.012516	Chengcui Zhang
20	18	0.011890	Waleed W. Smari

# Visualization of IRI (IEEE IRI 2003-2010) co-authorship network (global view)

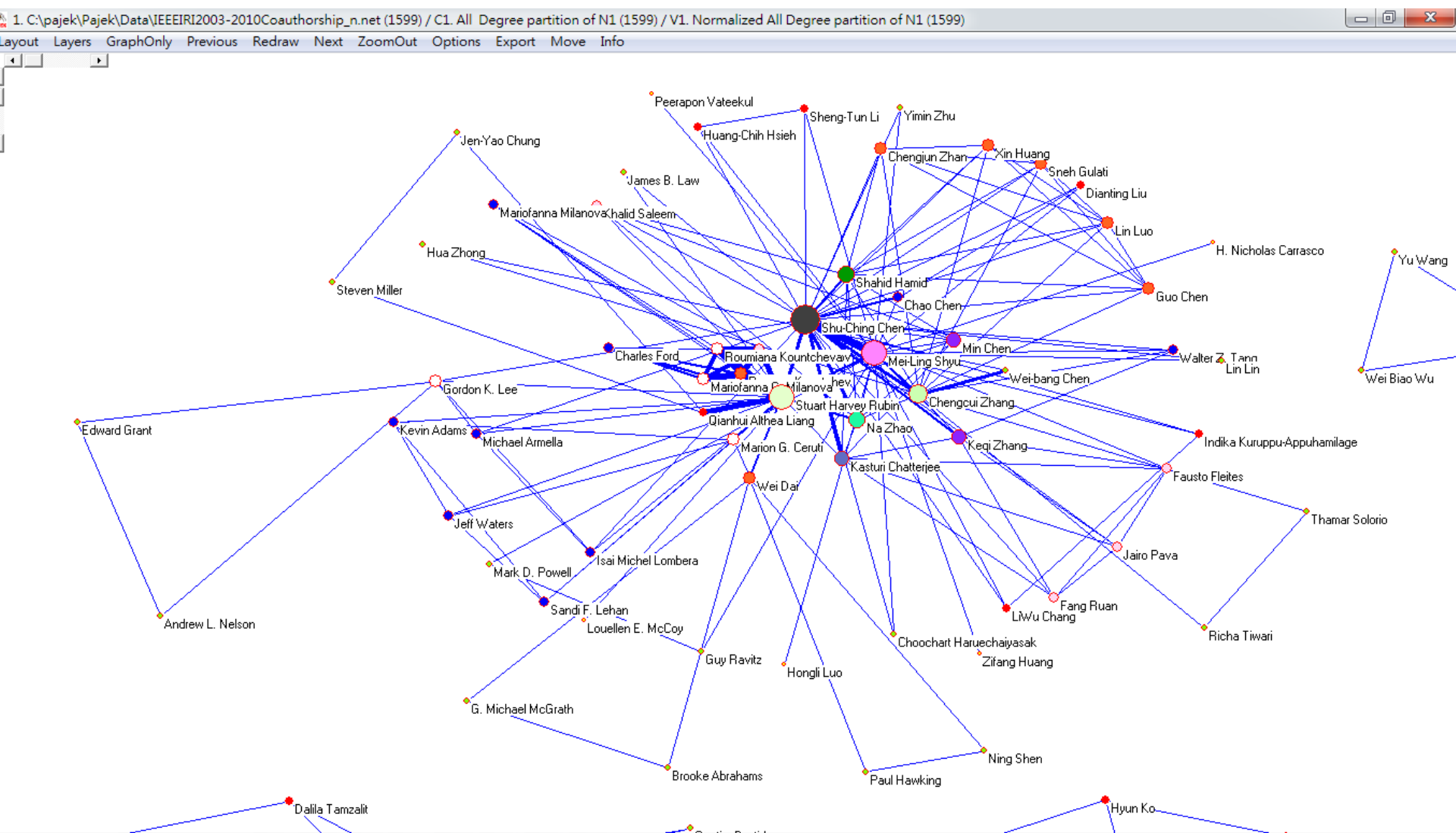


Source: Min-Yuh Day, Sheng-Pao Shih, Weide Chang (2011),  
"Social Network Analysis of Research Collaboration in Information Reuse and Integration"



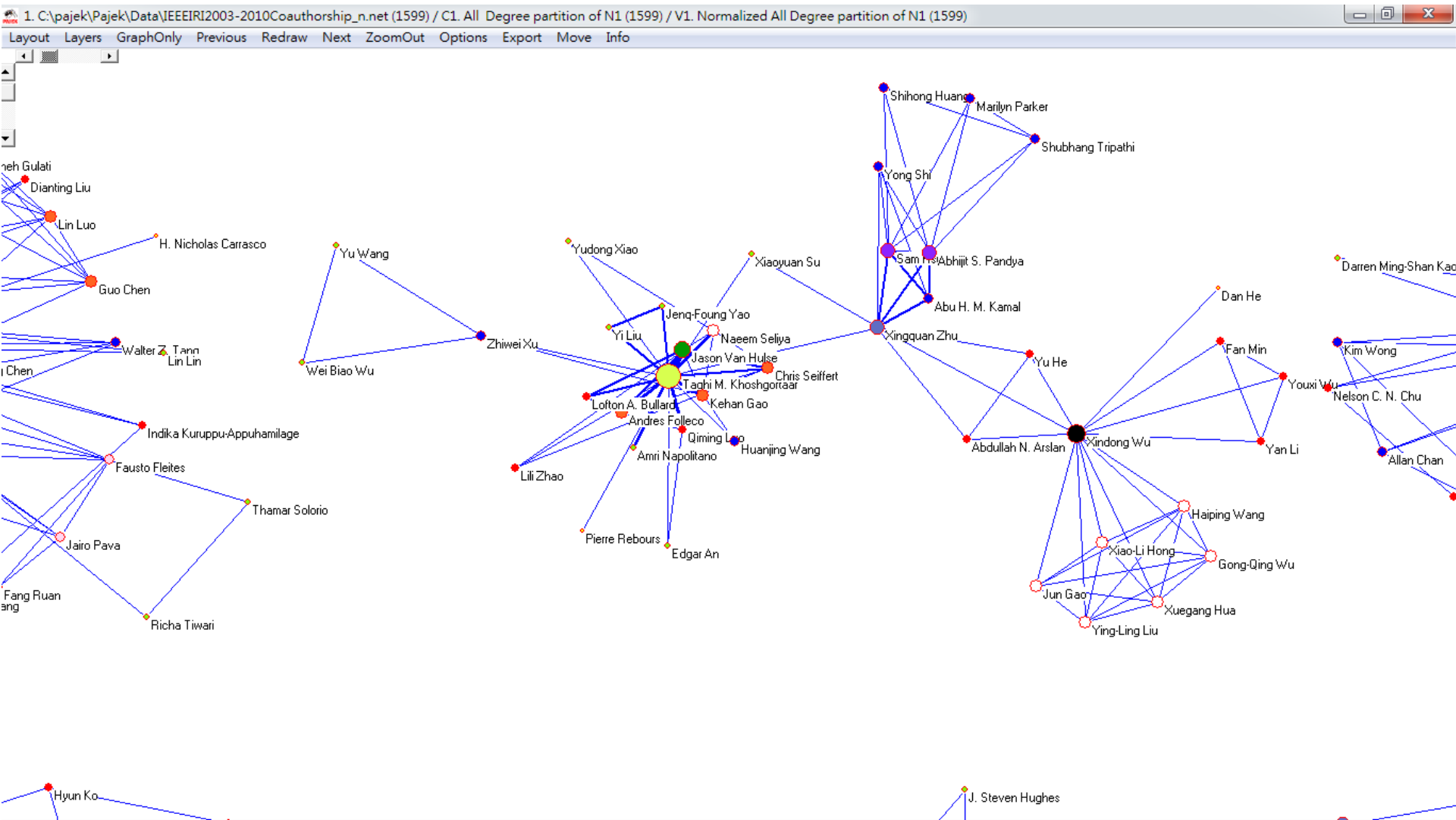
Source: Min-Yuh Day, Sheng-Pao Shih, Weide Chang (2011),  
 "Social Network Analysis of Research Collaboration in Information Reuse and Integration"

# Visualization of Social Network Analysis



Source: Min-Yuh Day, Sheng-Pao Shih, Weide Chang (2011),  
"Social Network Analysis of Research Collaboration in Information Reuse and Integration"

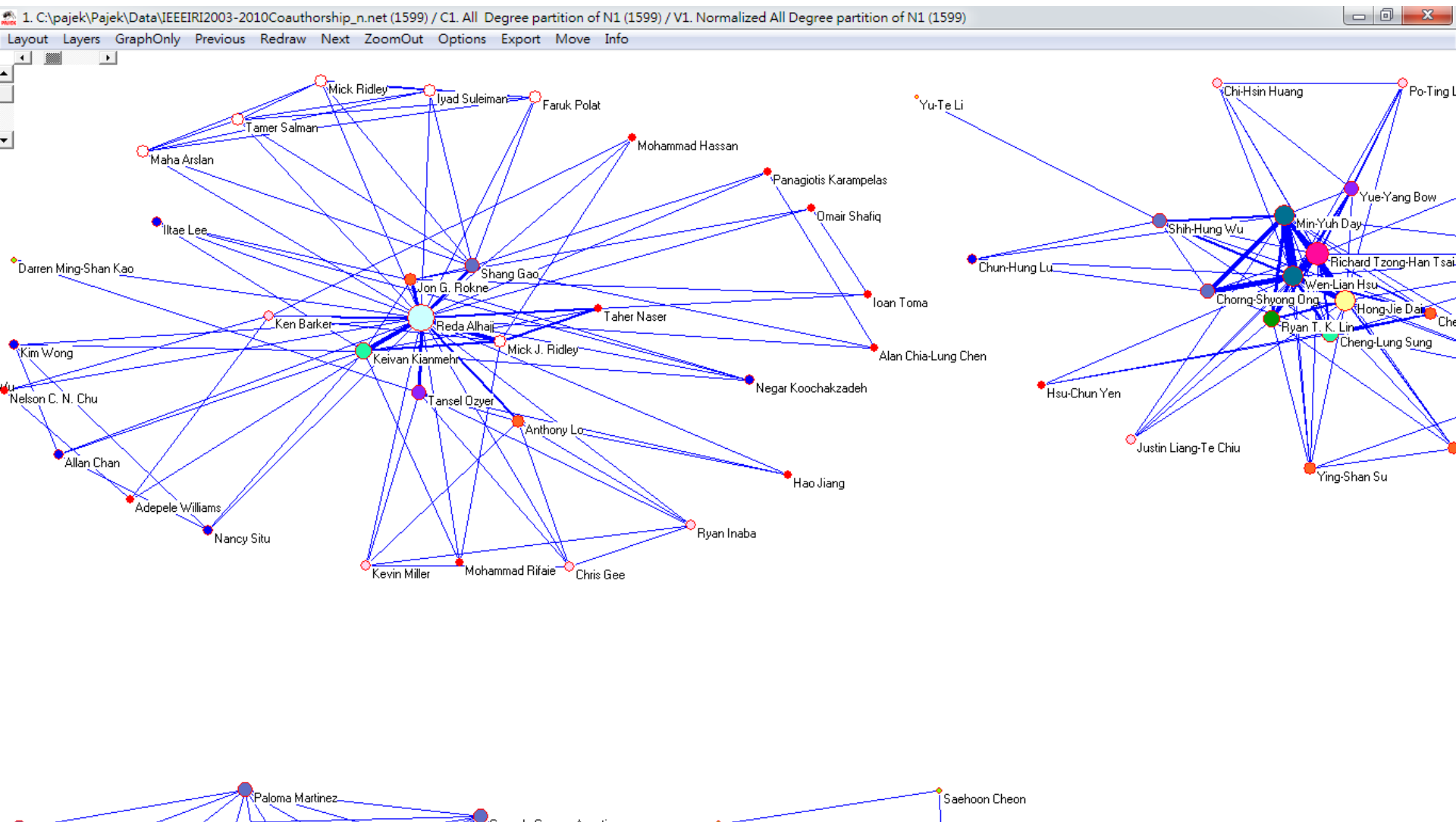
# Visualization of Social Network Analysis



Source: Min-Yuh Day, Sheng-Pao Shih, Weide Chang (2011),  
"Social Network Analysis of Research Collaboration in Information Reuse and Integration"



# Visualization of Social Network Analysis

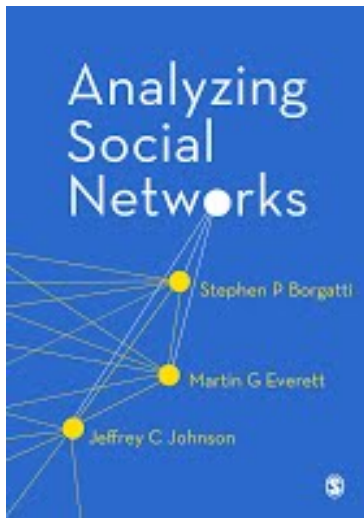


Source: Min-Yuh Day, Sheng-Pao Shih, Weide Chang (2011),  
"Social Network Analysis of Research Collaboration in Information Reuse and Integration"

# **Tools of Social Network Analysis**

# Social Network Analysis (SNA) Tools

- **NetworkX**
- **igraph**
- **Gephi**
- **UCINet**
- **Pajek**



# Tools of Social Network Analysis

- Focused Desktop Tools
  - **Gephi**
  - Ucinet
  - Pajek
  - NodeXL
  - Cytoscape

# Tools of Social Network Analysis

- Developer Tools
  - NetworkX
  - iGraph
  - SNAP
  - sigma.js

# Gephi



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## The Open Graph Viz Platform

Gephi is the leading visualization and exploration software for all kinds of graphs and networks. Gephi is open-source and free.

Runs on Windows, Mac OS X and Linux.

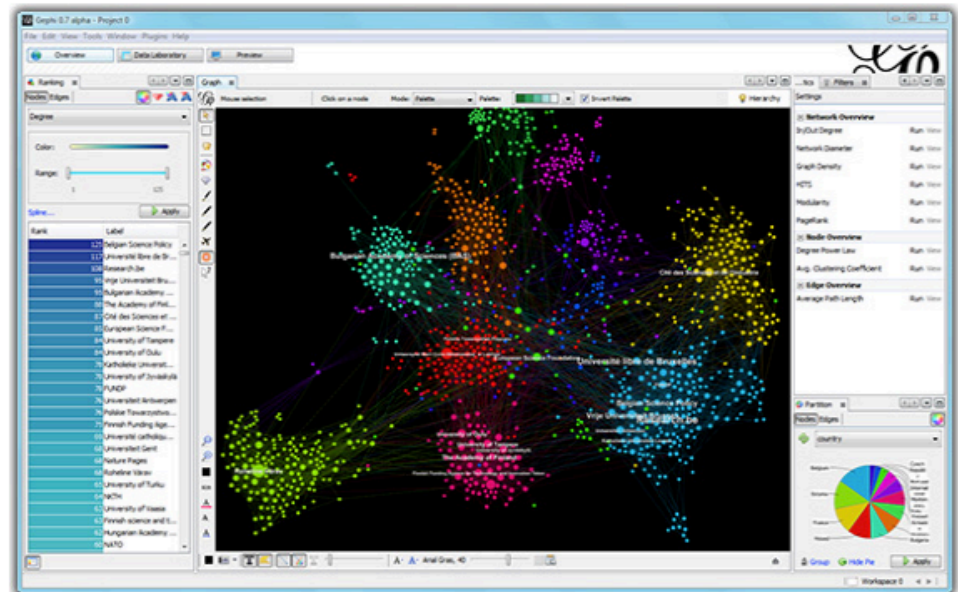
[Learn More on Gephi Platform](#)



[Release Notes](#) | [System Requirements](#)

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► [Videos](#)



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### APPLICATIONS

- ✓ **Exploratory Data Analysis:** intuition-oriented analysis by networks manipulations in real time.
- ✓ **Link Analysis:** revealing the underlying structures of associations between objects.
- ✓ **Social Network Analysis:** easy creation of social

Like Photoshop™ for graphs.

— the Community

### LATEST NEWS

► [Gephi updates with 0.9.1 version](#)

### PAPERS



<https://gephi.org/>

# UCINET

## UCINET Software

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### Links

- Analytic Technologies
  - NetDraw
  - E-Net
- LINKS Center
  - Workshop
- Steve Borgatti

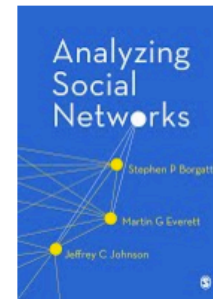
New! UCINET-oriented book on social network analysis now available! See [details](#).

UCINET 6 for Windows is a software package for the analysis of social network data. It was developed by Lin Freeman, Martin Everett and Steve Borgatti. It comes with the NetDraw network visualization tool.

If you use the software, please cite it. Here is a sample citation:

- **Borgatti, S.P., Everett, M.G. and Freeman, L.C. 2002. Ucinet for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies.**

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### Download and/or Purchase

- The program can be [downloaded](#) and used for free for 90 days. In addition, students can [purchase](#) the downloaded program for \$40. Faculty and government can purchase the downloaded program for \$150, and all others pay \$250. Site licenses and extremely generous volume discounts are available.
- Note that all purchases are provided as electronic downloads. If necessary you can order a CD from us for an exorbitant fee, but there is no reason to do this. Purchasers of the software are welcome to burn their own CDs at will. They are also free to download the program to all of their computers.
- For more details, including questions about taxes, shipping costs, payment methods, etc., please visit the [Order Info](#) page.

### News

#### [Week-long workshop on SNA](#)

The LINKS Center at the University of Kentucky is offering its annual 1-week summer workshop on social network analysis June 6-10, 2016 on the University of Kentucky campus ...  
Posted Mar 15, 2016, 12:54 PM by Steve Borgatti

Showing posts 1 - 1 of 9.

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### Current Version

**Version 6.614 | 22 May 2016** Changed Network|Compare aggregate proximity matrices|partition to be able to handle missing values Changed the CLI's IPF routine to default to treating diagonal values

# Pajek



## Networks / Pajek



## Program for Large Network Analysis

---

In January 2008 this page was replaced by [Pajek Wiki](#).

---

Pajek runs on Windows and is free for noncommercial use.

[DOWNLOAD Pajek](#)

Data: [test networks](#), [GPHs](#), [GEDs](#), [PDB files](#).

[Screenshots](#); [History](#); [Manual \(pdf\)](#); [Papers/presentations](#); [Applications](#); [in News](#); Examples: [SVG](#), [PDF](#).

[How to ?](#) [English](#) / [Slovene](#) / [Japanese](#) (problems with IE - download and use Acrobat reader).

[Pajek nicely runs on Linux via Wine](#), [Converting Excel/text into Pajek format](#),  
[Pajek to SVG animation](#), [WoS to Pajek](#).

Slides from [NICTA workshop](#), Sydney, Australia, June 14-17, 2005.

Slides from [workshop at GD'05](#), Limerick, Ireland, Sept 11-14, 2005.

[Pajek workshop](#) at [XXVIII Sunbelt Conference](#), St. Pete Beach, Florida, USA, January 22-27, 2008: [slides](#).

[Network analysis course](#) at [ECPR Summer School in Methods and Techniques](#), Ljubljana, Slovenia, July 30 - August 16, 2008.

W. de Nooy, A. Mrvar, V. Batagelj: *Exploratory Social Network Analysis with Pajek*, CUP, January 2005; ESNA page.  
P. Doreian, V. Batagelj, A. Ferligoj: *Generalized Blockmodeling*, CUP, November 2004.

Chapter about Pajek: V. Batagelj, A. Mrvar: *Pajek - Analysis and Visualization of Large Networks*.  
in Jünger, M., Mutzel, P., (Eds.) *Graph Drawing Software*. Springer, Berlin 2003. p. 77-103 / [Amazon](#).

An improved version of the paper presented at [Sunbelt'97](#) was published in [Connections](#) 21(1998)2, 47-57 - V. Batagelj,  
A. Mrvar: *Pajek - Program for Large Network Analysis* ([PDF](#); [PRISON.KIN](#)).


Our layouts for *Graph-Drawing Competitions*: [GD95](#), [GD96](#), [GD97](#), [GD98](#), [GD99](#), [GD00](#), [GD01](#) and [GD05](#).

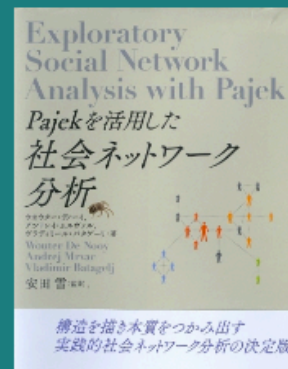
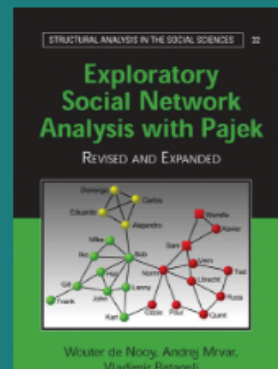
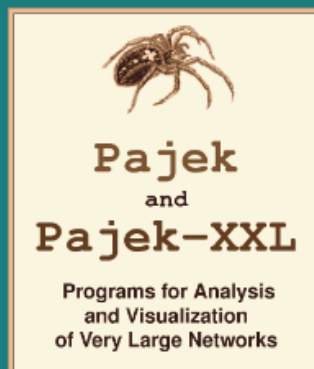
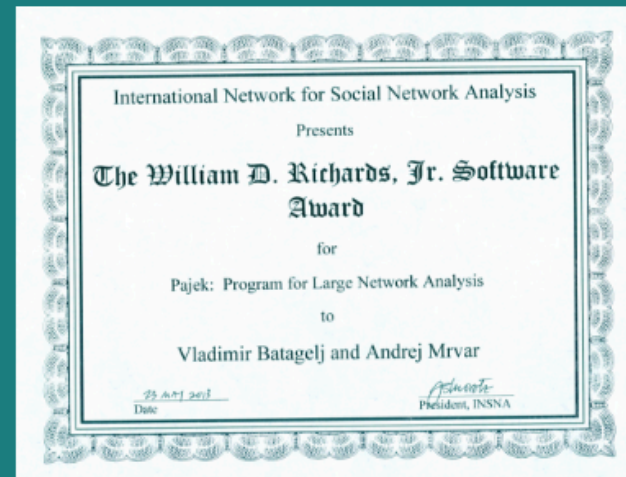
<http://vlado.fmf.uni-lj.si/pub/networks/pajek/>



# Pajek

## Pajek: analysis and visualization of large networks

	Ver.	32 bit	64 bit
May 10, 2016	4.10	<b>Web Start</b>  <b>Install Shield</b> <b>Install-Zip</b> <b>Portable</b>	<b>Web Start</b>  <b>Install Shield</b> <b>Install-Zip</b> <b>Portable</b>
March 1, 2016	4.09	<b>Install Shield</b> <b>Install-Zip</b> <b>Portable</b>	<b>Install Shield</b> <b>Install-Zip</b> <b>Portable</b>
Sept. 25, 2011	2.05	zip	zip
		<b>Pajek mailing list</b>	<b>Datasets</b>



# NodeXL

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## NodeXL: Network Overview, Discovery and Exploration for Excel

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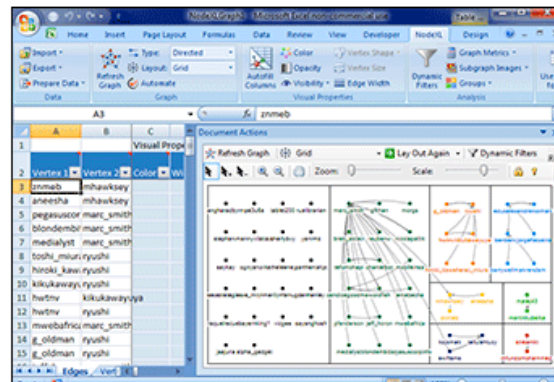
CURRENT	NodeXL Basic Excel Template 2014
DATE	Thu Jan 23, 2014 at 7:00 AM
STATUS	Beta
DOWNLOADS	213,252
RATING	★★★★☆ 17 ratings <a href="#">Review this release</a>

MOST HELPFUL REVIEWS

★★★★☆ Install on Windows 10 Pro 64-bit I gives an error message: 'Customized functionality in this application will not work because the c...  
(more)

NodeXL Basic is a free, open-source template for Microsoft® Excel® 2007, 2010, 2013 and 2016 that makes it easy to explore network graphs. With NodeXL, you can enter a network edge list in a worksheet, click a button and see your graph, all in the familiar environment of the Excel window.

NodeXL Pro offers additional features that extend NodeXL Basic, providing easy access to social media network data streams, advanced network metrics, and text and sentiment analysis, and



<https://nodexl.codeplex.com/>

# Cytoscape



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# Cytoscape

Network Data Integration, Analysis, and Visualization in a Box

Introduction

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# NetworkX

## NetworkX

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### High-productivity software for complex networks

NetworkX is a Python language software package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.



#### [Documentation](#)

*all documentation*

#### [Examples](#)

*using the library*

#### [Reference](#)

*all functions and methods*

### Features

- Python language data structures for graphs, digraphs, and multigraphs.
- Many standard graph algorithms
- Network structure and analysis measures
- Generators for classic graphs, random graphs, and synthetic networks
- Nodes can be "anything" (e.g. text, images, XML records)
- Edges can hold arbitrary data (e.g. weights, time-series)
- Open source [BSD license](#)
- Well tested: more than 1800 unit tests, >90% code coverage
- Additional benefits from Python: fast prototyping, easy to teach, multi-platform

#### Versions

#### Latest Release

networkx-1.11  
30 January 2016  
[downloads](#) | [docs](#) | [pdf](#)

#### Development

2.0dev  
[github](#) | [docs](#) | [pdf](#)  
build passing  
coverage 94%

#### Contact

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<https://networkx.github.io/>

# igraph



## igraph – The network analysis package

igraph is a collection of network analysis tools with the emphasis on **efficiency**, **portability** and ease of use. igraph is **open source** and free. igraph can be programmed in **R**, **Python** and **C/C++**.

igraph R package

python-igraph

igraph C library

R/igraph 1.0.0

Repositories at Github

R/igraph 0.7.1

C/igraph 0.7.1

R/igraph 0.7.0

python-igraph 0.7.0

C/igraph 0.7.0

R/igraph 0.6.5

## Recent news

### R/igraph 1.0.0

June 24, 2015

#### Release Notes

This is a new major release, with a lot of UI changes. We tried to make it easier to use, with short and easy to remember, consistent function names. Unfortunately

<http://igraph.org/redirect.html>





- SNAP for C++ ▶
- SNAP for Python ▶
- SNAP Datasets ▶
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- People
- Papers
- Citing SNAP
- Links
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## Open positions

Open research positions in **SNAP** group are available [here](#).

## Stanford Network Analysis Project

### • SNAP for C++: Stanford Network Analysis Platform

Stanford **Network Analysis Platform (SNAP)** is a general purpose network analysis and graph mining library. It is written in C++ and easily scales to massive networks with hundreds of millions of nodes, and billions of edges. It efficiently manipulates large graphs, calculates structural properties, generates regular and random graphs, and supports attributes on nodes and edges. SNAP is also available through the [NodeXL](#) which is a graphical front-end that integrates network analysis into Microsoft Office and Excel.

### • Snap.py: SNAP for Python

Snap.py is a Python interface for SNAP. It provides performance benefits of SNAP, combined with flexibility of Python. Most of the SNAP C++ functionality is available via Snap.py in Python.

### • Stanford Large Network Dataset Collection

A collection of more than 50 large network datasets from tens of thousands of nodes and edges to tens of millions of nodes and edges. It includes social networks, web graphs, road networks, internet networks, citation networks, collaboration networks, and communication networks.

### • Tutorials

Tutorials on using SNAP, on methods to analyze large network data, on ways how to think about networks and how to model them at the level of network structure, and on methods to study evolution and dynamics of diffusion and cascading behavior in networks.

- Tutorial on [Large Scale Network Analytics with SNAP](#) will be held at [WWW-15](#) conference, Florence, Italy, May 18, 2015. [More info](#).

# sigma.js

sigma.js

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TUTORIAL

REFERENCES



Sigma is a JavaScript library **dedicated to graph drawing**. It makes easy to publish networks on Web pages, and allows developers to integrate network exploration in rich Web applications.

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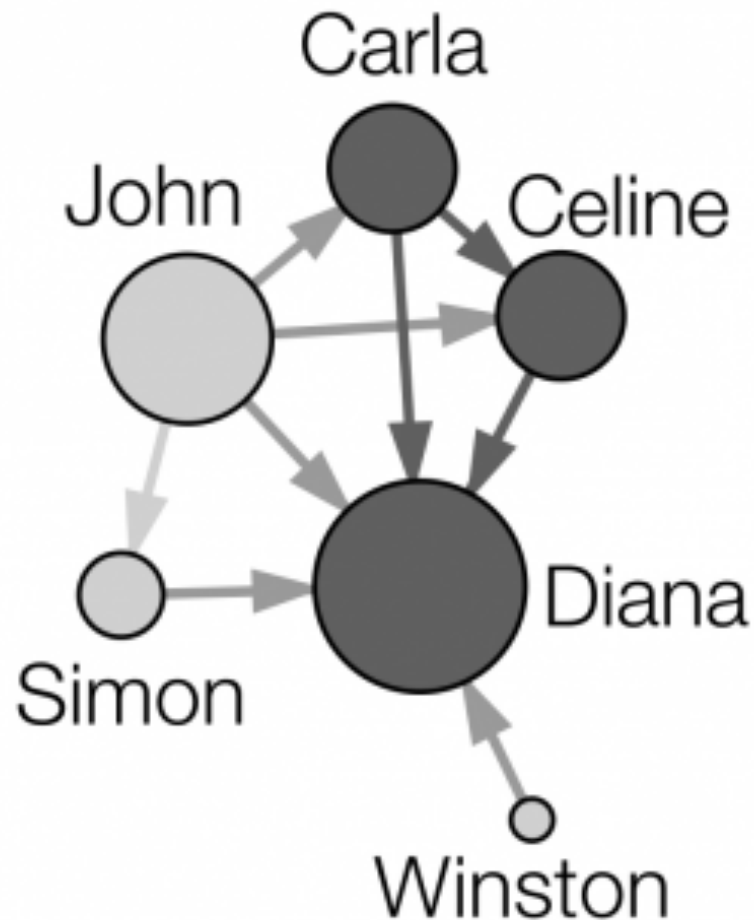
SCIENCESPO - MÉDIALAB

<http://sigmajs.org/>

# **Gephi: Social Network Analysis and Visualization**



# Network Analysis and Visualization with Gephi



## Nodes

Id,Label,Attribute

1,John,1

2,Carla,2

3,Simon,1

4,Celine,2

5,Winston,1

6,Diana,2

## Edges

Source,Target

1,2

1,3

1,4

1,6

2,4

2,6

3,6

4,6

5,6

# Nodes and Edges

## CSV Text Data for Gephi

### Nodes1.csv

```
Id,Label,Attribute
1,John,1
2,Carla,2
3,Simon,1
4,Celine,2
5,Winston,1
6,Diana,2
```

### Edges1.csv

```
Source,Target
1,2
1,3
1,4
1,6
2,4
2,6
3,6
4,6
5,6
```

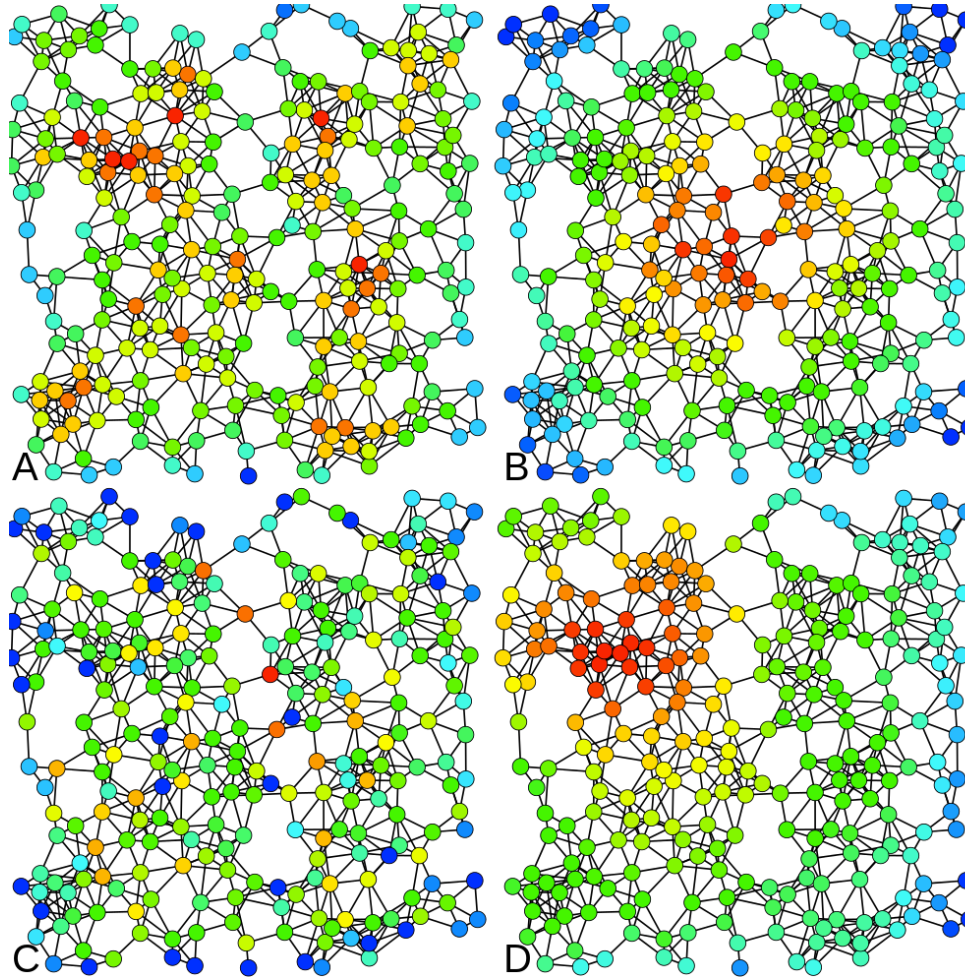
Nodes1.csv

×

```
Id,Label,Attribute
1,John,1
2,Carla,2
3,Simon,1
4,Celine,2
5,Winston,1
6,Diana,2
```

**A = Degree centrality**  
number of connexions

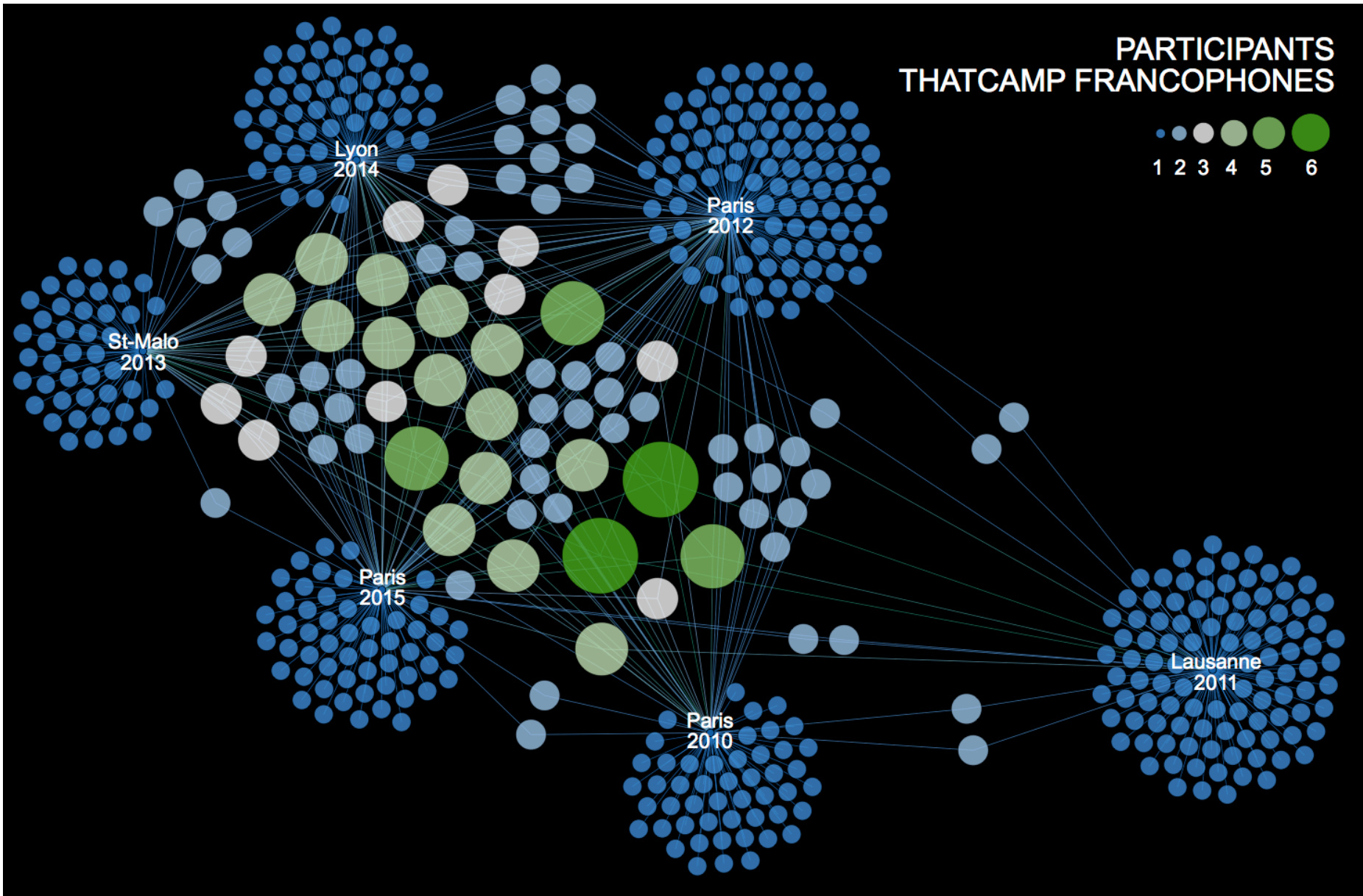
**B = Closeness centrality**  
closeness to the entire network



**C = Betweenness centrality**  
bridges nodes

**D = Eigenvector centrality**  
connection to well-connected nodes

# Conference Participants

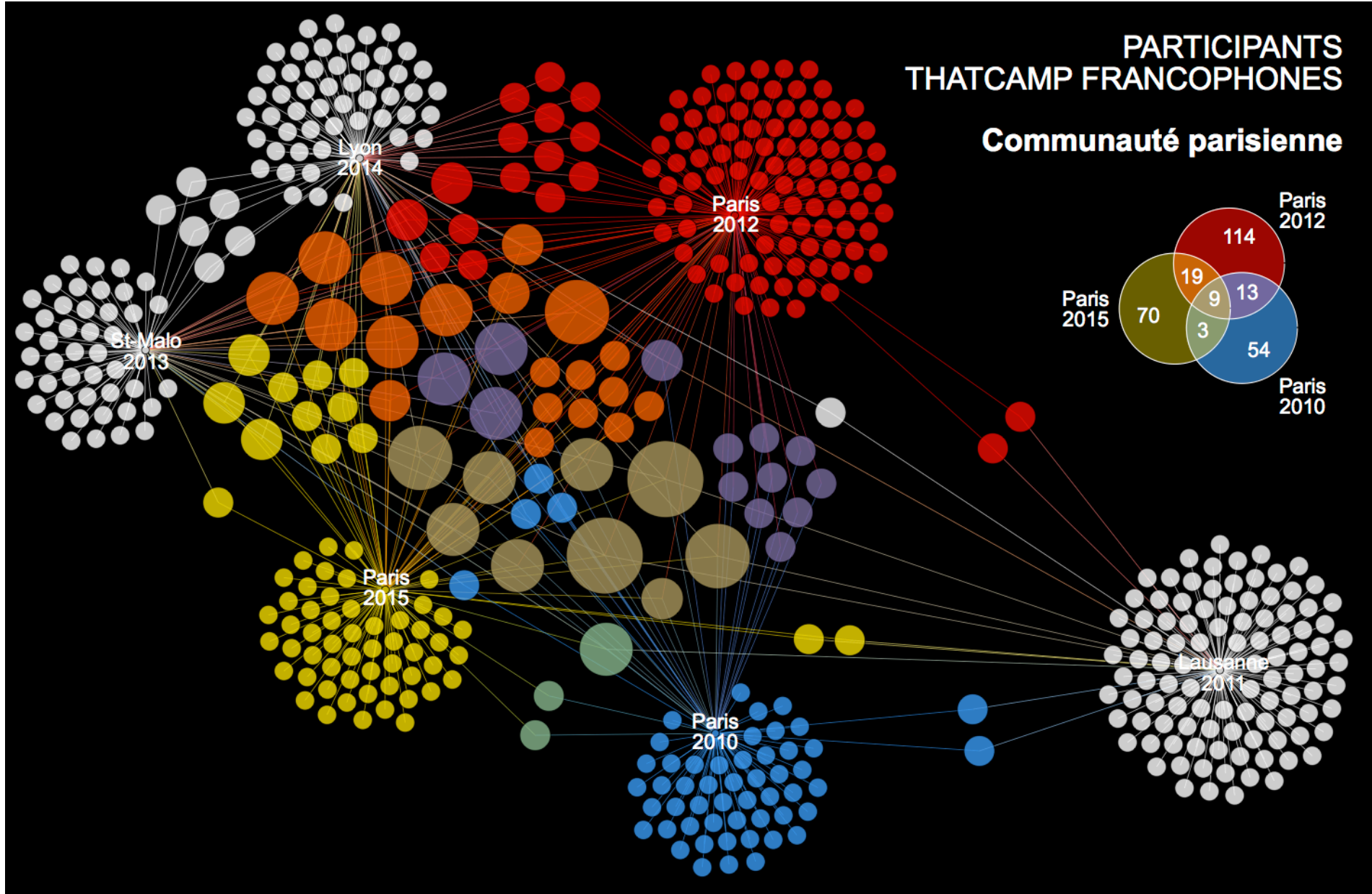
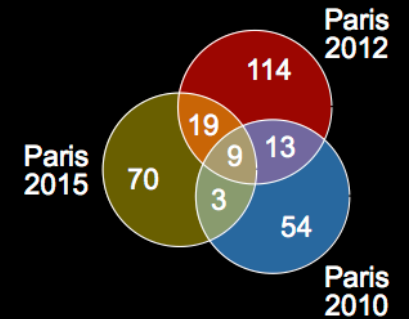




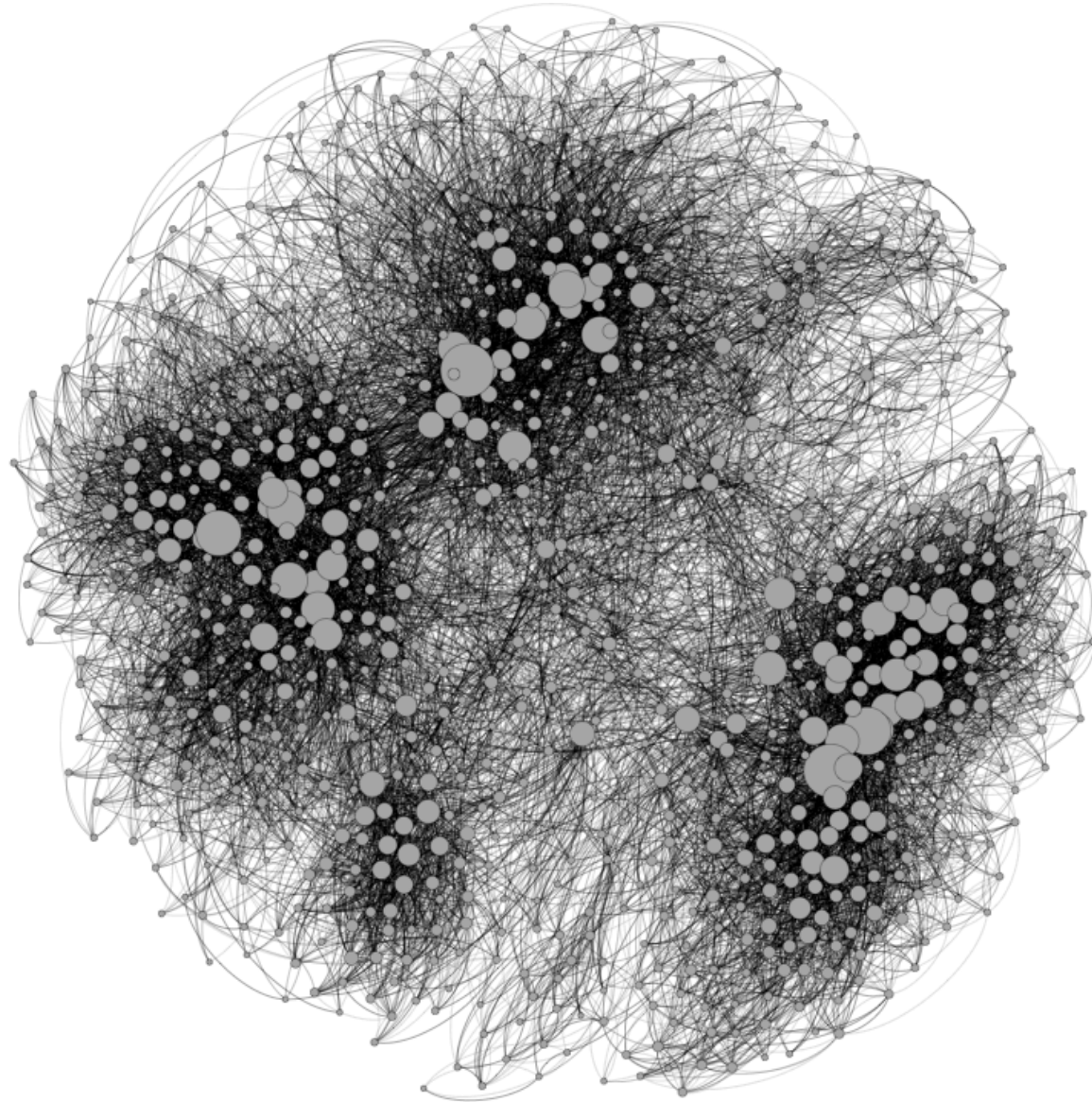
# Conference Participants

## PARTICIPANTS THATCAMP FRANCOPHONES

### Communauté parisienne

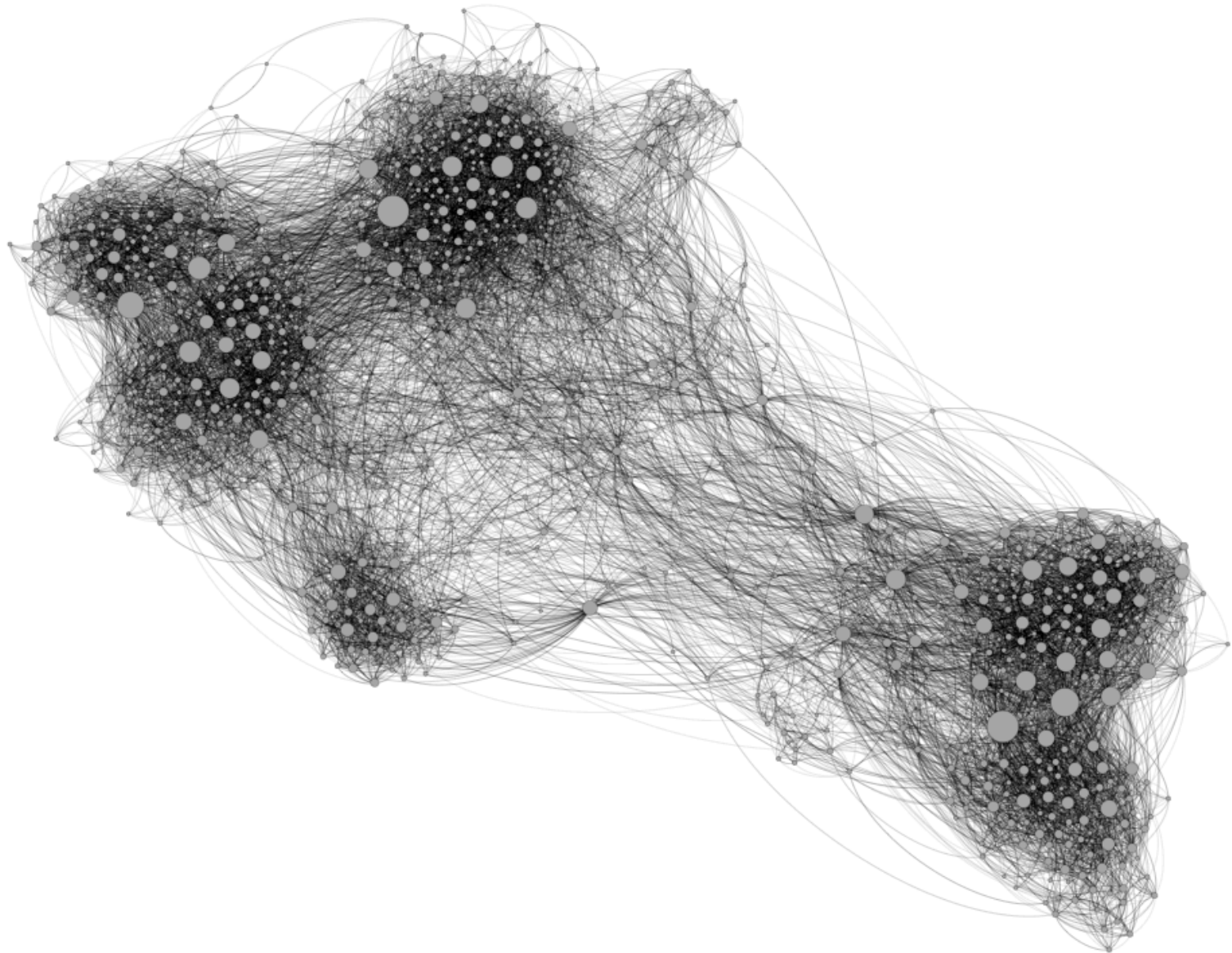


# Fruchterman Reingold





# Force Atlas 2



# Nodes' color

## Weighted In-Degree

The image shows a screenshot of the 'Ranking' dialog box in Gephi, specifically for 'Nodes'. The dialog is titled 'Ranking' and has a close button (X) in the top right corner. Below the title bar, there are two tabs: 'Nodes' (selected) and 'Edges'. To the right of the tabs are four icons: a rainbow circle, a red triangle, a blue 'A', and a red 'A'. Below the tabs is a dropdown menu showing 'Weighted In-Degree'. Underneath the dropdown is a 'Color' section with a horizontal color scale bar. The scale bar has three black triangular markers. Below the color scale is a 'Range' section with a horizontal range slider. The slider has two vertical end caps and is labeled with '0.0' on the left and '210.0' on the right. At the bottom left of the dialog is a 'Spline...' link. At the bottom right is an 'Apply' button with a green play icon.



# Weighted In-Degree



# Network Diameter

## Betweenness Centrality

## Closeness Centrality

Graph Distance settings

**Distance**  
The average graph-distance between all pairs of nodes. Connected nodes have graph distance 1. The diameter is the longest graph distance between any two nodes in the network. (i.e. How far apart are the two most distant nodes).

Directed  Normalize Centralities in [0,1]  
 UnDirected

**Betweenness Centrality:** Measures how often a node appears on shortest paths between nodes in the network.

**Closeness Centrality:** The average distance from a given starting node to all other nodes in the network.

**Eccentricity:** The distance from a given starting node to the farthest node from it in the network.

Cancel OK

Statistics x Filters

Settings


**Network Overview**

Average Degree		Run	●
Avg. Weighted Degree	25.486	Run	?
Network Diameter		Run	●
Graph Density		Run	●
HITS		Run	●
Modularity	0.57	Run	?
PageRank		Run	●
Connected Components		Run	●

**Node Overview**

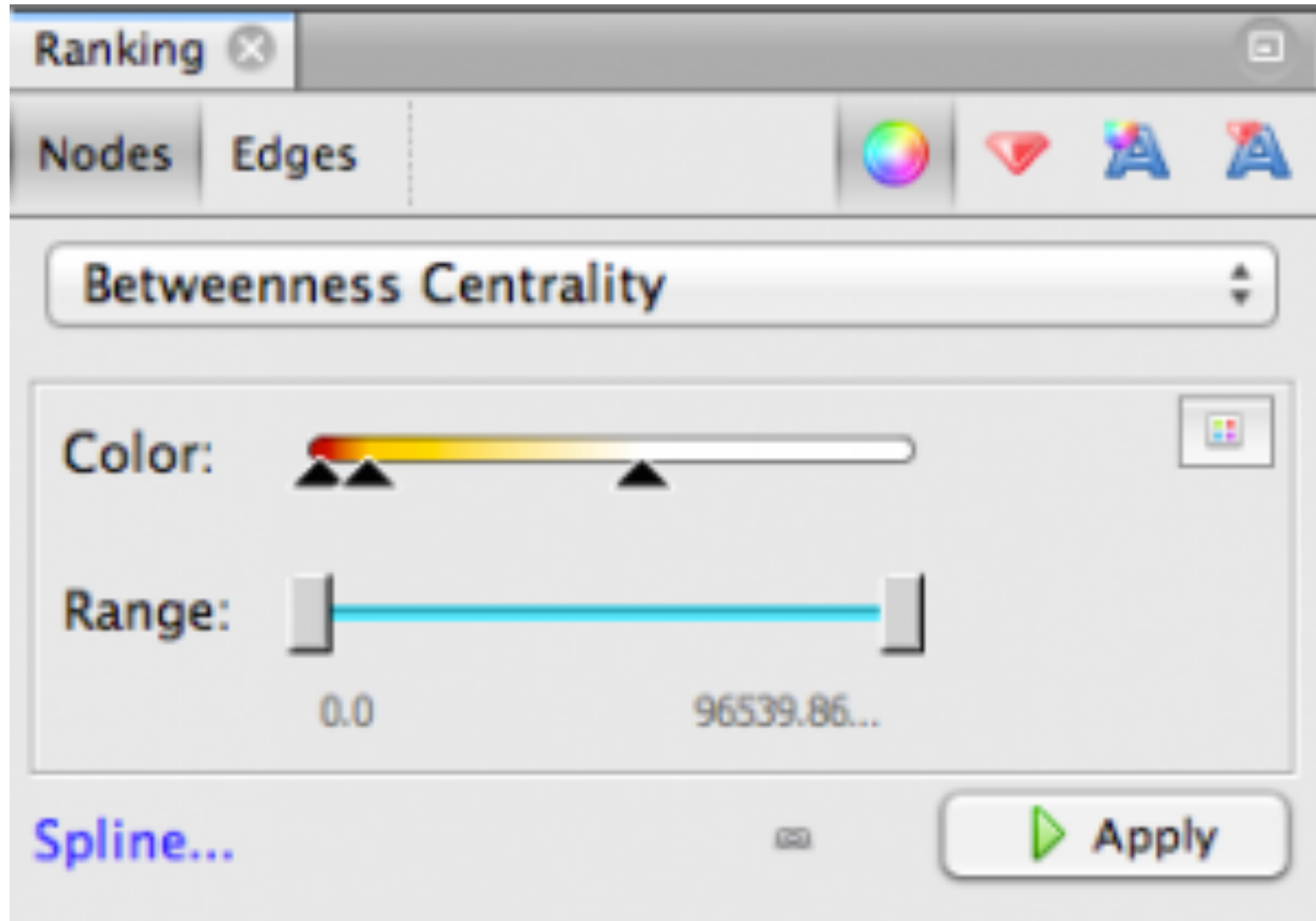
Avg. Clustering Coefficient		Run	●
Eigenvector Centrality		Run	●

**Edge Overview**



# Nodes' color

## Betweenness Centrality

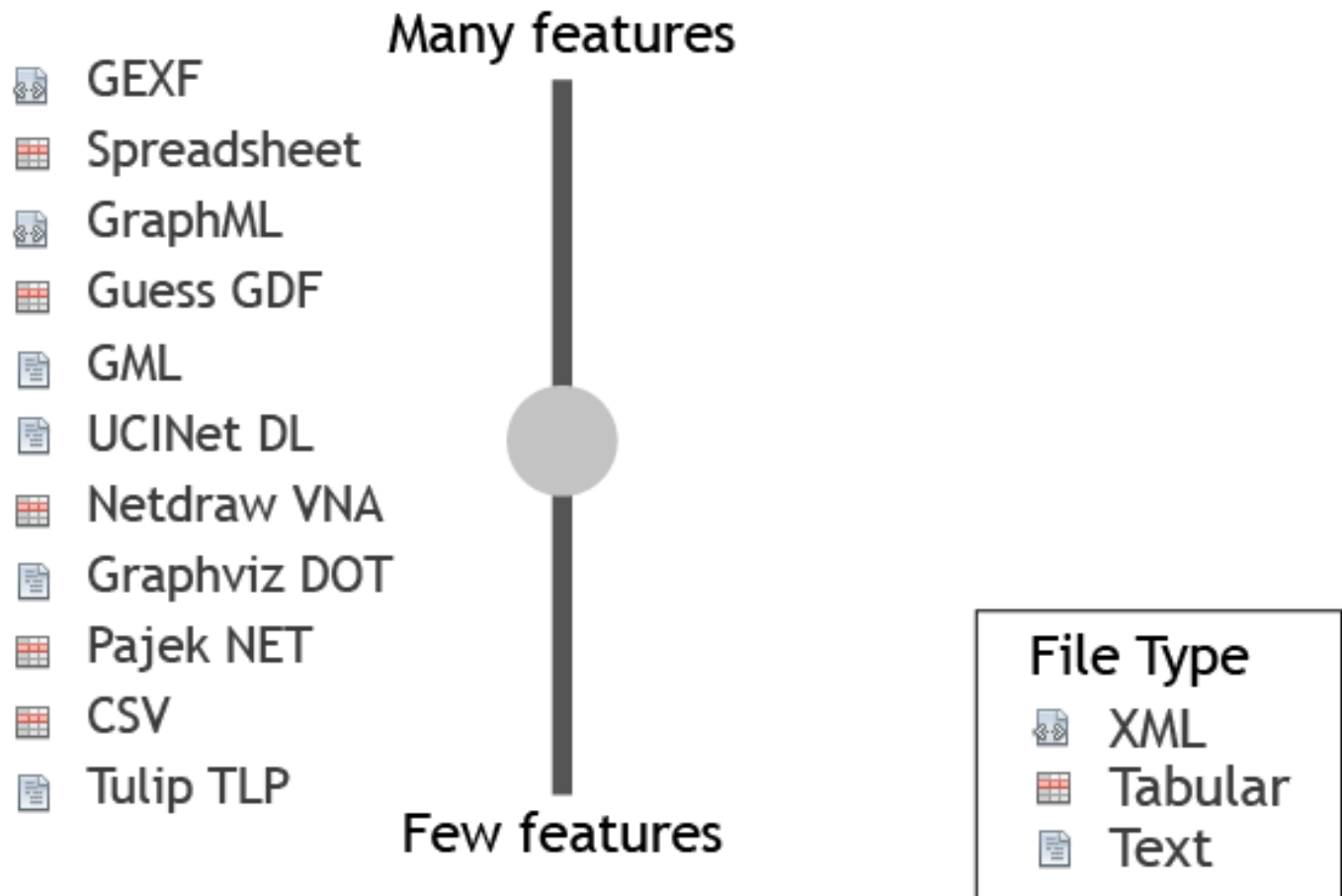


# Gephi Supported Graph Formats

	Edge List/Matrix Structure	XML Structure	Edge Weight	Attributes	Visualization Attributes	Attribute Default Value	Hierarchical Value	Dynamics
CSV	Yes	Yes						
DL Ucinet	Yes		Yes	Yes				
DOT Graphviz			Yes	Yes				
GDF			Yes	Yes	Yes			
GEXF		Yes	Yes	Yes	Yes	Yes	Yes	Yes
GML			Yes	Yes				
GraphML		Yes	Yes	Yes	Yes	Yes		
NET Pajek	Yes		Yes	Yes				
TLP Tulip								
VNA Netdraw			Yes	Yes				
Spreadsheet*			Yes	Yes				Yes

# Gephi Supported Graph Formats

Do you need...





# Gephi



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## The Open Graph Viz Platform

Gephi is the leading visualization and exploration software for all kinds of graphs and networks. Gephi is open-source and free.

Runs on Windows, Mac OS X and Linux.

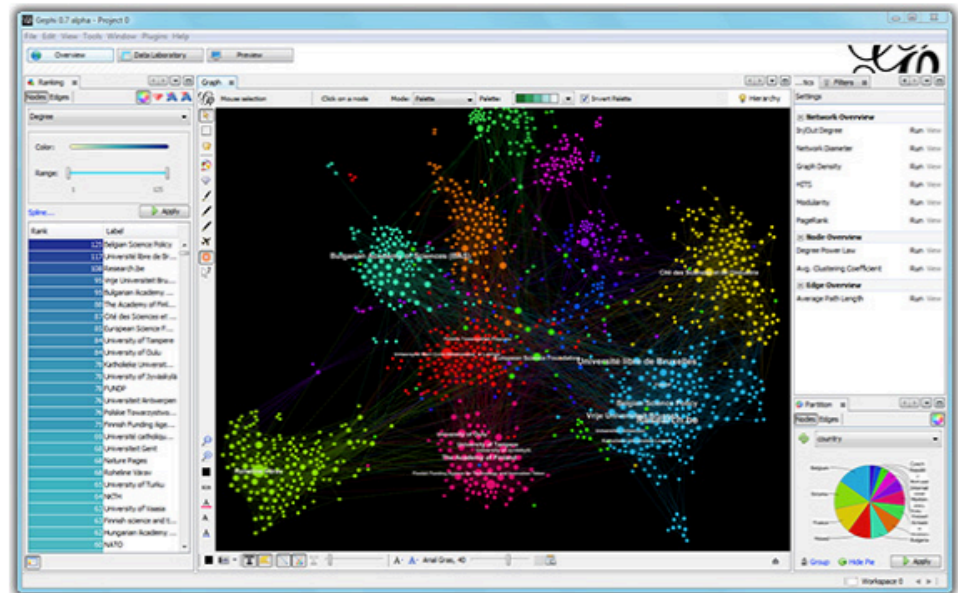
[Learn More on Gephi Platform >](#)



[Release Notes](#) | [System Requirements](#)

► [Features](#)  
► [Quick start](#)

► [Screenshots](#)  
► [Videos](#)



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### APPLICATIONS

- ✓ **Exploratory Data Analysis:** intuition-oriented analysis by networks manipulations in real time.
- ✓ **Link Analysis:** revealing the underlying structures of associations between objects.
- ✓ **Social Network Analysis:** easy creation of social

Like Photoshop™ for graphs.

— the Community

### LATEST NEWS

► [Gephi updates with 0.9.1 version](#)

### PAPERS



<https://gephi.org/>

# Download Gephi



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## Download

Gephi is an open-source and multiplatform software distributed under the dual license **CDDL 1.0** and **GNU General Public License v3**.

### Official Releases

[Release Notes](#) | [System Requirements](#) | [Installation instructions](#)

Gephi 0.9.1 is the latest stable release.

**Download Gephi for Mac OSX**

Version 0.9.1

If you have an older Gephi on your computer, you should uninstall it first, [see the installation instructions](#).

#### All downloads:

[Download Gephi 0.9.1 for Mac OS X](#)  
[Download Gephi 0.9.1 for Windows](#)  
[Download Gephi 0.9.1 for Linux](#)  
[Download Gephi 0.9.1 sources](#)  
[Download Older Versions](#)

#### Sources:

Gephi uses [GitHub](#) to host the source code and track issues. The [trunk](#) repository is the most up-to-date version but may be unstable. The last stable version is located in the release tab on [GitHub](#).

## Localization

Localization is available in **French, Spanish, Japanese, Brazilian Portuguese, Russian, Chinese, Czech** and **German**. In Gephi, simply go to **Tools -> Languages** to switch.

 Stay informed  
blog, twitter & more

 Contribute  
code, doc, test & more

 Report a Bug

 Request a Feature

 Share your ideas

### Ways to get help

- 2) [Get Personal Help](#)
- 3) [Other Gephi Support](#)
- 4) [Get Professional Training Courses](#)

### New to Gephi?

- [Installing Gephi](#)
- [System Requirements](#)
- [Quick Start Guide](#)
- [Customizing Gephi with plugins](#)

<https://gephi.org/users/download/>

# Download Gephi

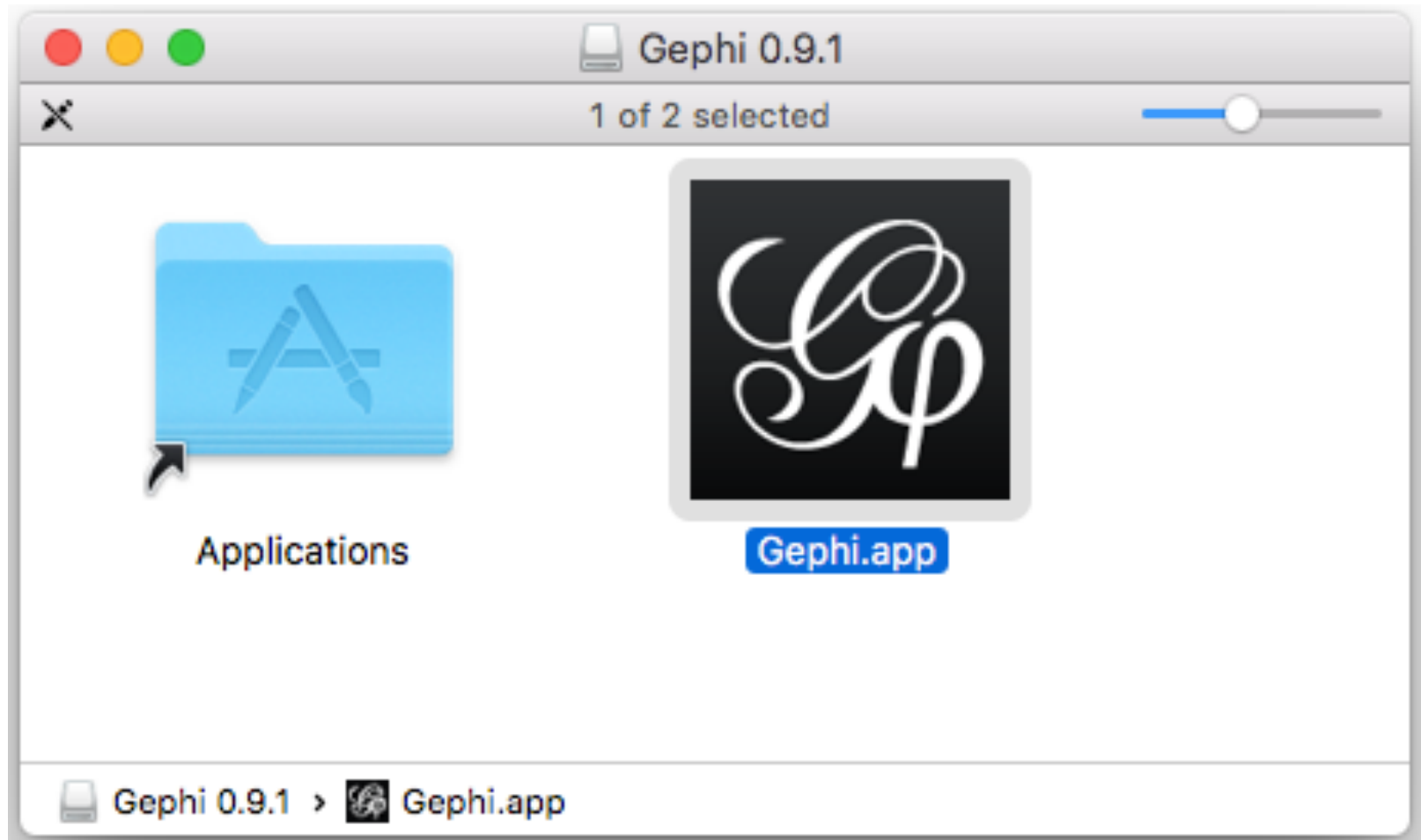


**gephi-0.9.1-macos.dmg**

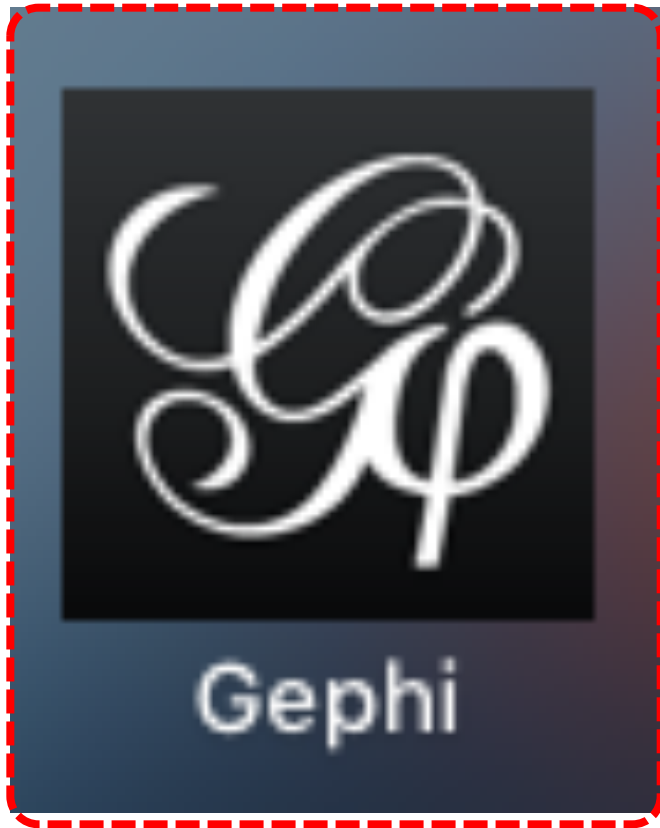
Disk Image - 121.1 MB



# Gephi 0.9.1



# Gephi



Gephi.app

**Gephi:**  
**New Project**  
**Import**  
**Nodes1.csv and**  
**Edges1.csv**  
**to Gephi**

# Gephi New Project



The screenshot displays the Gephi software interface. At the top, there are three tabs: 'Overview', 'Data Laboratory', and 'Preview'. Below these is a 'Data Table' window with 'Nodes', 'Edges', and 'Configuration' sections. A 'Filter:' input field is visible on the right. The main area shows a 'Welcome' dialog box with the following content:

- Welcome to Gephi** (with the Gephi logo)
- Open recent** (empty list)
- New Project**
  - [New Project](#) (highlighted with a red dashed box)
  - [Open Graph File...](#)
- Samples**
  - [Les Miserables.gexf](#)
  - [Java.gexf](#)
  - [Power Grid.gml](#)
- Open at startup**

# Gephi Overview



The screenshot shows the Gephi software interface with several panels highlighted by red boxes:

- 1. Appearance:** Located in the top-left, it includes tabs for 'Nodes' and 'Edges', and options for 'Unique' and 'Attribute' styling. A color selection area shows '#c0c0c0' and an 'Apply' button.
- 2. Layout:** Located below the Appearance panel, it features a dropdown menu to 'Choose a layout' and a 'Run' button.
- 3. Graph:** The central workspace, currently showing 'Dragging (Configure)'. It contains a toolbar with various graph manipulation tools.
- 4. Context:** Located in the top-right, it displays 'Nodes: 0', 'Edges: 0', and 'Directed Graph'.
- 5. Statistics/Filters:** Located in the bottom-right, it shows a list of network metrics such as 'Average Degree', 'Avg. Weighted Degree', 'Network Diameter', 'Graph Density', 'Modularity', 'PageRank', 'Connected Components', 'Avg. Clustering Coefficient', 'Eigenvector Centrality', 'Avg. Path Length', '# Nodes', '# Edges', 'Degree', and 'Clustering Coefficient'. Each metric has a 'Run' button.

Filters

# Gephi Data Laboratory: Import Spreadsheet



The screenshot displays the Gephi Data Laboratory interface. At the top, there are three tabs: 'Overview', 'Data Laboratory' (highlighted with a red dashed box), and 'Preview'. Below the tabs is a workspace area labeled 'Workspace 1'. The main interface is divided into a top toolbar and a main workspace. The toolbar includes buttons for 'Nodes', 'Edges', 'Configuration', 'Add node', 'Add edge', 'Search/Replace', 'Import Spreadsheet' (highlighted with a red dashed box), 'Export table', and 'More actions'. A 'Filter:' input field is also present. The main workspace shows a table with columns labeled 'Id', 'Label', and 'Interval'. At the bottom, there is a panel with various data manipulation actions: 'Add column', 'Merge columns', 'Delete column', 'Clear column', 'Copy data to other column', 'Fill column with a value', 'Duplicate column', 'Create a boolean column from regex match', and 'Create column with list of regex matching groups'.

# Gephi Data Laboratory: Import Spreadsheet



Overview | **Data Laboratory** | Preview

Workspace 1

Data Table

Nodes | Edges | Configuration | Add node | Add edge | Search/Replace | **Import Spreadsheet** | Export table | More actions | Filter: | Id

Id | Label | Interval

### Import spreadsheet

**Steps**

1. General options
2. Import settings

**General options**

Choose a CSV file to import:

[red error icon] **...**

Separator: As table: Charset:

Co... [dropdown] Edges table [dropdown] UTF-8 [dropdown]

Preview:

**Invalid CSV file**

Help < Back Next > Finish Cancel

Add column | Merge columns | Delete column | Clear column | Copy data to other column | Fill column with a value | Duplicate column | Create a boolean column from regex match | Create column with list of regex matching groups

# Import Nodes1.csv to Gephi



Overview | **Data Laboratory** | Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace **Import Spreadsheet** Export table More actions Filter: Id

Id Label Interval

Import spreadsheet

Steps

1. General options
2. Import settings

General options

Choose a CSV file to import:

/imyday/Documents/SCDBA/SNA\_Data/Nodes1.csv

Open

SNA\_Data

Name	D.
Edges1.csv	...
<b>Nodes1.csv</b>	...

File Format: All Files

Cancel Open

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

## Nodes1.csv

Id,Label,Attribute

1,John,1

2,Carla,2

3,Simon,1

4,Celine,2

5,Winston,1

6,Diana,2



# Import Nodes1.csv to Gephi



Workspace 1

Data Laboratory

Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Id

Id Label Interval

**Import spreadsheet**

**Steps**

1. General options
2. Import settings

**General options**

Choose a CSV file to import:

/imyday/Documents/SCDBA/SNA\_Data/Nodes1.csv

Separator: As table: Charset:

Co... Nodes ta... UTF-8

Preview:

Id	Label	Attribute
1	John	1
2	Carla	2
3	Simon	1
4	Celine	2
5	Winston	1
6	Diana	2

Help < Back **Next >** Finish Cancel

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

# Import Nodes1.csv to Gephi



Overview Data Laboratory Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Id

Id Label Interval

**Import spreadsheet**

**Steps**

1. General options
2. **Import settings**

**Import settings**

New columns are created with the specified type. A generated id is assigned if missing. Unless the option 'Force nodes to be created as new ones' is en

Imported columns:

- Id  
String
- Label  
String
- Attribute  
String
- Force nodes to be created as new ones

Help < Back Next > **Finish** Cancel

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

# Import Nodes1.csv to Gephi



Id	Label	Interval	Attribute
1	John		1
2	Carla		2
3	Simon		1
4	Celine		2
5	Winston		1
6	Diana		2

Nodes1.csv

```
Id,Label,Attribute  
1,John,1  
2,Carla,2  
3,Simon,1  
4,Celine,2  
5,Winston,1  
6,Diana,2
```

Toolbar options:

- Add column
- Merge columns
- Delete column
- Clear column
- Copy data to other column
- Fill column with a value
- Duplicate column
- Create a boolean column from regex match
- Create column with list of regex matching groups

# Import Edges1.csv to Gephi



The screenshot shows the Gephi Data Laboratory interface. At the top, there are three tabs: 'Overview', 'Data Laboratory', and 'Preview'. Below these is a 'Workspace 1' tab. The main area is titled 'Data Table' and contains a 'Nodes' tab and an 'Edges' tab, with 'Edges' selected and highlighted by a red dashed box. The 'Edges' tab has a 'Configuration' section with several buttons: 'Add node', 'Add edge', 'Search/Replace', 'Import Spreadsheet' (highlighted with a red dashed box), 'Export table', and 'More actions'. Below the buttons is a table with columns: 'Source', 'Target', 'Type', 'Id', 'Label', 'Interval', and 'Weight'. At the bottom of the interface is a toolbar with various actions: 'Add column', 'Merge columns', 'Delete column', 'Clear column', 'Copy data to other column', 'Fill column with a value', 'Duplicate column', 'Create a boolean column from regex match', and 'Create column with list of regex matching groups'.

# Import Edges1.csv to Gephi



The screenshot shows the Gephi Data Laboratory interface. The 'Import Spreadsheet' dialog box is open, showing the 'General options' step. The file path is set to `/Documents/SCDBA/SNA_Data/Edges1.csv`. A file browser window is open, showing the `SNA_Data` folder with `Edges1.csv` and `Nodes1.csv` files. The `Edges1.csv` file is selected. The `Open` button is highlighted.

Edges1.csv

Source, Target

- 1,2
- 1,3
- 1,4
- 1,6
- 2,4
- 2,6
- 3,6
- 4,6
- 5,6

# Import Edges1.csv to Gephi



**Steps**

1. General options
2. Import settings

**General options**

Choose a CSV file to import:  
/Documents/SCDBA/SNA\_Data/Edges1.csv ...

Separator: Comma    As table: **Edges table**    Charset: UTF-8

**Preview:**

Source	Target
1	2
1	3
1	4
1	6
2	4
2	6
3	6
4	6

Buttons: Help, < Back, **Next >**, Finish, Cancel

**Edges table**

Bottom toolbar: Add column, Merge columns, Delete column, Clear column, Copy data to other column, Fill column with a value, Duplicate column, Create a boolean column from regex match, Create column with list of regex matching groups

# Import Edges1.csv to Gephi



Overview Data Laboratory Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Source

Source Target Type Id Label Interval Weight

Import spreadsheet

**Steps**

1. General options
2. Import settings

**General options**

Choose a CSV file to import:  
/Documents/SCDBA/SNA\_Data/Edges1.csv

Separator: As table: Charset:

Co... Edges table UTF-8

**Preview:**

Source	Target
1	2
1	3
1	4
1	6
2	4
2	6
3	6
4	6

Help < Back Next > Finish Cancel

Edges table

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

# Import Edges1.csv to Gephi



Overview | Data Laboratory | Preview

Workspace 1

Data Table

Nodes | Edges | Configuration | Add node | Add edge | Search/Replace | Import Spreadsheet | Export table | More actions | Filter: | Source

Source | Target | Type | Id | Label | Interval | Weight

### Import spreadsheet

**Steps**

1. General options
2. **Import settings**

**Import settings**

New columns are created with the specified type. A generated id is assigned if missing or already existing. Edges need 'Source' and 'Target' columns with the id of the nodes. If no 'Type' column is provided, all edges will be directed. If an edge already exists, attributes will be ignored, but the edge will be updated.

Imported columns:

- Source  
String
- Target  
String
- Create missing nodes

Help | < Back | Next > | **Finish** | Cancel

Add column | Merge columns | Delete column | Clear column | Copy data to other column | Fill column with a value | Duplicate column | Create a boolean column from regex match | Create column with list of regex matching groups



# Import Edges1.csv to Gephi



Overview Data Laboratory Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Source

Source	Target	Type	Id	Label	Interval	Weight
1	2	Directed	0			1.0
1	3	Directed	1			1.0
1	4	Directed	2			1.0
1	6	Directed	3			1.0
2	4	Directed	4			1.0
2	6	Directed	5			1.0
3	6	Directed	6			1.0
4	6	Directed	7			1.0
5	6	Directed	8			1.0

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

# Gephi Overview



The screenshot displays the Gephi software interface. At the top, there are tabs for 'Overview' (highlighted with a red dashed border), 'Data Laboratory', and 'Preview'. Below these is 'Workspace 1'. The main interface is divided into several panels:

- Appearance:** Contains 'Nodes' and 'Edges' settings. The 'Nodes' section shows 'Unique' and 'Attribute' options, with a color selection set to '#c0c0c0'. An 'Apply' button is visible.
- Layout:** Features a dropdown menu labeled '---Choose a layout' and a 'Run' button. Below this, it displays '<No Properties>'. At the bottom left, there are 'Presets...' and 'Reset' buttons.
- Graph:** The central workspace shows a graph with 6 nodes and 9 edges. The status bar at the top of this panel indicates 'Dragging (Configure)'. A toolbar on the left side of the graph panel contains various manipulation tools.
- Context:** This panel on the right provides summary statistics and analysis options:
  - Nodes:** 6
  - Edges:** 9
  - Directed Graph**The 'Statistics' tab is active, showing a list of metrics with 'Run' buttons and progress indicators:
  - Network Overview:** Average Degree, Avg. Weighted Degree, Network Diameter, Graph Density, Modularity, PageRank, Connected Components.
  - Node Overview:** Avg. Clustering Coefficient, Eigenvector Centrality.
  - Edge Overview:** Avg. Path Length.
  - Dynamic:** # Nodes, # Edges, Degree, Clustering Coefficient.

The bottom status bar includes font settings: 'Arial-BoldMT, 32' and a color selection tool.

# Gephi Overview: Graph



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Dragging (Configure)

Unique Attribute

#c0c0c0

Apply

Layout | ---Choose a layout | Run

<No Properties>

Presets... Reset

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

**Network Overview**

- Average Degree
- Avg. Weighted Degree
- Network Diameter
- Graph Density
- Modularity
- PageRank
- Connected Components

**Node Overview**

- Avg. Clustering Coefficient
- Eigenvector Centrality

**Edge Overview**

- Avg. Path Length

**Dynamic**

- # Nodes
- # Edges
- Degree
- Clustering Coefficient

# Gephi Overview: Layout



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes | Edges | Dragging (Configure)

Unique | Attribute

#c0c0c0

Apply

Layout

---Choose a layout

- Fruchterman Reingold
- Label Adjust
- Noverlap
- OpenOrd
- Random Layout
- Rotate
- Yifan Hu
- Yifan Hu Proportional**

<No Properties>

Presets... Reset

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

**Network Overview**

- Average Degree
- Avg. Weighted Degree
- Network Diameter
- Graph Density
- Modularity
- PageRank
- Connected Components

**Node Overview**

- Avg. Clustering Coefficient
- Eigenvector Centrality

**Edge Overview**

- Avg. Path Length

**Dynamic**

- # Nodes
- # Edges
- Degree
- Clustering Coefficient

# Gephi Overview: Layout

## Yifan Hu Proportional



Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Dragging (Configure)

Unique Attribute

#c0c0c0

Apply

Layout

Yifan Hu Proportional

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu Proportional

Presets... Reset

Nodes: 6  
Edges: 9  
Directed Graph

Filters Statistics Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

# Gephi Overview: Layout

Yifan Hu



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | #c0c0c0 | Apply

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

```
graph TD; N1(( )) --> N2(( )); N1 --> N3(( )); N1 --> N4(( )); N3 --> N2; N4 --> N2; N5(( )) --> N2; N6(( )) --> N2; N2 --> N7(( )); N7 --> N2; N7 --> N8(( ))
```

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Arial-BoldMT, 32

# Appearance: Nodes Color



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges **Color**

Unique Attribute

#c0c0c0

Apply

Layout

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

```
graph TD; N1(( )) --> N2(( )); N2(( )) --> N3(( )); N2(( )) --> N4(( )); N2(( )) --> N5(( )); N3(( )) --> N6(( )); N4(( )) --> N5(( )); N5(( )) --> N6(( ));
```

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Font: Arial-BoldMT, 32

# Nodes Color / Attribute / Apply



Overview Data Laboratory Preview

Workspace 1

Appearance

Nodes Edges

Unique Attribute

Attribute

2	(50%)
1	(50%)

Apply

Layout

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Graph

Dragging (Configure)

```
graph TD; G1((Green)) --> G2((Green)); G1((Green)) --> P1((Pink)); G2((Green)) --> P2((Pink)); G2((Green)) --> P3((Pink)); P1((Pink)) --> P2((Pink)); P1((Pink)) --> P3((Pink)); P2((Pink)) --> P3((Pink)); P3((Pink)) --> G3((Green));
```

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters Statistics

Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Yifan Hu

Presets... Reset

Arial-BoldMT, 32



# Show Node Labels



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Dragging (Configure)

Unique Attribute

Attribute

2 (50%)  
1 (50%)

Apply

Layout

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Show Node Labels

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

# Show Node Labels



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Dragging (Configure)

Unique Attribute

Attribute

2 (50%)  
1 (50%)

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Winston Celine  
Diana Carla  
John  
Simon

Nodes: 6  
Edges: 9  
Directed Graph

Filters Statistics

Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Font: Arial-BoldMT, 32

# Show Labels



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Dragging (Configure)

Unique Attribute

Attribute

2 (50%)  
1 (50%)

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Winston Celine  
Diana Carla  
John  
Simon

Nodes: 6  
Edges: 9  
Directed Graph

Filters Statistics

Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Font: Arial-BoldMT, 32

# Global Edges Labels



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | Dragging (Configure)

Attribute

2	(50%)
1	(50%)

Apply

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Winston Celine Diana Carla John Simon

Global Edges Labels

Background color:  Zoom Highlight selection  Autoselect neighbor

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters Statistics Settings

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

# Labels



The screenshot shows a network visualization software interface. The main window displays a graph with six nodes labeled with names: Winston, Celine, Diana, Carla, John, and Simon. The nodes are connected by edges, forming a network structure. The nodes are colored: Winston, John, and Simon are green; Celine, Diana, and Carla are pink. The text labels are large and black, positioned near their respective nodes.

The interface includes several panels:

- Appearance:** Shows node and edge attributes. Under 'Attribute', there are two categories: '2' (50%) and '1' (50%).
- Layout:** Shows 'Yifan Hu' as the layout algorithm. Below it are properties for 'Yifan Hu's properties' (Optimal Distance: 100.0, Relative Strength: 0.2, Initial Step size: 20.0, Step ratio: 0.95, Adaptive Cooling: checked, Convergence Thresh: 1.0E-4) and 'Barnes-Hut's properties' (Quadtree Max Level: 10, Theta: 1.2).
- Context:** Shows graph statistics: Nodes: 6, Edges: 9, Directed Graph. It also has tabs for 'Filters', 'Statistics', and 'Settings'. Under 'Network Overview', there are various metrics with 'Run' buttons: Average Degree, Avg. Weighted Degree, Network Diameter, Graph Density, Modularity, PageRank, Connected Components. Under 'Node Overview': Avg. Clustering Coefficient, Eigenvector Centrality. Under 'Edge Overview': Avg. Path Length. Under 'Dynamic': # Nodes, # Edges, Degree, Clustering Coefficient.
- Labels Panel (highlighted with a red dashed box):** This panel is used to configure the appearance of node and edge labels. It has tabs for 'Global', 'Edges', and 'Labels'. The 'Labels' tab is active. It contains settings for 'Node' (checked) and 'Edge' (unchecked). For 'Node', the font is 'Arial-BoldMT, 32', color is black, and size is adjustable. For 'Edge', the font is 'Arial-BoldMT, 32', color is white, and size is adjustable.

# Labels Node Size



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | Filters Statistics | Settings

Attribute

2 (50%)  
1 (50%)

Apply

Layout

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

Winston  
Diana  
Celine  
John  
Simon  
Carla

Global Edges Labels

Node  Edge

Font: Arial-BoldMT, 32 Color: [black square]

Size: [slider]

Font: Arial-BoldMT, 32 Color: [white square]

Size: [slider]

Context

Nodes: 6  
Edges: 9  
Directed Graph

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

# Labels Node Font Size



Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges

Unique Attribute

Attribute

2 (50%)  
1 (50%)

Apply

Layout

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

Nodes: 6  
Edges: 9

Font

Family	Style	Size
Arial	Regular	24
Arial Black	Bold	24
Arial Hebrew	Italic	26
Arial Hebrew Scholar	Bold Italic	28
Arial Narrow		32
Arial Rounded MT Bold		36
Arial Unicode MS		40
Athelas		44
Avenir		48
Avenir Next		52

Preview

Aa Bb Yy Zz

OK Cancel

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Global Edges Labels

Node

Font: **Arial-BoldMT, 24** Color:

Size:

Edge

Font: Arial-BoldMT, 32 Color:

Size:

# Labels Node Size



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | Filters Statistics | Settings

Attribute

2 (50%)  
1 (50%)

Apply

Layout

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

```
graph TD; Winston((Winston)) --> Diana((Diana)); Diana --> Celine((Celine)); Diana --> John((John)); John --> Celine; John --> Carla((Carla)); Celine --> Carla;
```

Node  | Edge

Font: Arial-BoldMT, 24 | Color: [Black]

Size: [Slider]

Font: Arial-BoldMT, 32 | Color: [White]

Size: [Slider]

Global | Edges | Labels

Context

Nodes: 6  
Edges: 9  
Directed Graph

Network Overview

Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
Modularity	Run
PageRank	Run
Connected Components	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	Run
------------------	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run



# Labels Scaled



The screenshot displays a network visualization application with the following components:

- Top Bar:** Overview, Data Laboratory, Preview.
- Appearance Panel:** Nodes (Attribute), Edges (Unique, Attribute). Shows 2 nodes with attribute 2 (50%) and 1 node with attribute 1 (50%).
- Layout Panel:** Yifan Hu. Includes a Run button and properties for Yifan Hu's properties (Optimal Distance: 100.0, Relative Strength: 0.2, Initial Step size: 20.0, Step ratio: 0.95, Adaptive Cooling: checked, Convergence Thresh: 1.0E-4) and Barnes-Hut's properties (Quadtree Max Level: 10, Theta: 1.2).
- Graph Panel:** Dragging (Configure). Shows a directed graph with nodes: Winston (green), Diana (red), Celine (red), John (green), Simon (green), and Carla (red). Edges connect Winston to Diana, Diana to Celine, Diana to John, John to Celine, John to Simon, and Celine to Carla.
- Context Panel:** Nodes: 6, Edges: 9, Directed Graph. Includes Filters, Statistics, and Settings tabs. Network Overview includes Average Degree, Avg. Weighted Degree, Network Diameter, Graph Density, Modularity, PageRank, and Connected Components. Node Overview includes Avg. Clustering Coefficient and Eigenvector Centrality. Edge Overview includes Avg. Path Length. Dynamic section includes # Nodes, # Edges, Degree, and Clustering Coefficient.
- Bottom Panel:** Font settings for Node (Arial-BoldMT, 24) and Edge (Arial-BoldMT, 32). A red dashed box highlights a dropdown menu with options: AA Fixed, % Scaled (checked), and AA Node size.

# Labels Color

The image shows a network visualization software interface with a central graph and several control panels. The graph displays five nodes: Winston, Diana, Ce, Jo, and Simon, connected by directed edges. Diana is the central node, with arrows pointing to her from Winston, Ce, Jo, and Simon. The nodes are colored: Winston, Ce, Jo, and Simon are green, while Diana is pink. A 'Choose a Color' dialog box is open over the graph, showing a color wheel and various color selection options. The dialog box includes a color wheel, a vertical color bar, and input fields for Hue (2), Sat (96), Bri (99), Red (252), Green (17), Blue (9), Hex (FC1109), and Alpha (128). There are also 'Opacity' and 'Alpha' sliders, and 'Cancel' and 'OK' buttons. The software interface includes several panels: 'Appearance' (Nodes, Edges, Unique, Attribute), 'Graph' (Dragging (Configure)), 'Layout' (Yifan Hu, Run), and 'Dynamic' (# Nodes, # Edges, Degree, Clustering Coefficient). The 'Dynamic' panel has 'Run' buttons for each property. The 'Appearance' panel shows 'Attribute' with two items: 2 (50%) and 1 (50%). The 'Layout' panel shows 'Yifan Hu' with a 'Run' button. The 'Dynamic' panel shows '# Nodes', '# Edges', 'Degree', and 'Clustering Coefficient', each with a 'Run' button. The 'Graph' panel shows 'Dragging (Configure)'. The 'Appearance' panel shows 'Nodes' and 'Edges' tabs, and 'Unique' and 'Attribute' sub-tabs. The 'Attribute' sub-tab shows two items: 2 (50%) and 1 (50%). The 'Layout' panel shows 'Yifan Hu' with a 'Run' button. The 'Dynamic' panel shows '# Nodes', '# Edges', 'Degree', and 'Clustering Coefficient', each with a 'Run' button. The 'Graph' panel shows 'Dragging (Configure)'. The 'Appearance' panel shows 'Nodes' and 'Edges' tabs, and 'Unique' and 'Attribute' sub-tabs. The 'Attribute' sub-tab shows two items: 2 (50%) and 1 (50%).

# Labels Color



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | Filters Statistics | Settings

Attribute

- 2 (50%)
- 1 (50%)

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Winston

Celine

Diana

Carla

John

Simon

Global | Edges | Labels

Node

Font: **Arial-BoldMT, 24** Color: ■ Size:

Edge

Font: **Arial-BoldMT, 32** Color: ■ Size:

Nodes: 6  
Edges: 9  
Directed Graph

Network Overview

- Average Degree
- Avg. Weighted Degree
- Network Diameter
- Graph Density
- Modularity
- PageRank
- Connected Components

Node Overview

- Avg. Clustering Coefficient
- Eigenvector Centrality

Edge Overview

- Avg. Path Length

Dynamic

- # Nodes
- # Edges
- Degree
- Clustering Coefficient

# Gephi Statistics: Average Degree



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute

Attribute

2 (50%)  
1 (50%)

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Print | Copy | Save | Close

HTML Report

## Degree Report

Results:

Average Degree: 3.000

### Degree Distribution

Value	Count
1	1.00
2	1.00
3	2.00
4	1.00
5	1.00

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

Network Overview

- Average Degree: 3 Run
- Avg. Weighted Degree Run
- Network Diameter Run
- Graph Density Run
- Modularity Run
- PageRank Run
- Connected Components Run

Node Overview

- Avg. Clustering Coefficient Run
- Eigenvector Centrality Run

Edge Overview

- Avg. Path Length Run

Dynamic

- # Nodes Run
- # Edges Run
- Degree Run
- Clustering Coefficient Run

# Gephi Statistics: Average Degree



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute

Attribute

2 (50%)  
1 (50%)

Apply

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Print | Copy | Save | Close

HTML Report

### In-Degree Distribution

Value	Count
1	2
5	1

### Out-Degree Distribution

Value	Count
1	2
5	1

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

Network Overview

- Average Degree: 3 Run
- Avg. Weighted Degree: Run
- Network Diameter: Run
- Graph Density: Run
- Modularity: Run
- PageRank: Run
- Connected Components: Run

Node Overview

- Avg. Clustering Coefficient: Run
- Eigenvector Centrality: Run

Edge Overview

- Avg. Path Length: Run

Dynamic

- # Nodes: Run
- # Edges: Run
- Degree: Run
- Clustering Coefficient: Run

# Gephi Statistics: Avg. Weighted Degree



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute

Attribute

2 (50%)  
1 (50%)

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Print | Copy | Save | Close

## Weighted Degree Report

Results:

Average Weighted Degree: 1.500

### Degree Distribution

Value	Count
1	1.00
2	1.00
3	2.00
4	1.00

Filters | Statistics | Settings

Network Overview

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
Network Diameter		Run
Graph Density		Run
Modularity		Run
PageRank		Run
Connected Components		Run

Node Overview

Avg. Clustering Coefficient		Run
Eigenvector Centrality		Run

Edge Overview

Avg. Path Length		Run
------------------	--	-----

Dynamic

# Nodes		Run
# Edges		Run
Degree		Run
Clustering Coefficient		Run

Nodes: 6  
Edges: 9  
Directed Graph

# Gephi Statistics: Network Diameter



The screenshot displays the Gephi software interface. At the top, there are tabs for 'Overview', 'Data Laboratory', and 'Preview'. Below these is 'Workspace 1'. The main area is divided into several panels: 'Appearance' (Nodes, Edges, Unique, Attribute), 'Graph' (Dragging (Configure)), 'Context' (Nodes: 6, Edges: 9, Directed Graph), 'Filters', 'Statistics', and 'Settings'. The 'Statistics' panel is highlighted with a red dashed border and contains the following sections:

- Network Overview**
  - Average Degree: 3 [Run]
  - Avg. Weighted Degree: 1.5 [Run]
  - Network Diameter**: [Run] (highlighted with a red dashed box)
  - Graph Density: [Run]
  - Modularity: [Run]
  - PageRank: [Run]
  - Connected Components: [Run]
- Node Overview**
  - Avg. Clustering Coefficient: [Run]
  - Eigenvector Centrality: [Run]
- Edge Overview**
  - Avg. Path Length: [Run]
- Dynamic**
  - # Nodes: [Run]
  - # Edges: [Run]
  - Degree: [Run]
  - Clustering Coefficient: [Run]

The 'Graph Distance settings' dialog box is open in the center, providing details on the 'Distance' metric:

**Distance**  
The average graph-distance between all pairs of nodes. Connected nodes have graph distance 1. The diameter is the longest graph distance between any two nodes in the network. (i.e. How far apart are the two most distant nodes).

Directed  Undirected  Normalize Centralities in [0,1]

**Betweenness Centrality:** Measures how often a node appears on shortest paths between nodes in the network.  
**Closeness Centrality:** The average distance from a given starting node to all other nodes in the network.  
**Eccentricity:** The distance from a given starting node to the farthest node from it in the network.

Buttons: Cancel, OK

At the bottom, there are 'Global', 'Edges', and 'Labels' tabs. The 'Edges' tab is active, showing font and size settings for nodes and edges.

# Gephi Statistics: Network Diameter



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute

Attribute

2 (50%)  
1 (50%)

Apply

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

HTML Report

## Graph Distance Report

**Parameters:**  
Network Interpretation: directed

**Results:**  
Diameter: 1  
Radius: 0  
Average Path length: 1.0

### Betweenness Centrality Distribution

Centrality Value	Count
1.0	6.0

Print | Copy | Save | Close

Context

Nodes: 6  
Edges: 9  
Directed Graph

Filters | Statistics | Settings

**Network Overview**

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
<b>Network Diameter</b>	<b>1</b>	<b>Run</b>
Graph Density		Run
Modularity		Run
PageRank		Run
Connected Components		Run

**Node Overview**

Avg. Clustering Coefficient		Run
Eigenvector Centrality		Run

**Edge Overview**

Avg. Path Length	1	Run
------------------	---	-----

**Dynamic**

# Nodes		Run
# Edges		Run
Degree		Run
Clustering Coefficient		Run



# Gephi Statistics: Graph Density



The screenshot displays the Gephi software interface. At the top, there are tabs for 'Overview', 'Data Laboratory', and 'Preview'. Below these is the 'Workspace 1' tab. The main interface is divided into several panels: 'Appearance' (Nodes, Edges, Unique, Attribute), 'Graph' (Dragging), 'Context' (Nodes: 6, Edges: 9, Directed Graph), and 'Statistics' (Filters, Settings). The 'Statistics' window is open, showing a list of network metrics. A red dashed box highlights the 'Graph Density' metric, which is currently set to 0.3. Other metrics include Average Degree (3), Avg. Weighted Degree (1.5), Network Diameter (1), Modularity, PageRank, Connected Components, Avg. Clustering Coefficient, Eigenvector Centrality, Avg. Path Length (1), and Dynamic metrics like # Nodes, # Edges, Degree, and Clustering Coefficient. A 'Graph Density Report' window is also open, showing the following details:

**Graph Density Report**

**Parameters:**  
Network Interpretation: directed

**Results:**  
Density: 0.300

**Yifan Hu's properties**

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

**Barnes-Hut's properties**

Quadtree Max Level	10
Theta	1.2

**Yifan Hu**

Buttons for Print, Copy, Save, and Close are visible at the bottom of the report window.

# Gephi Statistics: Modularity



The screenshot displays the Gephi software interface. At the top, there are tabs for 'Overview', 'Data Laboratory', and 'Preview'. Below these is a 'Workspace 1' tab. The main window is divided into several panels:

- Appearance:** Shows 'Nodes' and 'Edges' settings. Under 'Nodes', there are two categories: 'Unique' and 'Attribute'. The 'Attribute' category is selected, showing two items: a pink square with value '2' (50%) and a green square with value '1' (50%).
- Layout:** Shows 'Yifan Hu' as the selected algorithm. A 'Run' button is visible.
- Graph:** The central area where the graph is displayed. A 'Modularity settings' dialog box is open over it. The dialog has a title bar and contains the following text:

**Modularity**  
Community detection algorithm.

Randomize Produce a better decomposition but increases computation time

Use weights Use edge weight

Resolution: Lower to get more communities (smaller ones) and higher than 1.0 to get less communities (bigger ones).  
1.0

Buttons: Cancel, OK
- Context:** Shows graph statistics: 'Nodes: 6', 'Edges: 9', and 'Directed Graph'. Below this is a 'Statistics' panel with a 'Settings' sub-panel. It lists various metrics with 'Run' buttons:
  - Network Overview:** Average Degree (3), Avg. Weighted Degree (1.5), Network Diameter (1), Graph Density (0.3), Modularity (Run), PageRank (Run), Connected Components (Run).
  - Node Overview:** Avg. Clustering Coefficient (Run), Eigenvector Centrality (Run).
  - Edge Overview:** Avg. Path Length (1) (Run).
  - Dynamic:** # Nodes (Run), # Edges (Run), Degree (Run), Clustering Coefficient (Run).
- Bottom Panel:** Shows styling options for 'Node' and 'Edge'. For 'Node', the font is 'Arial-BoldMT, 24' and the color is red. For 'Edge', the font is 'Arial-BoldMT, 32' and the color is grey.

# Gephi Statistics: Modularity



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes | Edges | Unique | Attribute

Attribute

- 2 (50%)
- 1 (50%)

HTML Report

## Modularity Report

**Parameters:**

- Randomize: On
- Use edge weights: On
- Resolution: 1.0

**Results:**

- Modularity: 0.000
- Modularity with resolution: 0.000
- Number of Communities: 1

### Size Distribution

Size (number of nodes)	Count
1	2

Filters | Statistics

Settings

- Network Overview**
- Average Degree: 3 [Run]
- Avg. Weighted Degree: 1.5 [Run]
- Network Diameter: 1 [Run]
- Graph Density: 0.3 [Run]
- Modularity: 0 [Run]**
- PageRank [Run]
- Connected Components [Run]
- Node Overview**
- Avg. Clustering Coefficient [Run]
- Eigenvector Centrality [Run]
- Edge Overview**
- Avg. Path Length: 1 [Run]
- Dynamic**
- # Nodes [Run]
- # Edges [Run]
- Degree [Run]
- Clustering Coefficient [Run]

Yifan Hu

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4
Barnes-Hut's properties	
Quadtree Max Level	10
Theta	1.2

Yifan Hu

Print | Copy | Save | Close

# Gephi Statistics: Connected Components



The screenshot displays the Gephi software interface. At the top, there are tabs for 'Overview', 'Data Laboratory', and 'Preview'. Below these, the 'Appearance' panel is visible, showing 'Nodes' and 'Edges' settings. The 'Graph' panel is in the center, with a 'Dragging (Configure)' tooltip. A 'Connected Components settings' dialog box is open, showing options for 'Directed' (selected) and 'Undirected' components. The 'Statistics' window is open on the right, showing network overview statistics: Nodes: 6, Edges: 9, Directed Graph. The 'Statistics' window is highlighted with a red dashed border. Below the dialog, the 'Global' settings panel is visible, showing font and size settings for nodes and edges.

**Connected Components settings**

**Connected Components**  
Determines the number of connected components in the network.

- Directed Detects strongly & weakly connected components
- Undirected Detects only weakly connected components

**Statistics**

**Network Overview**

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
Network Diameter	1	Run
Graph Density	0.3	Run
Modularity	0	Run
PageRank		Run
Connected Components		Run

**Node Overview**

Avg. Clustering Coefficient		Run
Eigenvector Centrality		Run

**Edge Overview**

Avg. Path Length	1	Run
------------------	---	-----

**Dynamic**

# Nodes		Run
# Edges		Run
Degree		Run
Clustering Coefficient		Run

# Gephi Statistics: Connected Components



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes | Edges | Unique | Attribute

Attribute

2 (50%)  
1 (50%)

Apply

Layout | Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... | Reset

Dragging (Configure)

HTML Report

## Connected Components Report

**Parameters:**  
Network Interpretation: directed

**Results:**  
Number of Weakly Connected Components: 1  
Number of Strongly Connected Components: 6

### Size Distribution

Component Size	Count
1	1.0

Print | Copy | Save | Close

Context

**Nodes: 6**  
**Edges: 9**  
Directed Graph

Filters | Statistics | Settings

**Network Overview**

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
Network Diameter	1	Run
Graph Density	0.3	Run
Modularity	0	Run
PageRank		Run
<b>Connected Components</b>	<b>1</b>	<b>Run</b>

**Node Overview**

Avg. Clustering Coefficient		Run
Eigenvector Centrality		Run

**Edge Overview**

Avg. Path Length	1	Run
------------------	---	-----

**Dynamic**

# Nodes		Run
# Edges		Run
Degree		Run
Clustering Coefficient		Run

# Appearance Nodes Size



Overview | Data Laboratory | Preview

Workspace 1

Appearance x

Nodes Edges

Unique Attribute Size

In-Degree

Min size: 5 Max size: 30

Apply

Layout x

Yifan Hu

Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Graph x

Dragging (Configure)

```
graph TD; Winston((Winston)) --> Diana((Diana)); Diana((Diana)) --> Celine((Celine)); Diana((Diana)) --> John((John)); Diana((Diana)) --> Simon((Simon)); Celine((Celine)) --> Diana((Diana)); John((John)) --> Celine((Celine)); John((John)) --> Carla((Carla)); John((John)) --> Diana((Diana)); Carla((Carla)) --> Diana((Diana)); Simon((Simon)) --> Diana((Diana));
```

Context x

Nodes: 6  
Edges: 9  
Directed Graph

Filters Statistics x

Settings

Network Overview

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
Network Diameter	1	Run
Graph Density	0.3	Run
Modularity	0	Run
PageRank		Run
Connected Components	1	Run

Node Overview

Avg. Clustering Coefficient		Run
Eigenvector Centrality		Run

Edge Overview

Avg. Path Length	1	Run
------------------	---	-----

Dynamic

# Nodes		Run
# Edges		Run
Degree		Run
Clustering Coefficient		Run

Presets... Reset

Yifan Hu

# Appearance Nodes Size

## Attribute / In-Degree



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes | Edges | Unique | Attribute

In-Degree

---Choose an attribute

Degree

**In-Degree**

Out-Degree

Out-Degree

Weighted Out-Degree

In-Degree

Closeness Centrality

Apply

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

```
graph TD; Diana((Diana)) --> Winston((Winston)); Diana((Diana)) --> Celine((Celine)); Diana((Diana)) --> John((John)); Diana((Diana)) --> Simon((Simon)); Diana((Diana)) --> Carla((Carla)); Celine((Celine)) --> John((John)); John((John)) --> Carla((Carla)); Celine((Celine)) --> Carla((Carla));
```

Context

Nodes: 6

Edges: 9

Directed Graph

Filters | Statistics | Settings

Network Overview

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
Network Diameter	1	Run
Graph Density	0.3	Run
Modularity	0	Run
PageRank		Run
Connected Components	1	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	1	Run
------------------	---	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Yifan Hu

Arial-BoldMT, 24

# Appearance Nodes Size

Attribute / In-Degree / Min size / Max size / Apply

The screenshot displays a network visualization software interface. The central graph shows six nodes: Winston, Diana, Celine, John, Simon, and Carla. Diana is the largest node, colored pink, and is the central hub. Other nodes are smaller and colored green or pink. The interface includes several panels:

- Appearance Panel (Left):** Shows the 'Nodes' tab selected. Under 'Attribute', 'In-Degree' is chosen. Below, 'Min size' is set to 5 and 'Max size' is set to 30. An 'Apply' button is highlighted with a red dashed box.
- Graph Panel (Center):** Displays the network graph with nodes and directed edges.
- Context Panel (Right):** Shows graph statistics: Nodes: 6, Edges: 9, Directed Graph. It also includes a 'Network Overview' section with various metrics like Average Degree (3), Avg. Weighted Degree (1.5), Network Diameter (1), Graph Density (0.3), Modularity (0), PageRank, and Connected Components (1). Below that is a 'Node Overview' section with Avg. Clustering Coefficient and Eigenvector Centrality, and an 'Edge Overview' section with Avg. Path Length (1). A 'Dynamic' section at the bottom lists # Nodes, # Edges, Degree, and Clustering Coefficient, each with a 'Run' button.
- Layout Panel (Bottom Left):** Shows 'Yifan Hu' as the layout algorithm and a 'Run' button.
- Bottom Bar:** Includes a font selection dropdown set to 'Arial-BoldMT, 24' and other UI controls.



# Appearance Edges

## Attribute / Weight / Color



Overview Data Laboratory Preview

Workspace 1

Appearance Edges

Nodes Edges

Unique Attribute

Weight

Color: Default Invert Recent

Graph Dragging (Configure)

Context Nodes: 6 Edges: 9 Directed Graph

Filters Statistics Settings

Network Overview

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
Network Diameter	1	Run
Graph Density	0.3	Run
Modularity	0	Run
PageRank		Run
Connected Components	1	Run

Node Overview

Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run

Edge Overview

Avg. Path Length	1	Run
------------------	---	-----

Dynamic

# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Winston Celine Diana Carla John Simon

# Appearance Edges

## Attribute / Weight / Color / Apply



Overview | Data Laboratory | Preview

Workspace 1

Appearance Edges

Nodes Edges Unique Attribute

Weight

Color: [Color Picker]

Spline... [Apply]

Layout Yifan Hu [Run]

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thresh	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Graph Dragging (Configure)

```
graph TD; Winston --> Diana; Diana --> Celine; Celine --> Carla; Carla --> Diana; Diana --> John; John --> Carla; John --> Simon;
```

Context Nodes: 6 Edges: 9 Directed Graph

Filters Statistics Settings

Network Overview

Average Degree	3	Run
Avg. Weighted Degree	1.5	Run
Network Diameter	1	Run
Graph Density	0.3	Run
Modularity	0	Run
PageRank		Run
Connected Components	1	Run

Node Overview

Avg. Clustering Coefficient		Run
Eigenvector Centrality		Run

Edge Overview

Avg. Path Length	1	Run
------------------	---	-----

Dynamic

# Nodes		Run
# Edges		Run
Degree		Run
Clustering Coefficient		Run

Presets... Reset

Yifan Hu

Arial-BoldMT, 24

# Gephi Data Laboratory



Overview **Data Laboratory** Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Id

Id	Label	Interval	Attribute	In-Degr...	Out-De...	Degree	Weighted In-...	Weighted Out-...	Weighted ...	Eccentri...	Closeness Ce...	Harmonic Closeness ...	Betweenness C...	Modularity...	Compon...	Strongly-Conn...
1	John	1	0	4	4	4	0.0	4.0	4.0	1.0	1.0	1.0	0.0	0	0	4
2	Carla	2	1	2	3	3	1.0	2.0	3.0	1.0	1.0	1.0	0.0	0	0	3
3	Simon	1	1	1	2	2	1.0	1.0	2.0	1.0	1.0	1.0	0.0	0	0	2
4	Celine	2	2	1	3	3	2.0	1.0	3.0	1.0	1.0	1.0	0.0	0	0	1
5	Winston	1	0	1	1	1	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0	0	5
6	Diana	2	5	0	5	5	5.0	0.0	5.0	0.0	0.0	0.0	0.0	0	0	0

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

# Gephi Preview



Overview Data Laboratory **Preview**

Workspace 1

Preview Settings

63 Preview

Presets

Default

Settings Manage renderers

Nodes

Border Width 1.0

Border Color custom [0,0...]

opacity 100.0

Node Labels

Show Labels

Font Arial 12 Plain

Proportional size

Color custom [0,0...]

Shorten label

Max characters 30

Outline size 0.0

Outline color custom [25...]

Outline opacity 80.0

Box

Box color parent

Box opacity 100.0

Edges

Show Edges

Thickness 1.0

Rescale weight

Color mixed

Opacity 100.0

Curved

Preview ratio: 100%

Refresh

Export: SVG/PDF/PNG

Background Reset zoom - +

# Gephi Preview: Show Labels



Overview | Data Laboratory | **Preview**

Workspace 1

Preview Settings

Presets: Default

Settings | Manage renderers

Nodes

- Border Width: 1.0
- Border Color: custom [0,0...]
- opacity: 100.0

Node Labels

- Show Labels:
- Font: Arial 8 Plain
- Proportional size:
- Color: original
- Shorten label:
- Max characters: 12
- Outline size: 2.0
- Outline color: custom [25...]
- Outline opacity: 40.0
- Box:
- Box color: parent
- Box opacity: 100

Edges

- Show Edges:
- Thickness: 1.0
- Rescale weight:
- Color: mixed
- Opacity: 100.0
- Curved:

Preview ratio: 100%

Refresh

Export: SVG/PDF/PNG

Background | Reset zoom | - | +

# Gephi Preview: Default Straight



The screenshot displays the Gephi Preview window. On the left, the 'Preview Settings' panel is open, showing various configuration options. The 'Presets' dropdown is set to 'Default Straight', which is highlighted with a red dashed box. Below this, the 'Settings' tab is active, showing a list of parameters such as 'opacity', 'Node Labels', 'Edges', and 'Edge Arrows'. A 'Refresh' button is also highlighted with a red dashed box. The main preview area shows a network graph with nodes: Winston, Celine, Diana, John, Simon, and Carla. Diana is the largest node, with the name 'Diana' written in large black text across it. Edges connect the nodes, with some being straight lines and others curved. The 'Background' checkbox is checked at the bottom.

Category	Parameter	Value
General	opacity	100.0
Node Labels	Show Labels	<input checked="" type="checkbox"/>
Node Labels	Font	Arial 8 Plain
Node Labels	Proportional size	<input checked="" type="checkbox"/>
Node Labels	Color	custom [0,0,...
Node Labels	Shorten label	<input checked="" type="checkbox"/>
Node Labels	Max characters	14
Node Labels	Outline size	2.0
Node Labels	Outline color	custom [25,...
Node Labels	Outline opacity	80.0
Node Labels	Box	<input type="checkbox"/>
Node Labels	Box color	parent
Node Labels	Box opacity	100.0
Edges	Show Edges	<input checked="" type="checkbox"/>
Edges	Thickness	1.0
Edges	Rescale weight	<input type="checkbox"/>
Edges	Color	mixed
Edges	Opacity	100.0
Edges	Curved	<input type="checkbox"/>
Edges	Radius	0.0
Edge Arrows	Size	3.0

Preview ratio: 100%

Export: SVG/PDF/PNG

Background  Reset zoom - +

# Gephi Preview: Default Straight



Overview | Data Laboratory | Preview

Workspace 1

Preview Settings | Preview

Presets: Default Straight

Settings | Manage renderers

opacity: 100.0

Node Labels

- Show Labels:
- Font: Arial 12 Plain
- Proportional size:
- Color: custom [0,0,...
- Shorten label:
- Max characters: 30
- Outline size: 0.0
- Outline color: custom [25,...
- Outline opacity: 80.0
- Box:
- Box color: parent
- Box opacity: 100.0

Edges

- Show Edges:
- Thickness: 1.0
- Rescale weight:
- Color: mixed
- Opacity: 100.0
- Curved:
- Radius: 0.0
- Edge Arrows: Size: 3.0

Preview ratio: 100%

Export: SVG/PDF/PNG

Refresh

Background | Reset zoom | - | +

```
graph TD; Winston((Winston)) --> Diana((Diana)); John((John)) --> Diana; John --> Celine((Celine)); John --> Carla((Carla)); John --> Simon((Simon)); Celine --> Diana; Carla --> Diana;
```

# Gephi Preview: Export SVG/PDF/PNG



Overview | Data Laboratory | Preview

Workspace 1

Preview Settings | Preview

Presets: Default Straight

Settings | Manage renderers

opacity	100.0
Node Labels	
Show Labels	<input checked="" type="checkbox"/>
Font	Arial 12 Plain
Proportional size	<input type="checkbox"/>
Color	custom [0,0,...
Shorten label	<input type="checkbox"/>
Max characters	30
Outline size	0.0
Outline color	custom [25,...
Outline opacity	80.0
Box	<input type="checkbox"/>
Box color	parent
Box opacity	100.0
Edges	
Show Edges	<input checked="" type="checkbox"/>
Thickness	1.0
Rescale weight	<input type="checkbox"/>
Color	mixed
Opacity	100.0
Curved	<input type="checkbox"/>
Radius	0.0
Edge Arrows	
Size	3.0

Preview ratio: 100%

Refresh

Export: SVG/PDF/PNG

Background | Reset zoom | - | +

Winston → Diana  
Simon → Diana  
Celine → Diana

Export dialog:

Save As: SNA\_Gephi\_1

SNA\_Data

Name	...	D.
Edges1.csv	...	...
Nodes1.csv	...	...

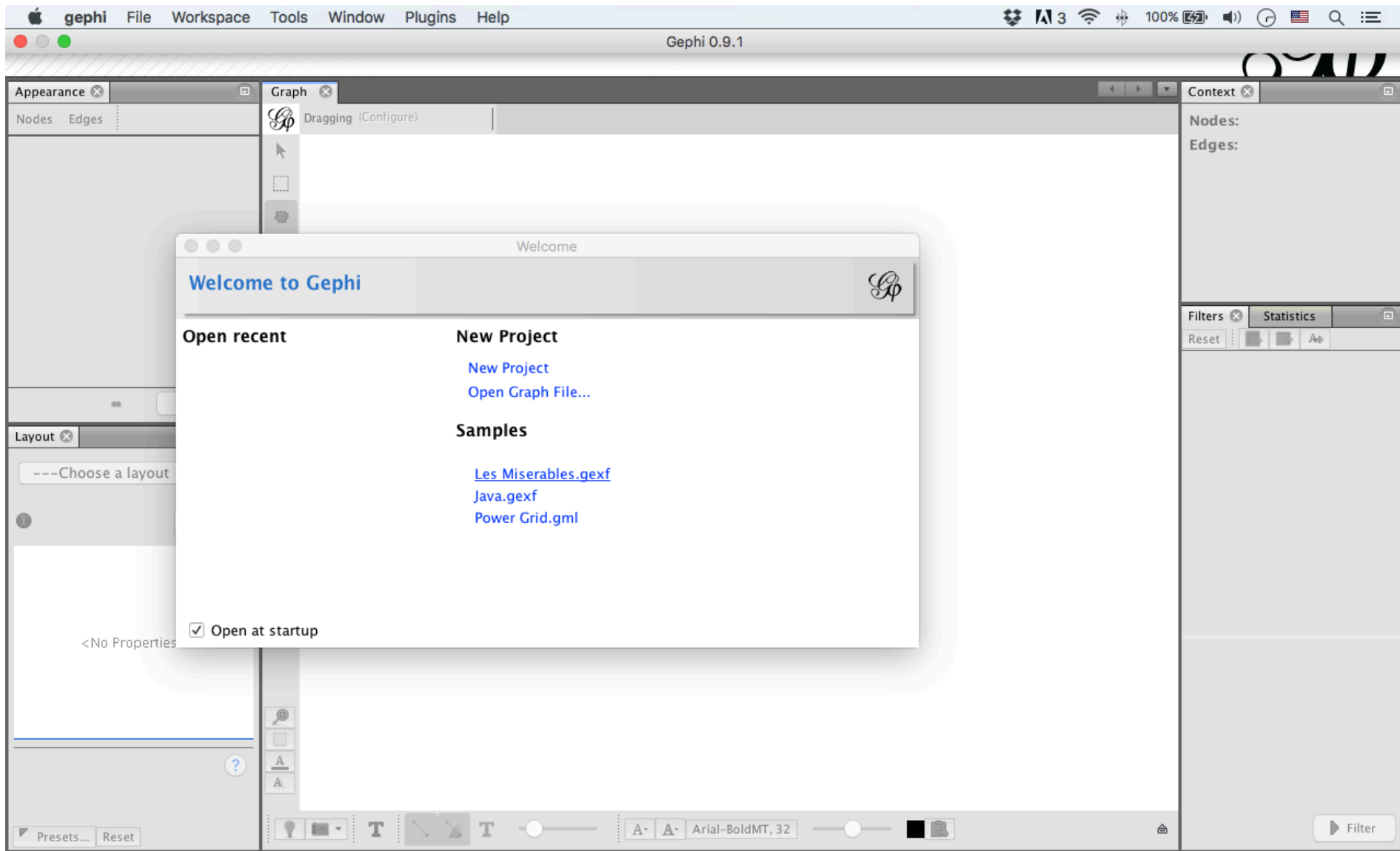
File Format: PNG Files (\*.png)

New Folder | Cancel | Save | Options...



# Open Gephi Samples

# Gephi Samples



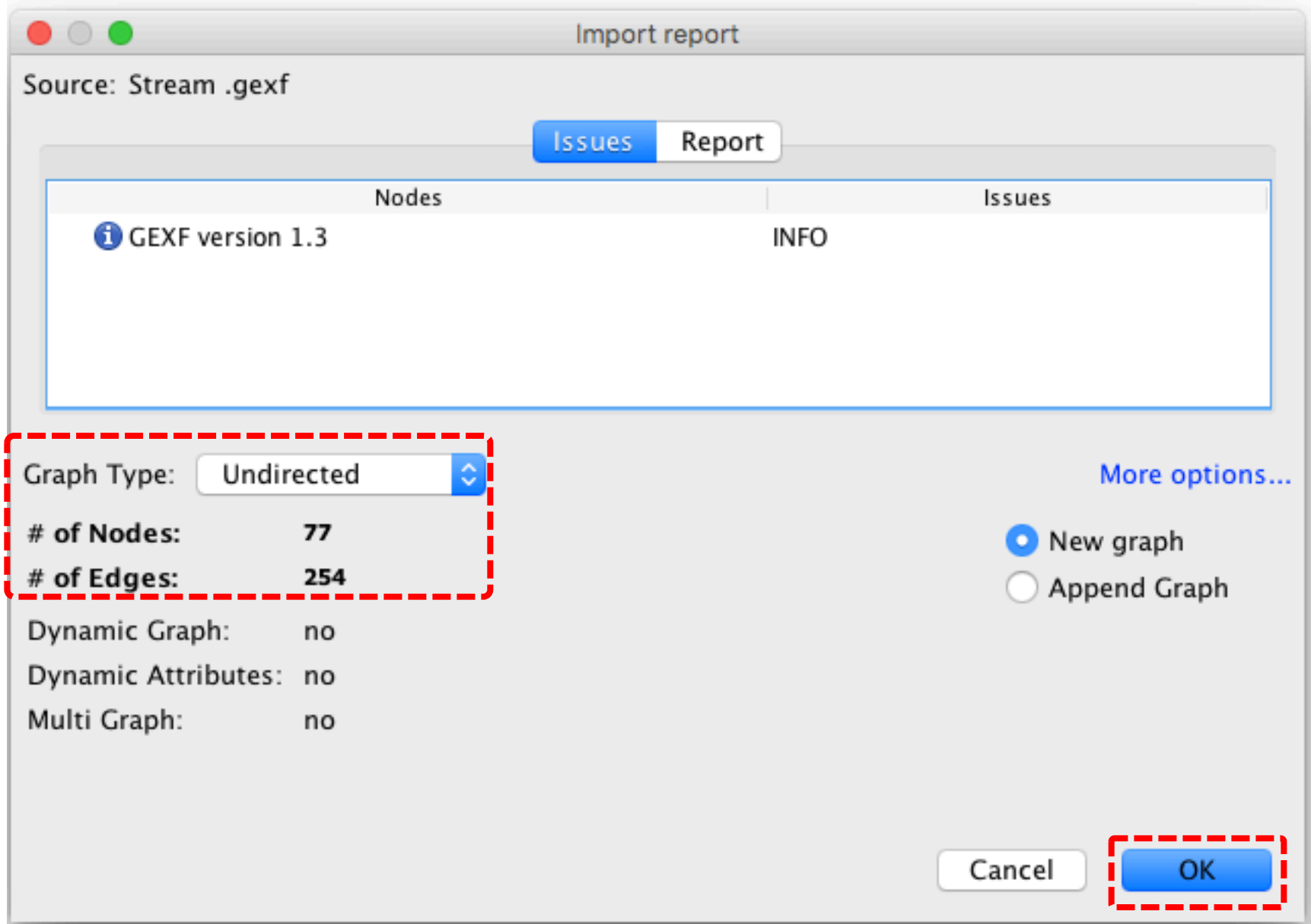
# Gephi Samples

## Les Miserables.gexf



The screenshot shows the Gephi software interface with a 'Welcome' dialog box open. The dialog box has a title bar 'Welcome' and a logo. It is divided into sections: 'Open recent', 'New Project', and 'Samples'. The 'Samples' section contains three items: 'Les Miserables.gexf', 'java.gexf', and 'Power Grid.gml'. The 'Les Miserables.gexf' item is highlighted with a red dashed box, and a tooltip is visible next to it with the text 'Coappearance Network of Characters in 'Les Miserables' (D. E. Knuth)'. Below the 'Samples' section, there is a checkbox labeled 'Open at startup' which is checked. The background shows the main Gephi interface with tabs for 'Appearance', 'Graph', and 'Context'. The 'Graph' tab is active, showing a 'Dragging (Configure)' window. The 'Context' tab shows 'Nodes:' and 'Edges:' sections. The 'Filters' and 'Statistics' tabs are also visible. The bottom of the interface shows a toolbar with various icons and a status bar with 'Presets...' and 'Reset' buttons.

# Gephi Import Report



# Gephi Overview



Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Unique Attribute

#c0c0c0

Apply

Layout


---Choose a layout

Run

<No Properties>

Presets... Reset

Dragging (Configure)



Nodes: 77  
Edges: 254  
Undirected Graph

Filters Statistics

Reset

Library

- Attributes
- Dynamic
- Edges
- Operator
- Topology
- Saved queries

Queries

Drag filter here

Filter

Arial-BoldMT, 32

# Gephi Layout



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Dragging (Configure)

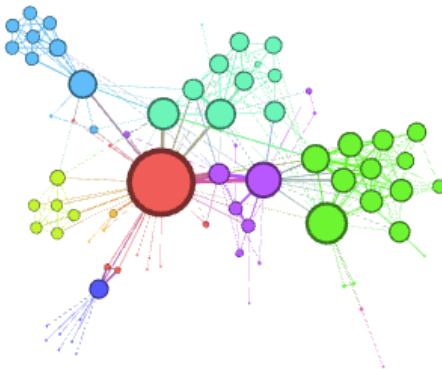
Unique Attribute

#c0c0c0

Apply

Layout

- Choose a layout
- Contraction
- Expansion
- Force Atlas
- ForceAtlas 2
- Fruchterman Reingold
- Label Adjust
- Noverlap
- OpenOrd



Nodes: 77  
Edges: 254  
Undirected Graph

Filters | Statistics

Reset

Library

- Attributes
- Dynamic
- Edges
- Operator
- Topology
- Saved queries

Queries

Drag filter here

Presets... Reset

Arial-BoldMT, 32

Filter

# Gephi Layout: Force Atlas



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute

#c0c0c0

Apply

Layout

Force Atlas

Run

Force Atlas

Inertia	0.1
Repulsion strength	200.0
Attraction strength	10.0
Maximum displacement	10.0
Auto stabilize force	<input checked="" type="checkbox"/>
Autostab Strength	80.0
Autostab sensibility	0.2
Gravity	30.0

Force Atlas

Presets... Reset

Filters | Statistics

Reset

Library

- Attributes
- Dynamic
- Edges
- Operator
- Topology
- Saved queries

Queries

Drag filter here

Filter

# Gephi Layout: Contraction



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | #c0c0c0 | Apply

Layout

Contraction

Run

properties

Scale factor 0.8

Contraction

Presets... Reset

Statistics

Nodes: 77  
Edges: 254  
Undirected Graph

Filters | Statistics | Reset

Library

- Attributes
- Dynamic
- Edges
- Operator
- Topology
- Saved queries

Queries

Drag filter here

Filter



# Gephi Layout: Expansion



Overview Data Laboratory Preview

Workspace 1

Appearance x Graph x Context x

Nodes Edges Unique Attribute #c0c0c0 Apply

Layout x

Expansion

Run


properties

Scale factor 0.8

Expansion ?

Presets... Reset

Dragging (Configure)



Nodes: 77  
Edges: 254  
Undirected Graph

Filters x Statistics x

Reset

Library

- Attributes
- Dynamic
- Edges
- Operator
- Topology
- Saved queries

Queries

Drag filter here

Filter

# Gephi Layout: ForceAtlas 2



The screenshot displays the Gephi software interface with the ForceAtlas 2 layout algorithm selected. The central canvas shows a network graph with nodes of various sizes and colors (green, purple, red, blue, yellow) clustered together. The interface includes several panels:

- Appearance:** Shows node and edge appearance settings, including a color selection for nodes set to #c0c0c0.
- Graph:** Displays the network graph with a "Dragging (Configure)" tooltip.
- Context:** Provides summary statistics: Nodes: 77, Edges: 254, Undirected Graph.
- Filters and Statistics:** Includes a "Reset" button and a "Library" section with folders for Attributes, Dynamic, Edges, Operator, Topology, and Saved queries. A "Queries" section is also present with a "Drag filter here" prompt.
- Layout:** The ForceAtlas 2 settings panel is highlighted with a red dashed border. It includes a "Stop" button (also highlighted with a red dashed box) and the following parameters:
  - Threads: 3
  - Performance: Tolerance (speed) 1.0, Approximate Repu (checkbox), Approximation 1.2
  - Tuning: Scaling 10.0, Stronger Gravity (checkbox), Gravity 1.0

The bottom status bar shows the current font as Arial-BoldMT, 32, and the active window is titled "ForceAtlas 2".

# Gephi Layout: Fruchterman Reingold



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | #c0c0c0 | Apply

Layout | Fruchterman Reingold | Stop | Fruchterman Reingold | Area: 10000.0 | Gravity: 10.0 | Speed: 1.0 | Fruchterman Reingold | Presets... Reset

Context | Nodes: 77 | Edges: 254 | Undirected Graph | Filters | Statistics | Reset | Library | Attributes | Dynamic | Edges | Operator | Topology | Saved queries | Queries | Drag filter here | Filter

# Gephi Layout: OpenOrd



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes | Edges | Unique | Attribute

#c0c0c0

Apply

Layout

OpenOrd

Run

Stages

Liquid (%)	25
Expansion (%)	25
Cooldown (%)	25
Crunch (%)	10
Simmer (%)	15

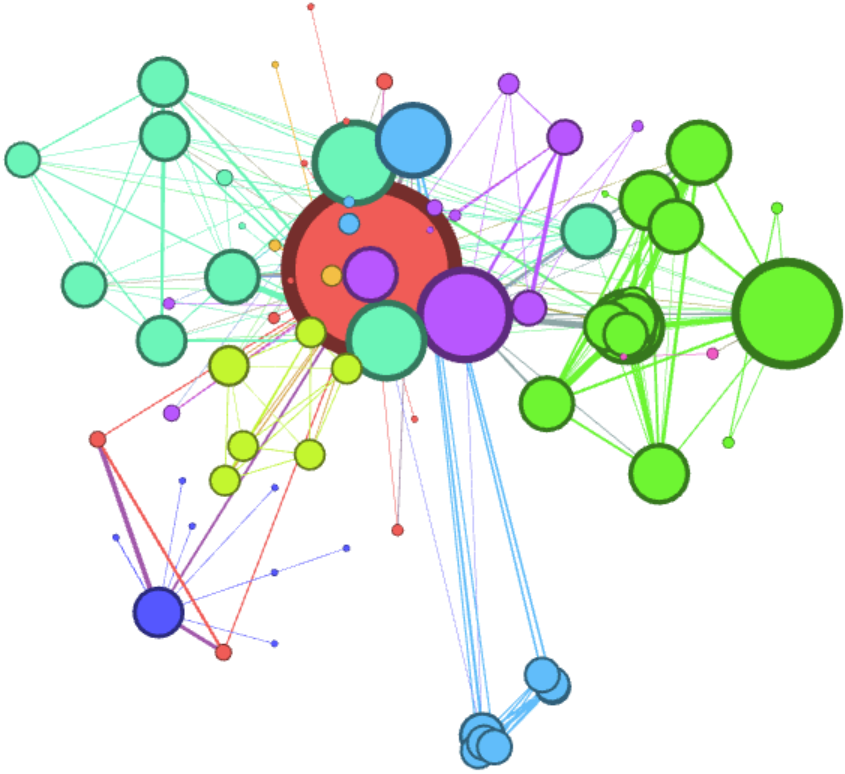
OpenOrd

Edge Cut	0.8
Num Threads	3
Num Iterations	750

OpenOrd

Presets... Reset

Dragging (Configure)



Nodes: 77  
Edges: 254  
Undirected Graph

Filters | Statistics

Reset

Library

- Attributes
- Dynamic
- Edges
- Operator
- Topology
- Saved queries

Queries

Drag filter here

Filter

# Gephi Layout: Yifan Hu



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | #c0c0c0 | Apply

Layout | Yifan Hu | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thres	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu

Presets... Reset

Nodes: 77  
Edges: 254  
Undirected Graph

Filters | Statistics | Reset | Library | Attributes | Dynamic | Edges | Operator | Topology | Saved queries | Queries | Drag filter here | Filter

# Gephi Layout: Yifan Hu Proportional



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | #c0c0c0 | Apply

Layout | Yifan Hu Proportional | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thres	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu Proportional

Presets... Reset

Nodes: 77  
Edges: 254  
Undirected Graph

Filters | Statistics | Reset | Library | Attributes | Dynamic | Edges | Operator | Topology | Saved queries | Queries | Drag filter here | Filter

# Gephi Data Laboratory: Nodes



Overview **Data Laboratory** Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Id

Id	Label	Interval	Modularity Class
0	Myriel		0
1	Napoleon		0
10	Labarre		1
11	Valjean		1
12	Marguerite		1
13	MmeDeR		1
14	Isabeau		1
15	Gervais		1
16	Tholomyes		2
17	Listolier		2
18	Fameuil		2
19	Blacheville		2
2	MlleBaptistine		1
20	Favourite		2
21	Dahlia		2
22	Zephine		2
23	Fantine		2
24	MmeThenardier		7
25	Thenardier		7
26	Cosette		6
27	Javert		7
28	Fauchelevant		4
29	Bamatobois		3
3	MmeMagloire		1
30	Perpetue		2
31	Simplice		2
32	Scaufflaire		1
33	Woman1		1
34	Judge		3
35	Champmathieu		3

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

# Gephi Data Laboratory: Edges



Overview **Data Laboratory** Preview

Workspace 1

Data Table

Nodes **Edges** Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Source

Source	Target	Type	Id	Label	Interval	Weight
1	0	Undirected	0			1.0
2	0	Undirected	1			8.0
3	0	Undirected	2			10.0
3	2	Undirected	3			6.0
4	0	Undirected	4			1.0
5	0	Undirected	5			1.0
6	0	Undirected	6			1.0
7	0	Undirected	7			1.0
8	0	Undirected	8			2.0
9	0	Undirected	9			1.0
11	0	Undirected	13			5.0
11	2	Undirected	12			3.0
11	3	Undirected	11			3.0
11	10	Undirected	10			1.0
12	11	Undirected	14			1.0
13	11	Undirected	15			1.0
14	11	Undirected	16			1.0
15	11	Undirected	17			1.0
17	16	Undirected	18			4.0
18	16	Undirected	19			4.0
18	17	Undirected	20			4.0
19	16	Undirected	21			4.0
19	17	Undirected	22			4.0
19	18	Undirected	23			4.0
20	16	Undirected	24			3.0
20	17	Undirected	25			3.0
20	18	Undirected	26			3.0
20	19	Undirected	27			4.0
21	16	Undirected	28			3.0
21	17	Undirected	29			3.0

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups



# Gephi Data Laboratory: Export table to CSV file



Overview **Data Laboratory** Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet **Export table** More actions Filter: Id

Id	Label	Interval	Modularity Class
0	Myriel		0
1	Napoleon		0
10	Labarre		1
11	Valjean		1
12	Marguerite		1
13	MmeDeR		1
14	Isabeau		1
15	Gervais		1
16	Tholomyes		2
17	Listolier		2
18	Fameuil		2
19	Blacheville		2
2	MlleBaptistine		1
20	Favourite		2
21	Dahlia		2
22	Zephine		2
23	Fantine		2
24	MmeThenardier		7
25	Thenardier		7
26	Cosette		6
27	Javert		7
28	Fauchelevant		4
29	Bamatabois		3
3	MmeMagloire		1
30	Perpetue		2
31	Simlice		2
32	Scaufflaire		1
33	Woman1		1
34	Judge		3
35	Champmathieu		3

Export table to CSV file

Separator: Comma

Charset: UTF-8

Columns:

- Id
- Label
- Interval
- Modularity Class

Cancel OK

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups

# Gephi Preview



Overview Data Laboratory **Preview**

Workspace 1

Preview Settings Preview

Presets

Default

Settings Manage renderers

Nodes

Border Width	1.0
Border Color	custom [0,0... ..]
opacity	100.0

Node Labels

Show Labels	<input type="checkbox"/>
Font	Arial 12 Plain ...
Proportional size	<input checked="" type="checkbox"/>
Color	custom [0,0... ..]
Shorten label	<input type="checkbox"/>
Max characters	30
Outline size	0.0
Outline color	custom [25... ..]
Outline opacity	80.0
Box	<input type="checkbox"/>
Box color	parent ...
Box opacity	100.0

Edges

Show Edges	<input checked="" type="checkbox"/>
Thickness	1.0
Rescale weight	<input type="checkbox"/>
Color	mixed ...
Opacity	100.0
Curved	<input checked="" type="checkbox"/>

Preview ratio: 100%

Refresh

Export: SVG/PDF/PNG

Background Reset zoom - +

# Gephi Preview: Export SVG/PDF/PNG



The screenshot shows the Gephi Preview interface. At the top, the 'Preview' tab is selected. The 'Preview Settings' panel on the left is visible, showing various rendering options for nodes and edges. The main preview area displays a network graph with blue and green nodes and edges. An 'Export' dialog box is open in the center, with the following details:

- Save As: Gephi\_SNA
- Folder: SNA
- File Format: PNG Files (\*.png)
- Buttons: New Folder, Cancel, Save, Options...

At the bottom left of the Preview window, the 'Export' dropdown menu is set to 'SVG/PDF/PNG'.

# Gephi Overview: Text Labels



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes Edges | Unique Attribute | #c0c0c0 | Apply

Layout | Yifan Hu Proportional | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
Convergence Thres	1.0E-4

Barnes-Hut's properties

Quadtree Max Level	10
Theta	1.2

Yifan Hu Proportional

Presets... Reset

Dragging (Configure)

Context

Nodes: 77  
Edges: 254  
Undirected Graph

Filters | Settings

Network Overview

- Average Degree
- Avg. Weighted Degree
- Network Diameter
- Graph Density
- Modularity
- PageRank
- Connected Components

Node Overview

- Avg. Clustering Coef
- Eigenvector Centralit

Edge Overview

- Avg. Path Length

Dynamic

- # Nodes
- # Edges
- Degree
- Clustering Coefficient

Text Labeling Tools

- Text tool icon (highlighted with a red dashed box)
- Font: Arial-BoldMT, 32
- Color: [Black]
- Size: [Slider]

Global | Edges | Labels (highlighted with a red dashed box)

Node

- Font: Arial-BoldMT, 32
- Color: [Black]
- Size: [Slider]

Edge

- Font: Arial-BoldMT, 32
- Color: [White]
- Size: [Slider]

Size: Scaled (highlighted with a red dashed box)

Color: Text (highlighted with a red dashed box)

Hide non-selected

# Gephi Overview: Text Labels



Overview | Data Laboratory | Preview

Workspace 1

Appearance | Graph | Context

Nodes | Edges | Unique | Attribute

#c0c0c0

Apply

Layout | Yifan Hu Proportional | Run

Yifan Hu's properties

Optimal Distance	100.0
Relative Strength	0.2
Initial Step size	20.0
Step ratio	0.95
Adaptive Cooling	<input checked="" type="checkbox"/>
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Barnes-Hut's properties

Quadtree Max Level	10
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Yifan Hu Proportional

Presets... Reset

Dragging (Configure)

Context

Nodes: 77  
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Undirected Graph

Filters | Settings

Network Overview

- Average Degree
- Avg. Weighted Degree
- Network Diameter
- Graph Density
- Modularity
- PageRank
- Connected Components

Node Overview

- Avg. Clustering Coefficient
- Eigenvector Centrality

Edge Overview

- Avg. Path Length

Dynamic

- # Nodes
- # Edges
- Degree
- Clustering Coefficient

Font: Arial-BoldMT, 32

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<http://analyzingthesocialweb.com/course-materials.shtml>
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