

Social Computing and Big Data Analytics



社群運算與大數據分析

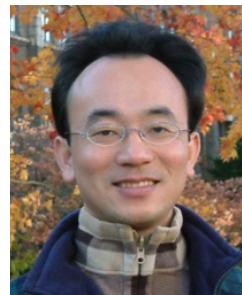
Measurements and Tools of Social Network Analysis

(社會網絡分析量測與工具)

1042SCBDA13

MIS MBA (M2226) (8628)

Wed, 8,9, (15:10-17:00) (B309)



Min-Yuh Day

戴敏育

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專任助理教授

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淡江大學 資訊管理學系

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

2016-05-25



課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

- 1 2016/02/17 Course Orientation for Social Computing and Big Data Analytics
(社群運算與大數據分析課程介紹)
- 2 2016/02/24 Data Science and Big Data Analytics:
Discovering, Analyzing, Visualizing and Presenting Data
(資料科學與大數據分析：
探索、分析、視覺化與呈現資料)
- 3 2016/03/02 Fundamental Big Data: MapReduce Paradigm,
Hadoop and Spark Ecosystem
(大數據基礎：MapReduce典範、
Hadoop與Spark生態系統)

課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

- | | | |
|---|------------|---|
| 4 | 2016/03/09 | Big Data Processing Platforms with SMACK:
Spark, Mesos, Akka, Cassandra and Kafka
(大數據處理平台SMACK：
Spark, Mesos, Akka, Cassandra, Kafka) |
| 5 | 2016/03/16 | Big Data Analytics with Numpy in Python
(Python Numpy 大數據分析) |
| 6 | 2016/03/23 | Finance Big Data Analytics with Pandas in Python
(Python Pandas 財務大數據分析) |
| 7 | 2016/03/30 | Text Mining Techniques and
Natural Language Processing
(文字探勘分析技術與自然語言處理) |
| 8 | 2016/04/06 | Off-campus study (教學行政觀摩日) |

課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

9 2016/04/13 Social Media Marketing Analytics
(社群媒體行銷分析)

10 2016/04/20 期中報告 (Midterm Project Report)

11 2016/04/27 Deep Learning with Theano and Keras in Python
(Python Theano 和 Keras 深度學習)

12 2016/05/04 Deep Learning with Google TensorFlow
(Google TensorFlow 深度學習)

13 2016/05/11 Sentiment Analysis on Social Media with
Deep Learning
(深度學習社群媒體情感分析)

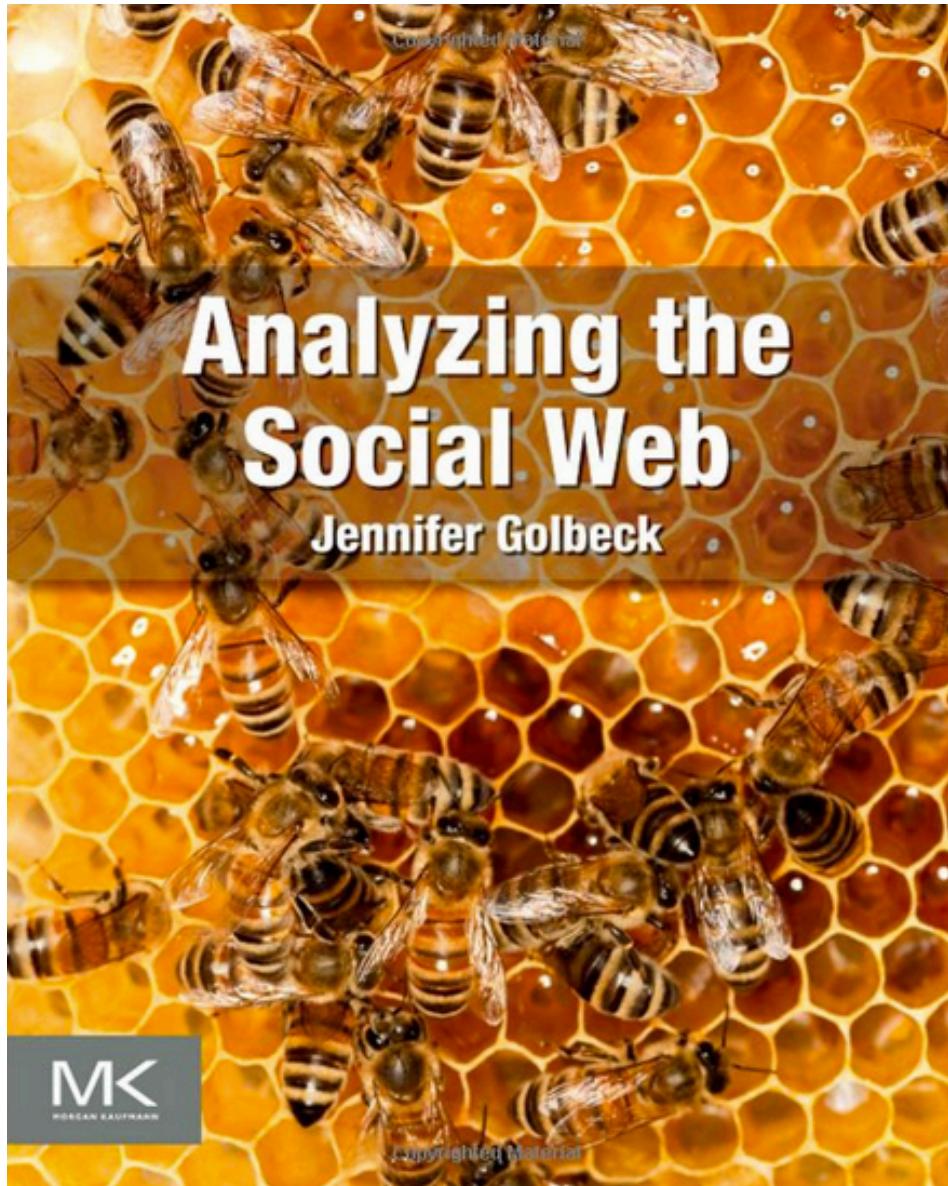
課程大綱 (Syllabus)

週次 (Week) 日期 (Date) 內容 (Subject/Topics)

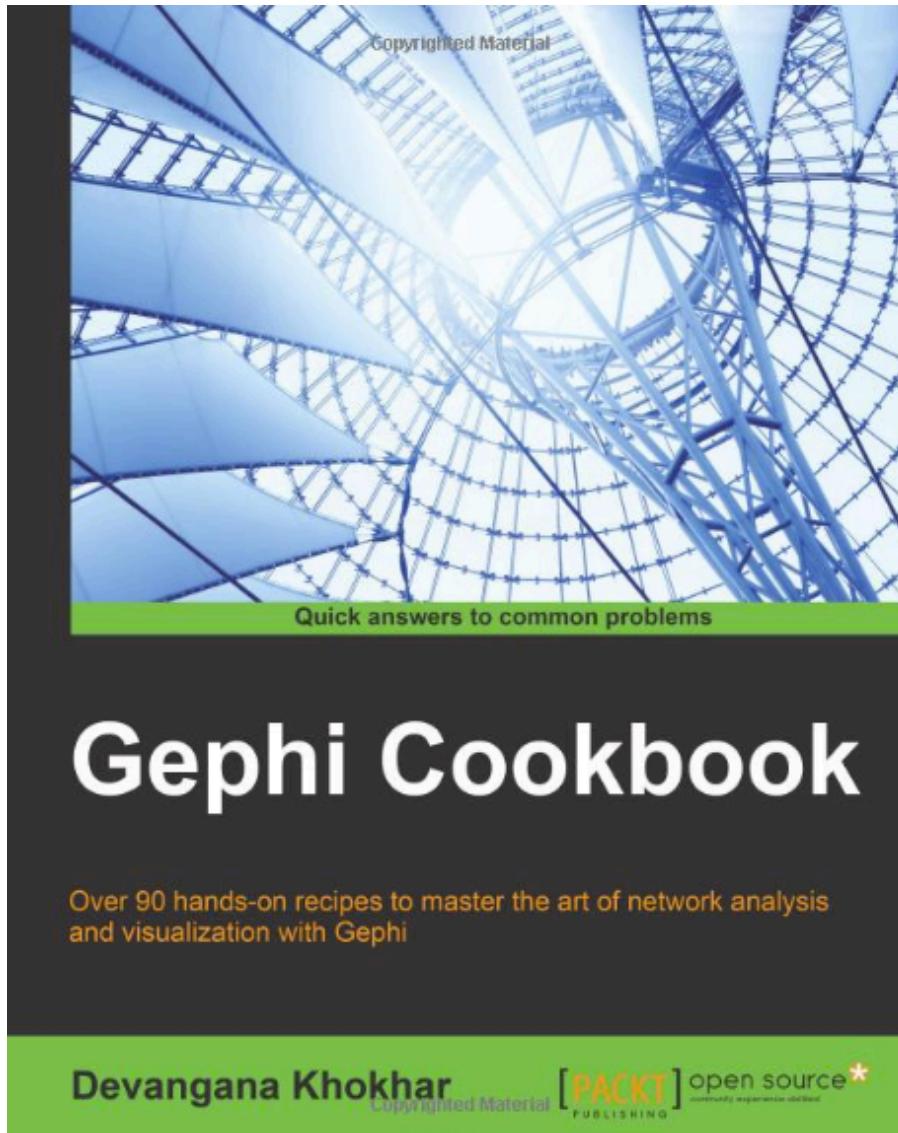
- | | | |
|----|------------|---|
| 14 | 2016/05/18 | Social Network Analysis (社會網絡分析) |
| 15 | 2016/05/25 | Measurements and Tools of
Social Network Analysis
(社會網絡分析量測與工具) |
| 16 | 2016/06/01 | Final Project Presentation I (期末報告 I) |
| 17 | 2016/06/08 | Practice of Big Data Analytics in Teradata
(Teradata 大數據分析實務)
[Invited Speaker: Irene Chen (陳維君), Consultant, Teradata] |
| 18 | 2016/06/15 | Final Project Presentation II (期末報告 II) |

Measurements and Tools of Social Network Analysis

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



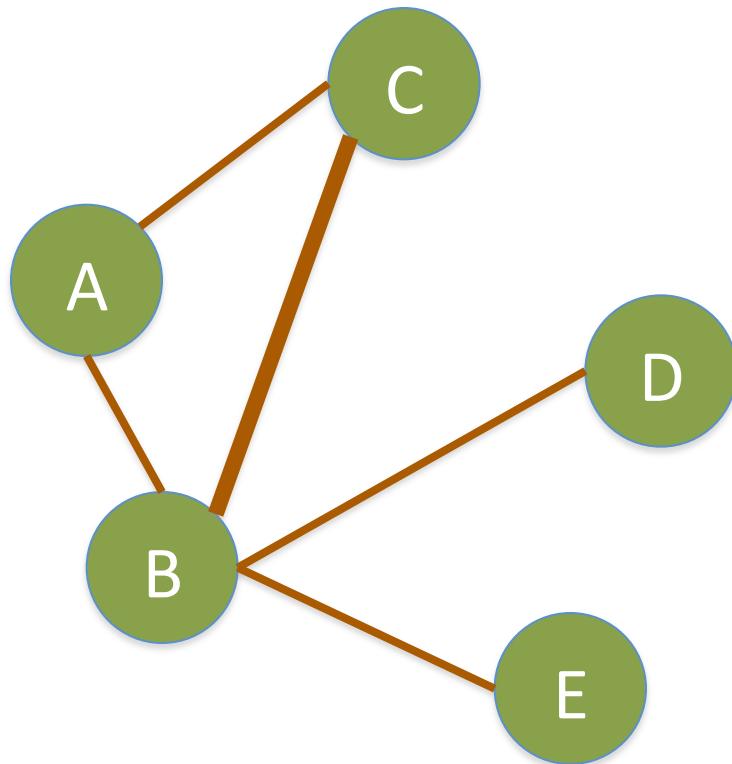
Devangana Khokhar (2015), Gephi Cookbook, Packt Publishing



Source: <http://www.amazon.com/Gephi-Cookbook-Devangana-Khokhar/dp/1783987405>

Graph Theory

Graph



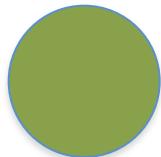
Graph

$$g = (V, E)$$

Vertex (Node)



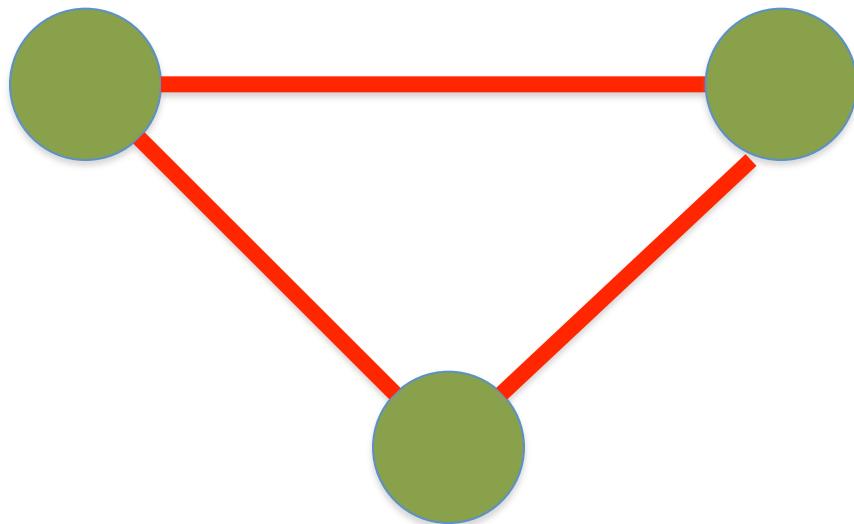
Vertices (Nodes)



Edge



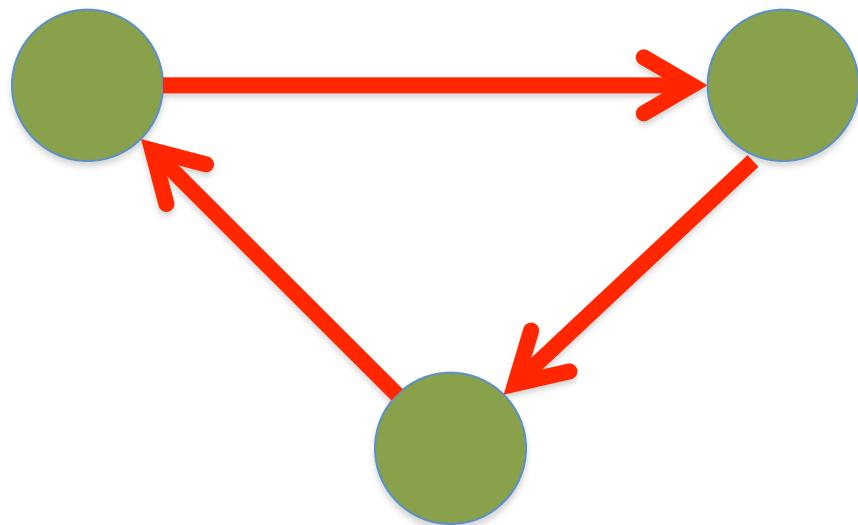
Edges



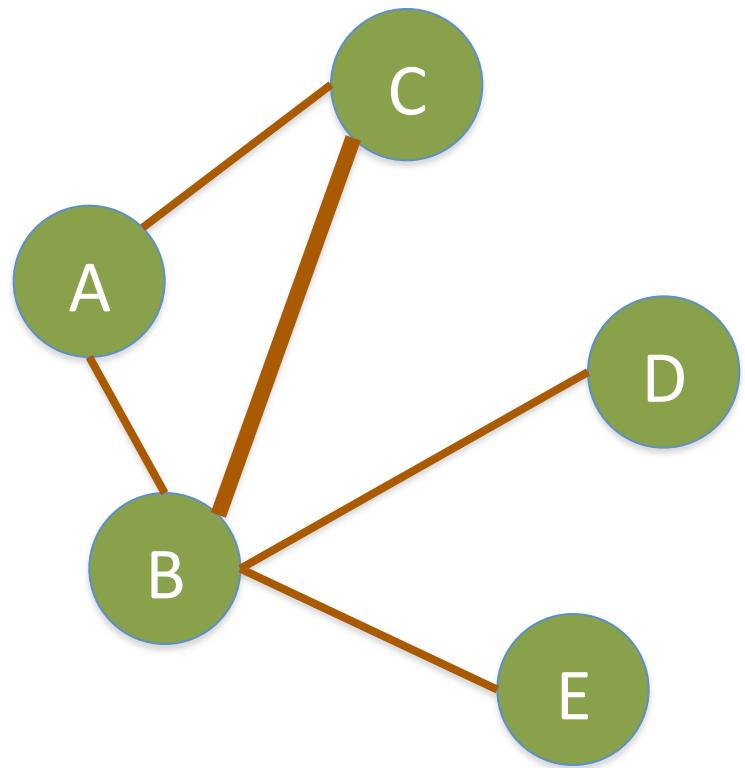
Arc



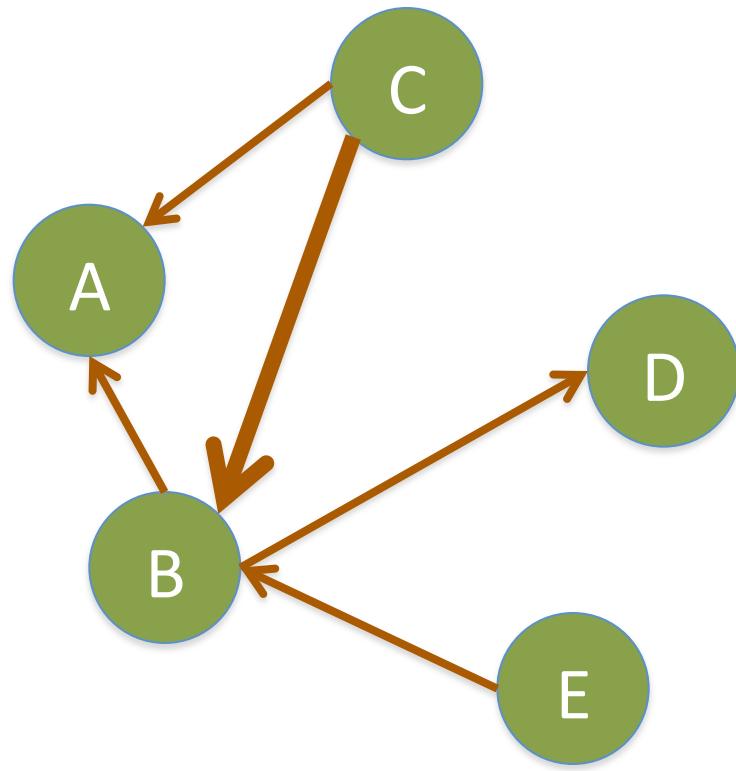
Arcs



Undirected Graph

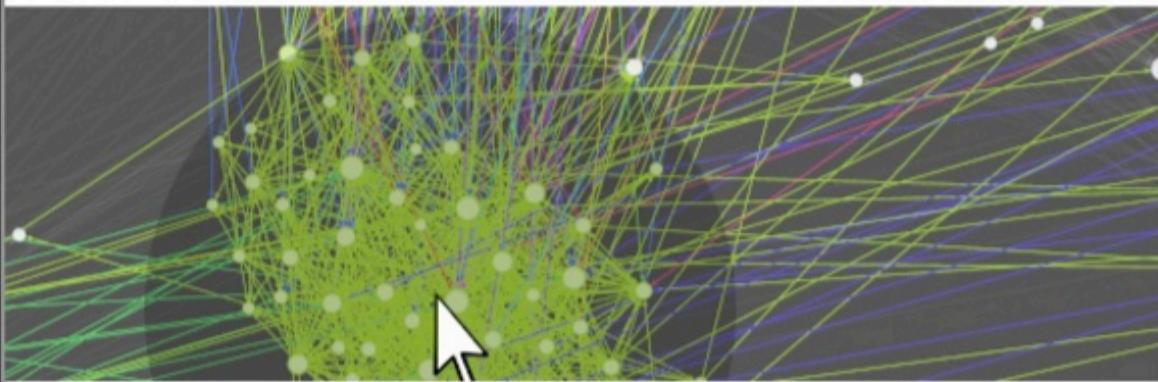
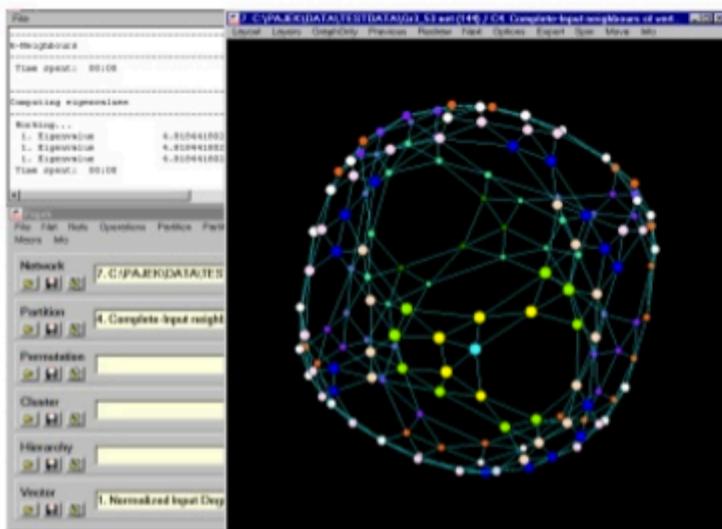


Directed Graph



Measurements of Social Network Analysis

Exploratory Network Analysis

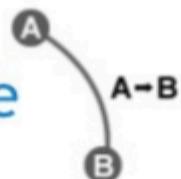


1 see the network

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

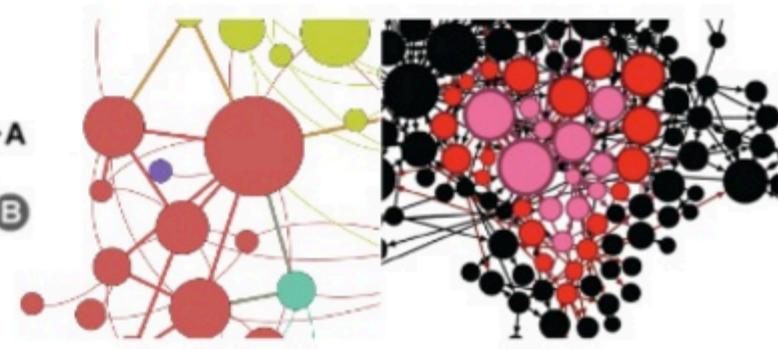
3 build a visual language

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

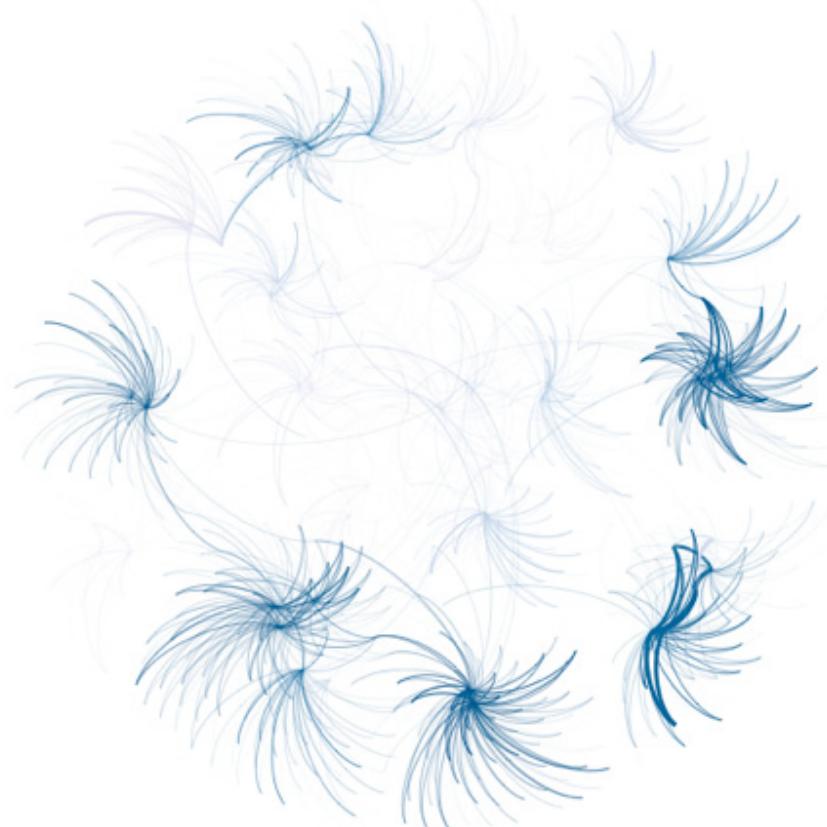
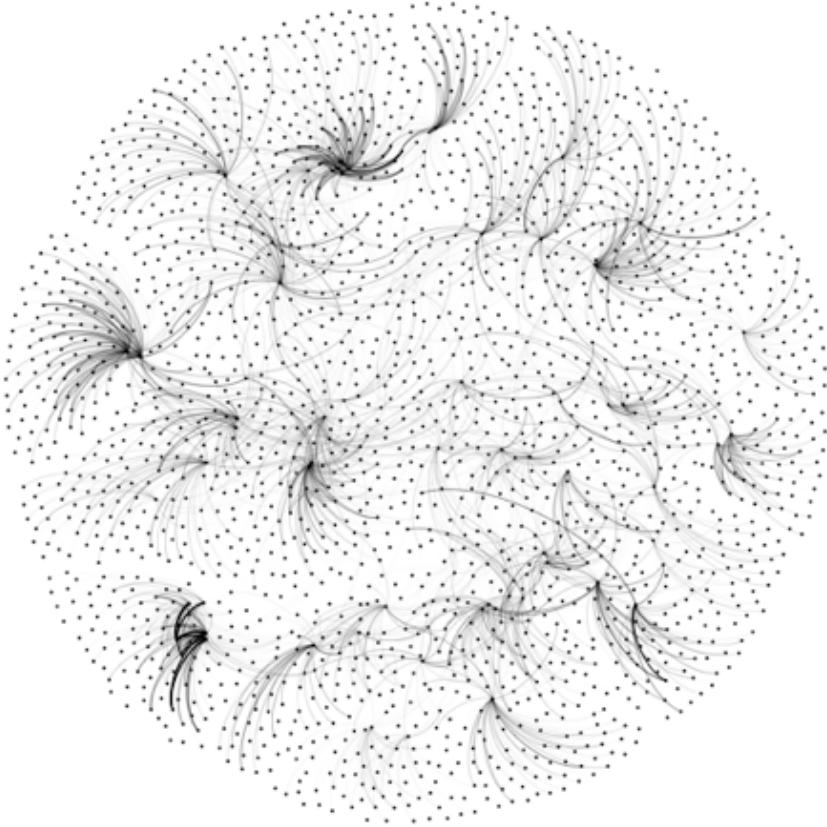


2 interact in real time

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



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

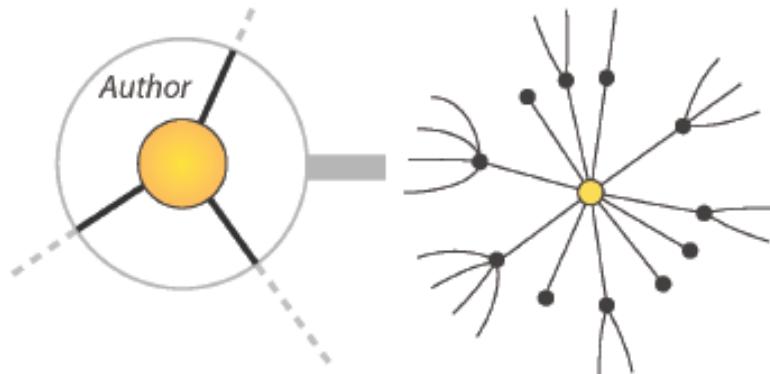
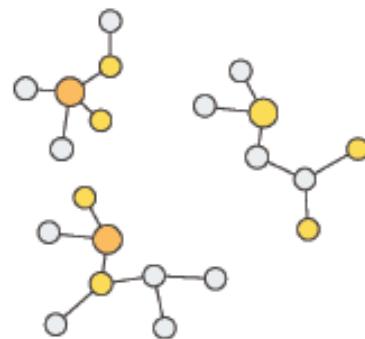
on multiple dimensions

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

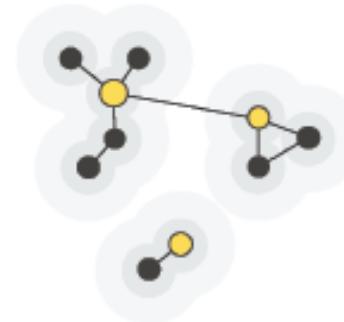
- centrality
- distances
- neighborhood
- location
- local authority vs hub

“Crossing” cursor on Quantitative Data



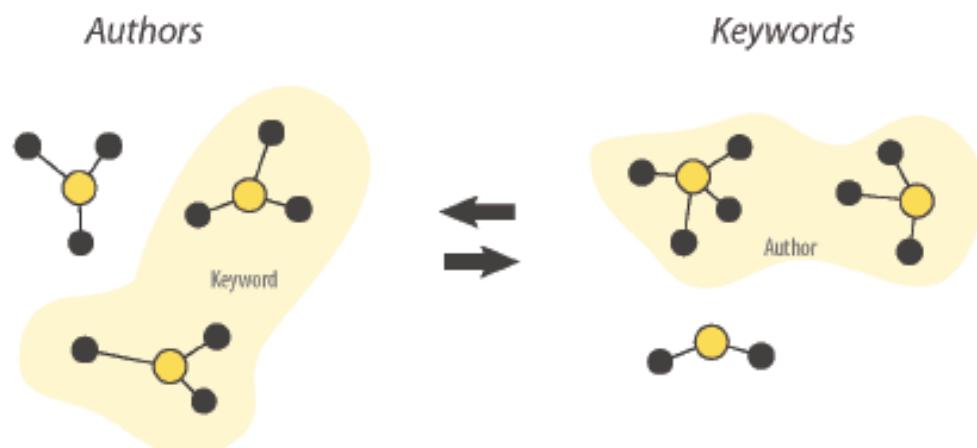
Social

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



Semantic

- topics
- thematic clusters



Geographic

- spatial phenomena

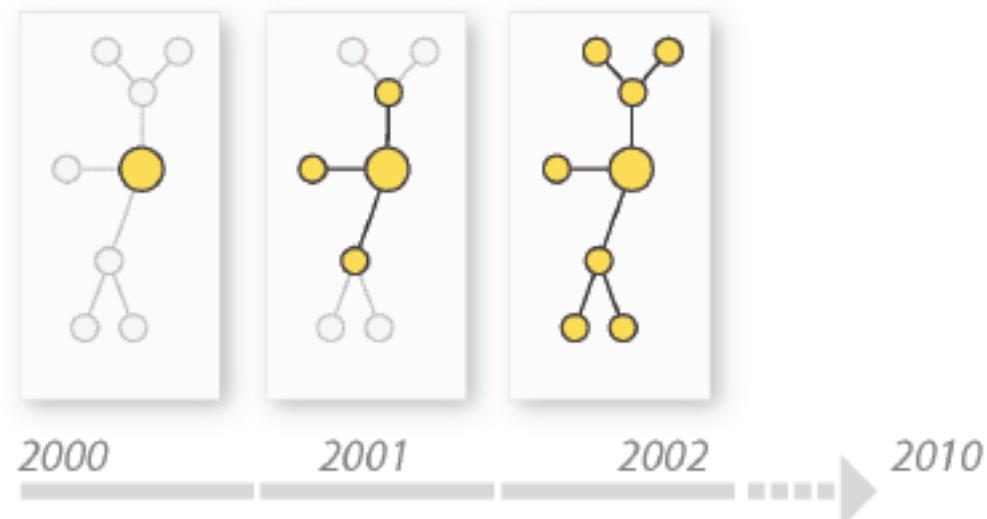
“Timeline” cursor on Temporal Data



Evolution of social ties

Evolution of communities

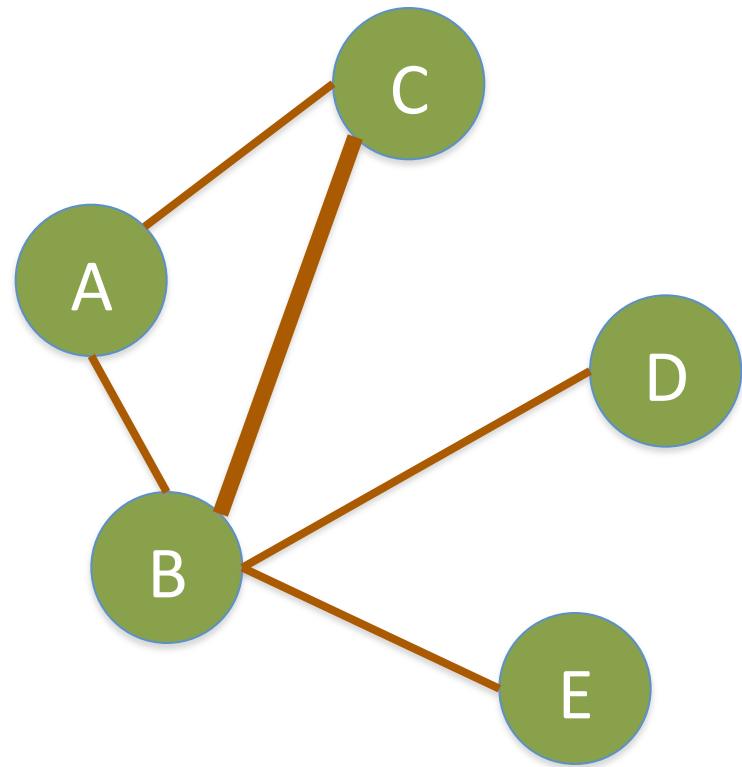
Evolution of topics



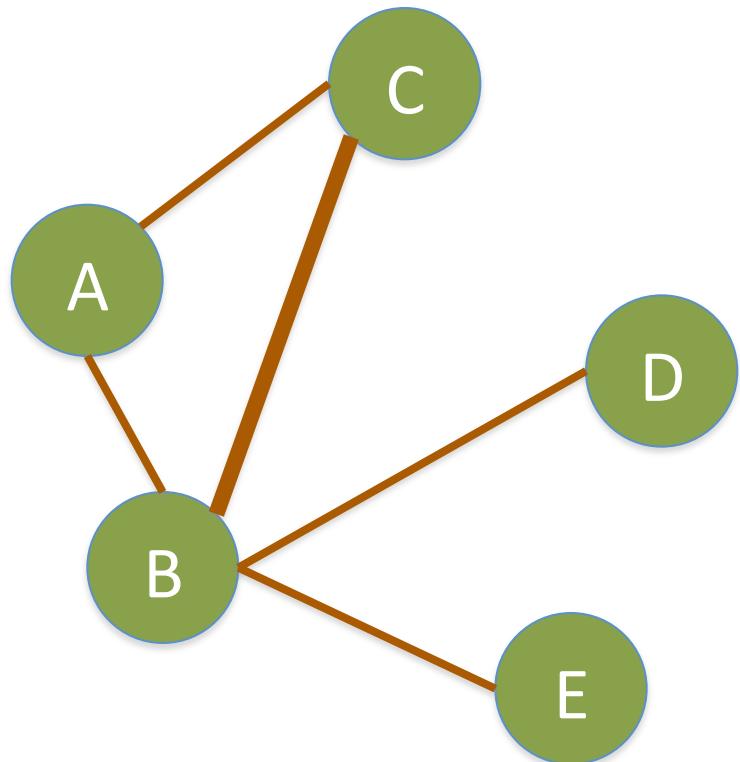
SNA Guideline

# nodes	
1 - 100	lists + edges in bonus, focus on qualitative data
100 - 1,000	<p>How attributes explain the structure?</p> <ul style="list-style-type: none">• 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 <p>challenge: mix attribute crossing and connectivity</p>
1,000 - 50,000	<p>How the structure explains attributes?</p> <ul style="list-style-type: none">• 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 <p>challenge: pattern recognition</p>
> 50,000	require high computational power

Degree

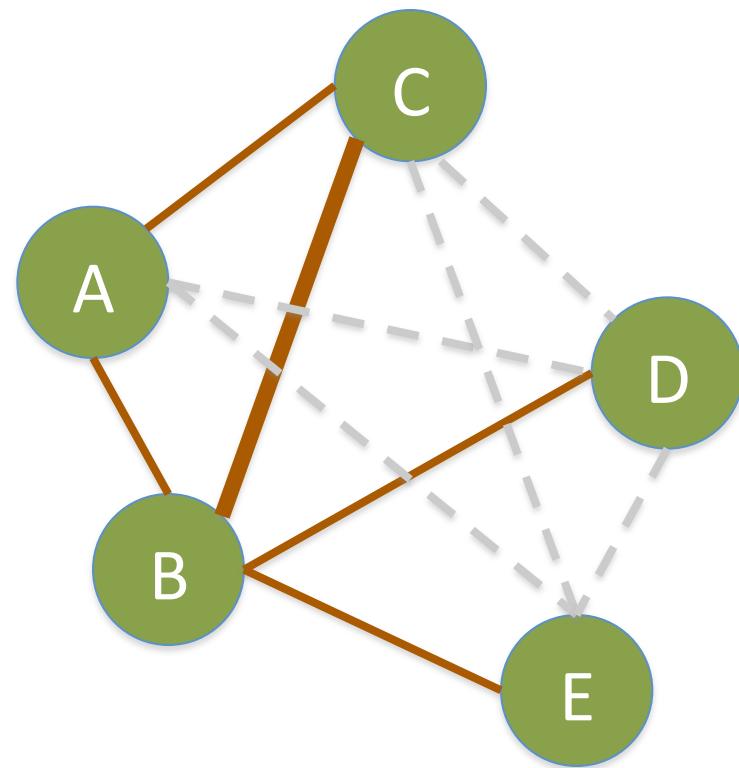


Degree



A: 2
B: 4
C: 2
D: 1
E: 1

Density

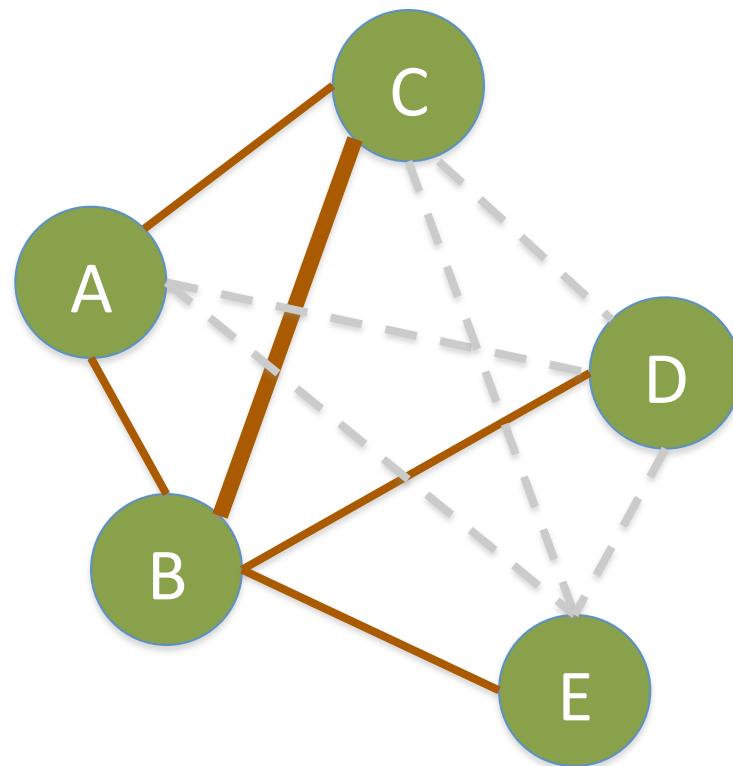


Density

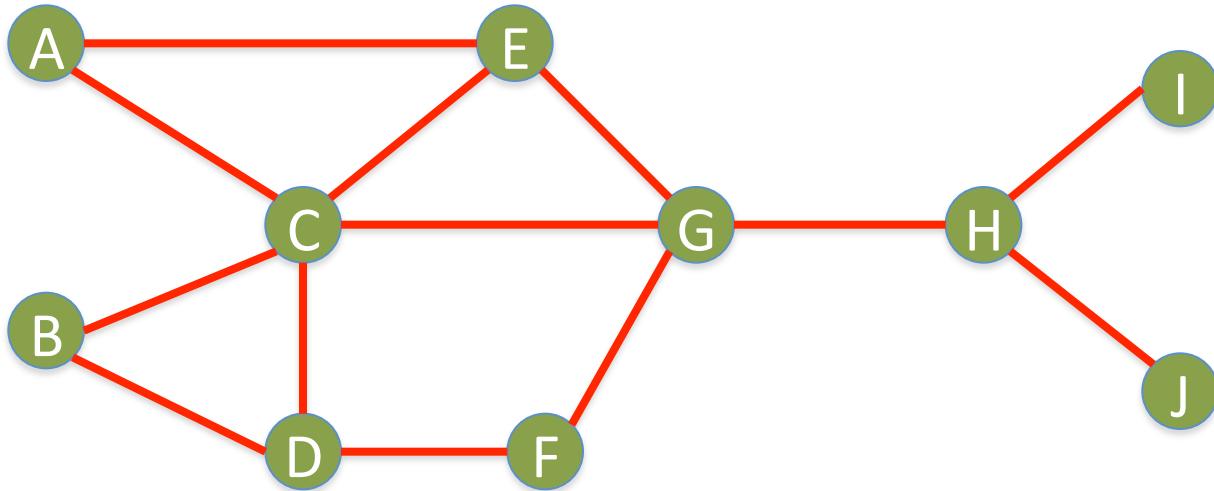
Edges (Links): 5

Total Possible Edges: 10

Density: $5/10 = 0.5$



Density



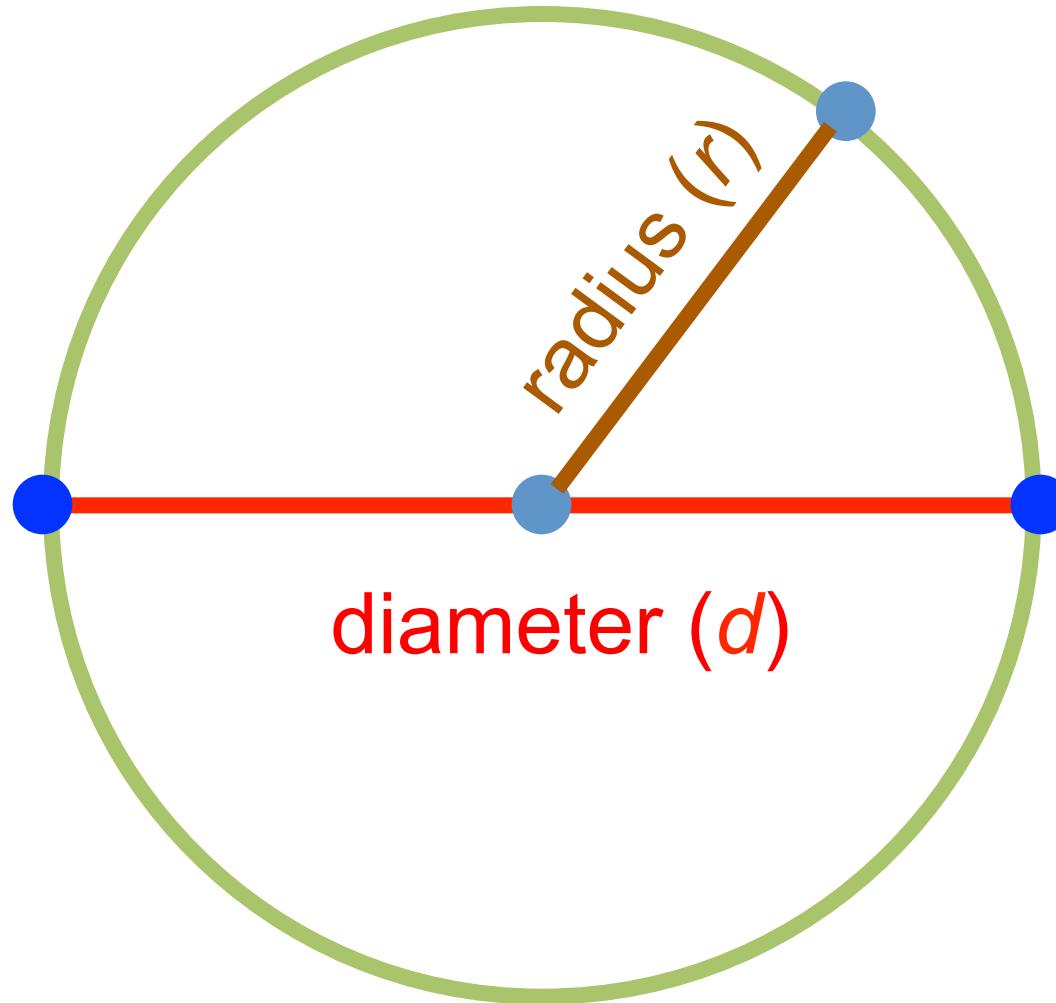
Nodes (n): 10

Edges (Links): 13

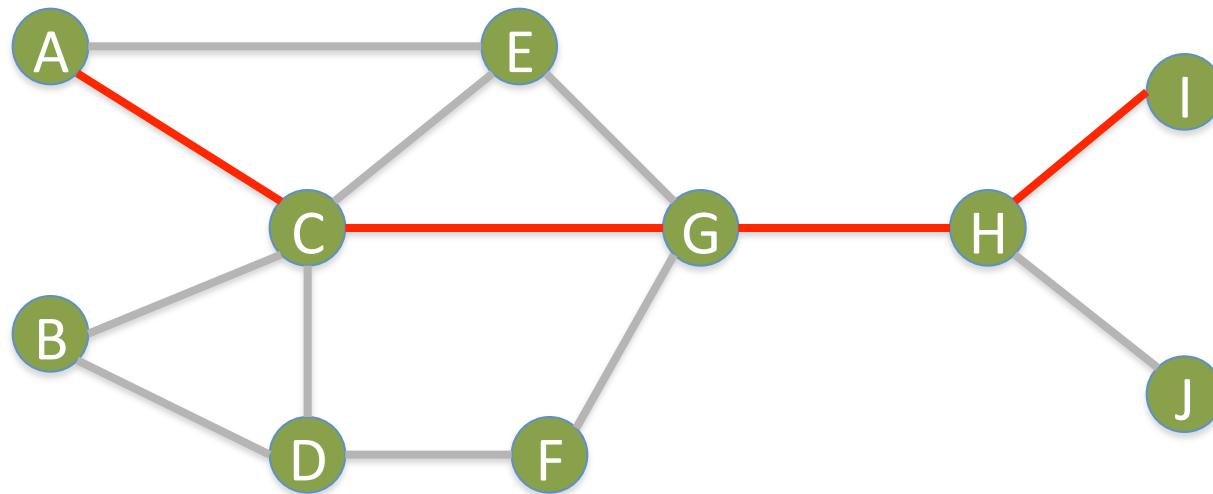
Total Possible Edges: $(n * (n-1)) / 2 = (10 * 9) / 2 = 45$

Density: $13/45 = 0.29$

Diameter

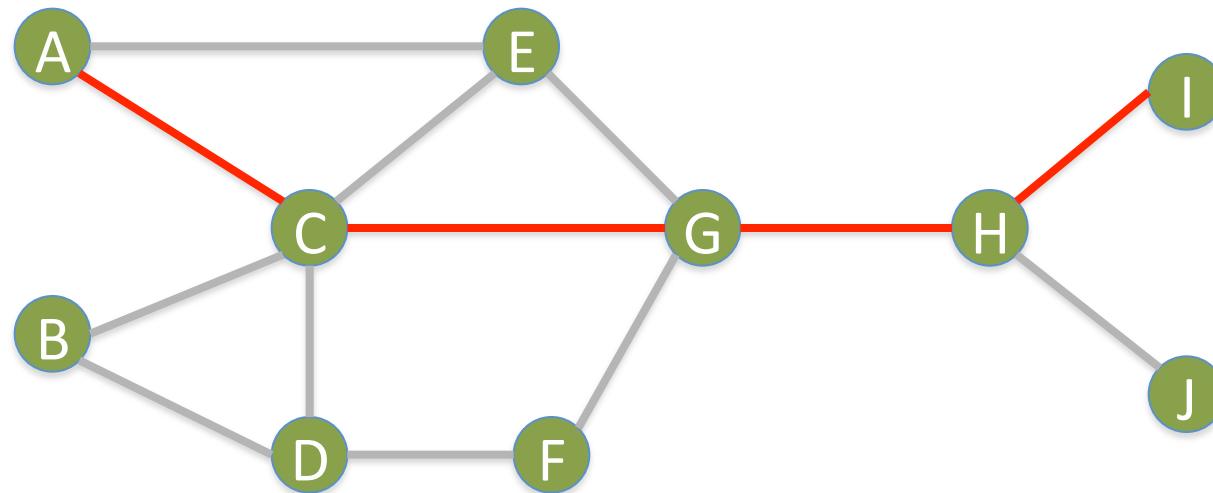


Diameter



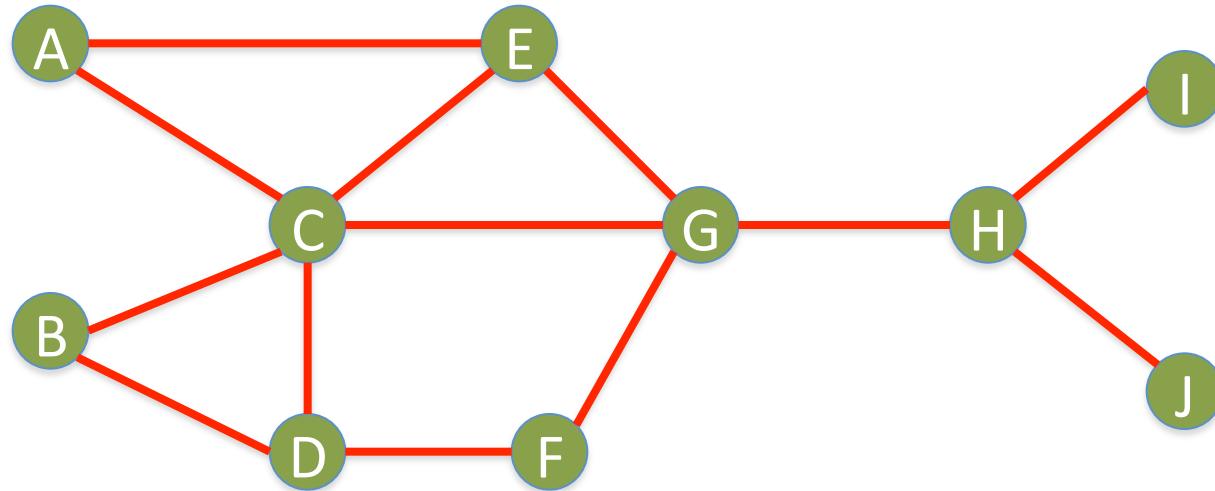
Diameter

Geodesic Path (Shortest Path)



$A \rightarrow I$: Diameter = 4

Which Node is Most Important?



Centrality

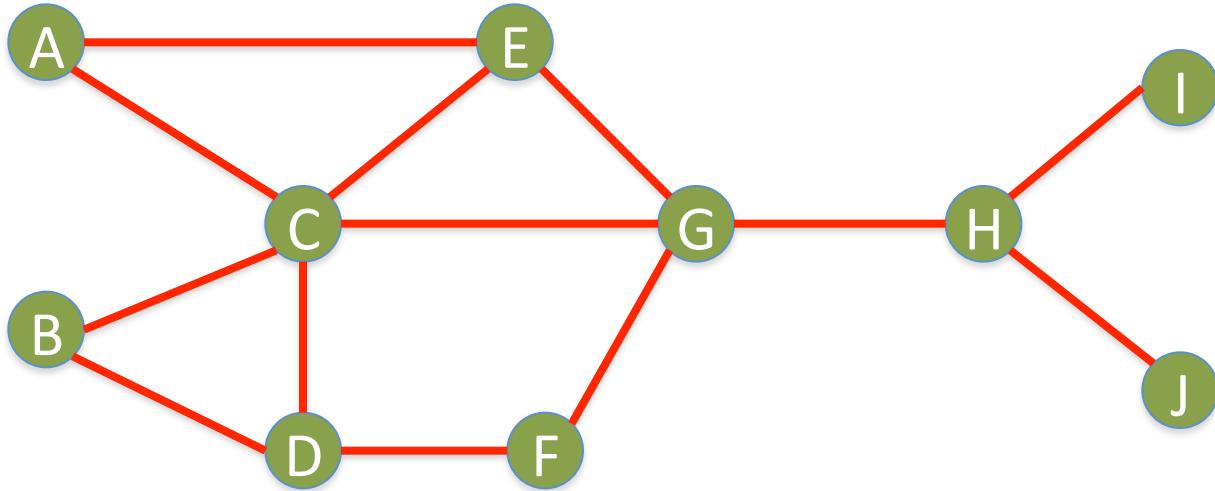
- Important or prominent actors are those that are linked or involved with other actors extensively.
- A person with extensive contacts (links) or communications with many other people in the organization is considered more important than a person with relatively fewer contacts.
- The links can also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

Social Network Analysis (SNA)

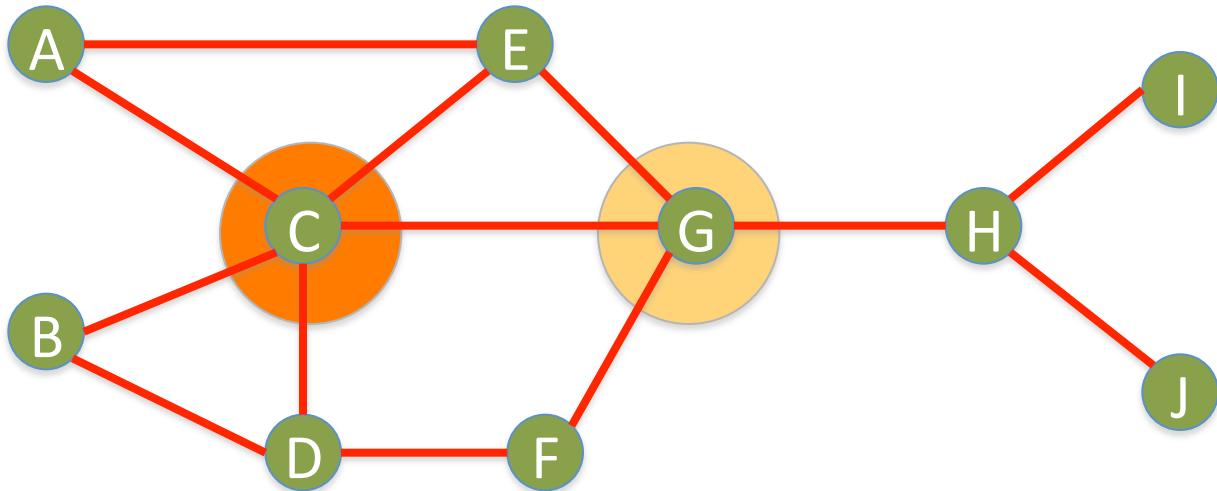
- Degree Centrality
- Betweenness Centrality
- Closeness Centrality

Degree Centrality

Social Network Analysis: Degree Centrality



Social Network Analysis: Degree Centrality



Node	Score	Standardized Score
A	2	$2/10 = 0.2$
B	2	$2/10 = 0.2$
C	5	$5/10 = 0.5$
D	3	$3/10 = 0.3$
E	3	$3/10 = 0.3$
F	2	$2/10 = 0.2$
G	4	$4/10 = 0.4$
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

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

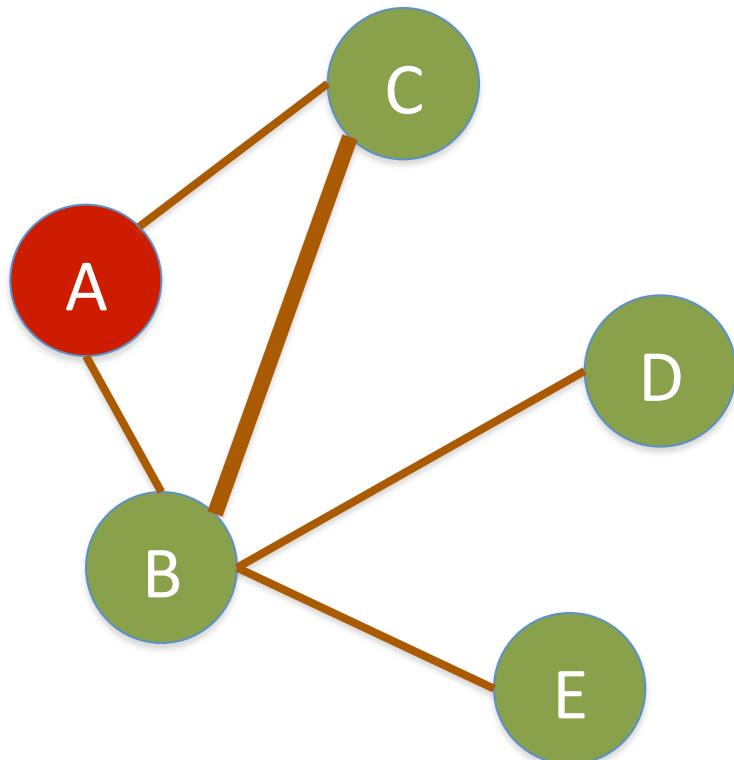
Where g_{jk} = the number of shortest paths connecting jk
 $g_{jk}(i)$ = the number that actor i is on.

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:

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

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

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

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

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

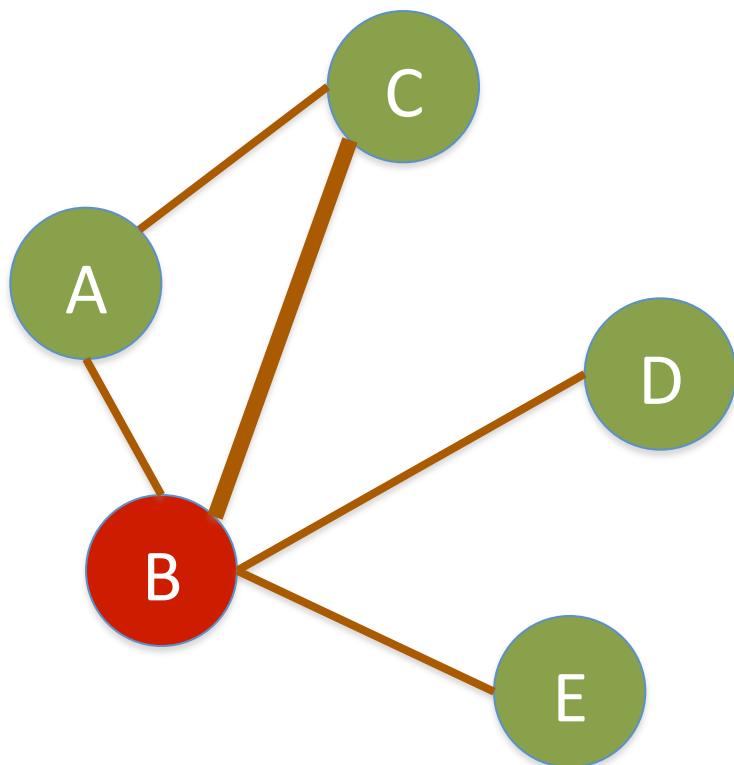
$$D \rightarrow E: 0/1 = 0$$

—

Total: 0

A: Betweenness Centrality = 0

Betweenness Centrality



B:

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

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

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

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

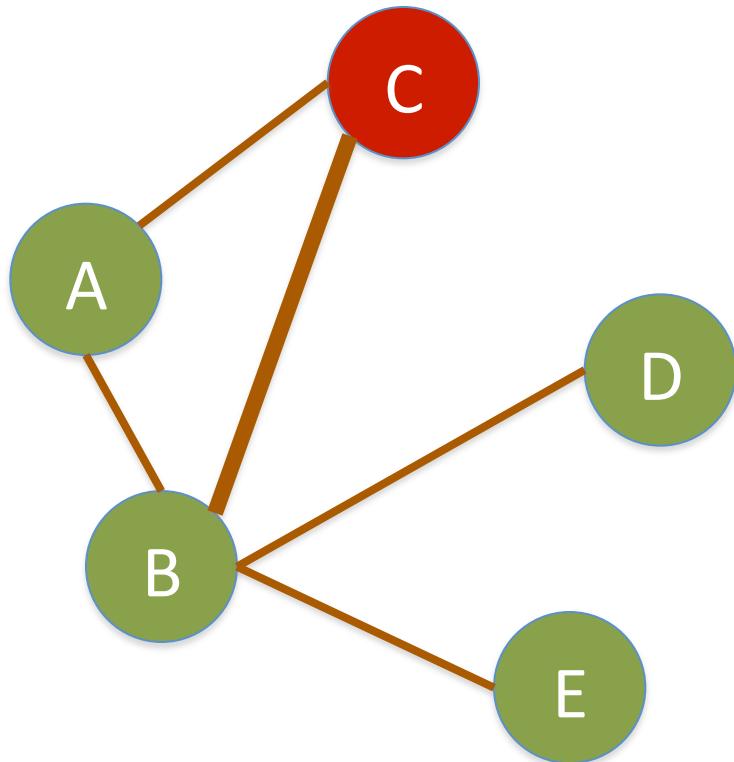
$$C \rightarrow E: 1/1 = 1$$

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

Total: 5

B: Betweenness Centrality = 5

Betweenness Centrality



C:

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

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

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

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

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

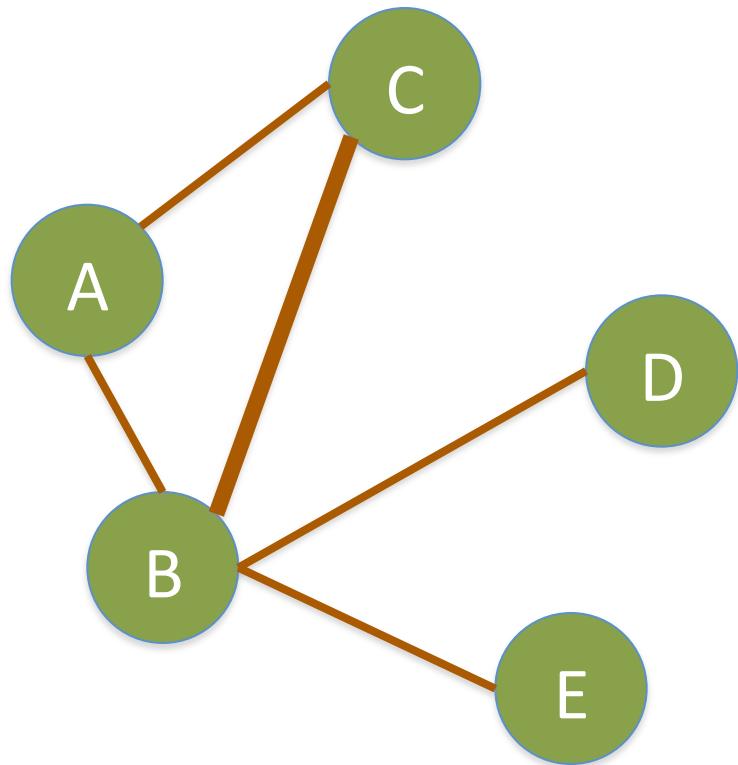
$$D \rightarrow E: 0/1 = 0$$

—

Total: 0

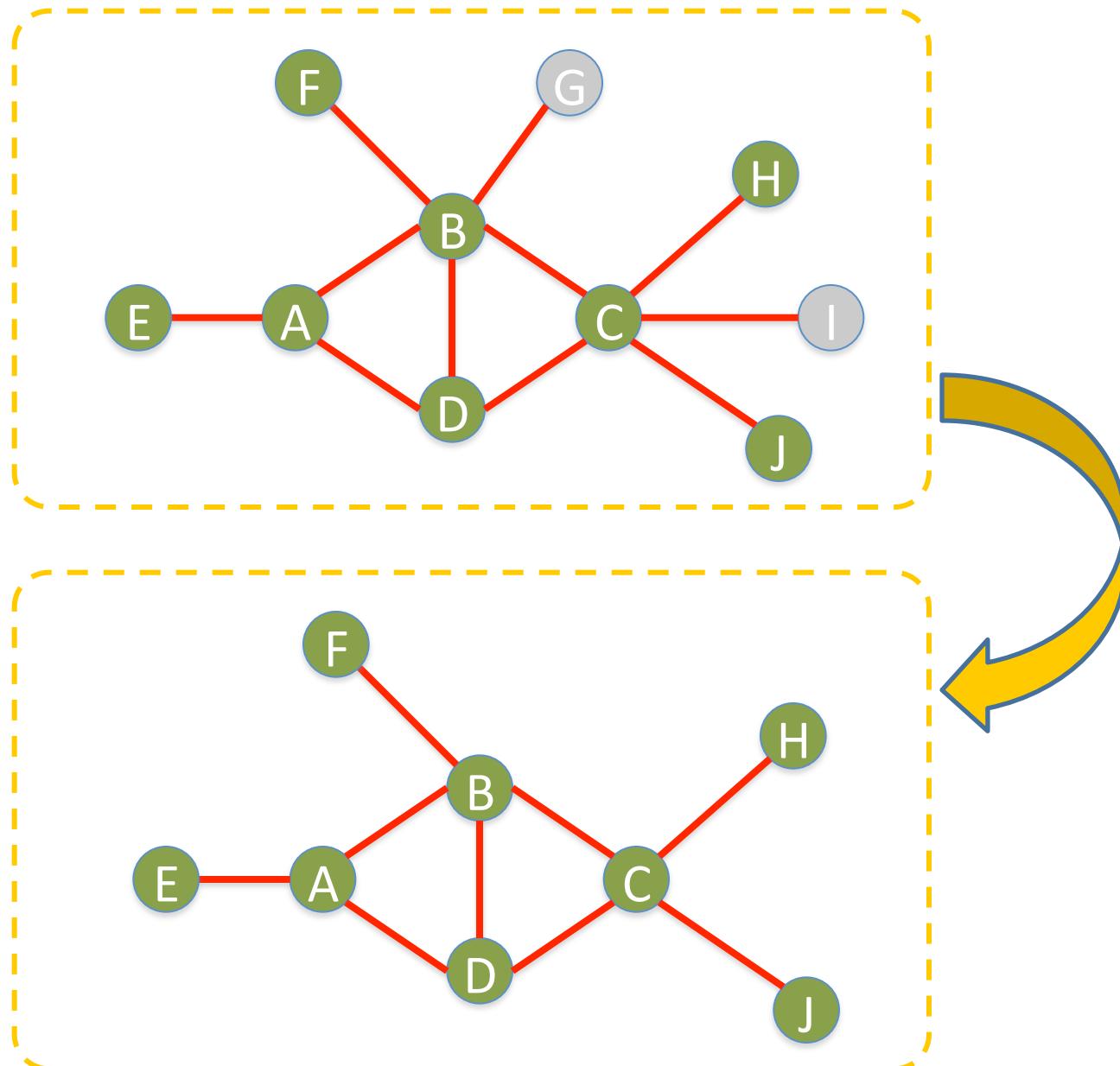
C: Betweenness Centrality = 0

Betweenness Centrality

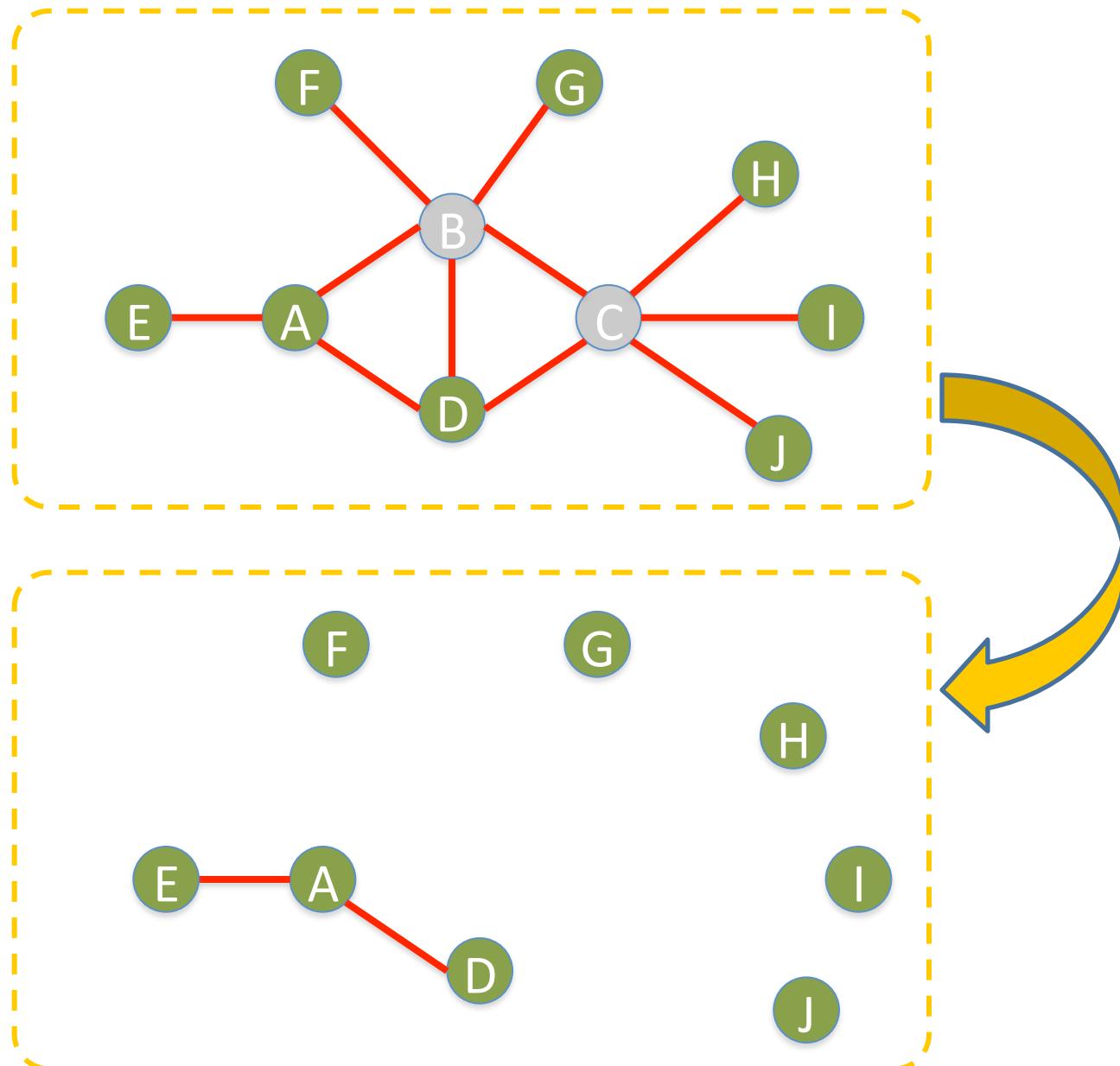


A: 0
B: 5
C: 0
D: 0
E: 0

Which Node is Most Important?

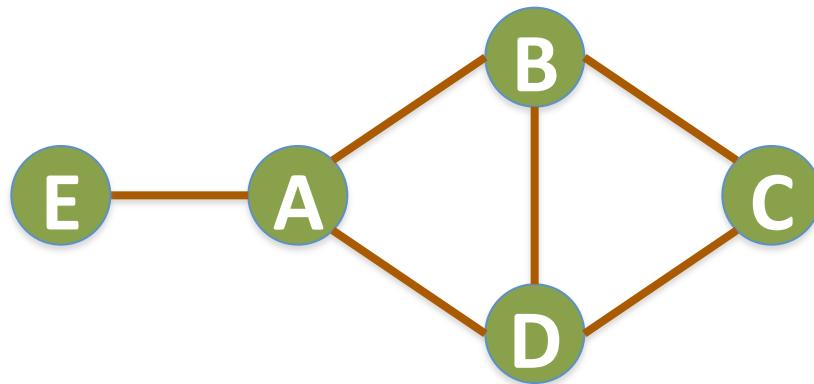


Which Node is Most Important?

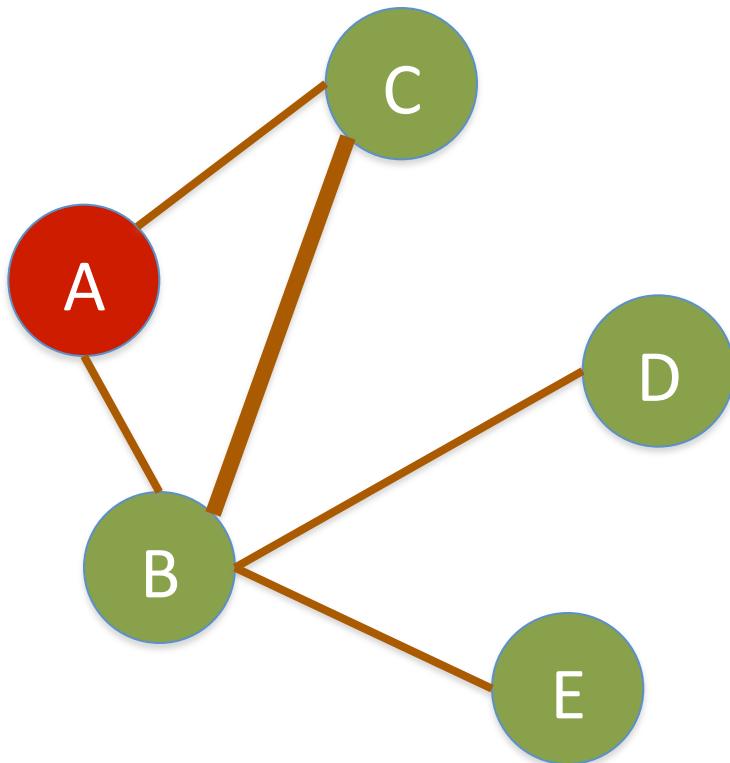


Betweenness Centrality

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



Betweenness Centrality



A:

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

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

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

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

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

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

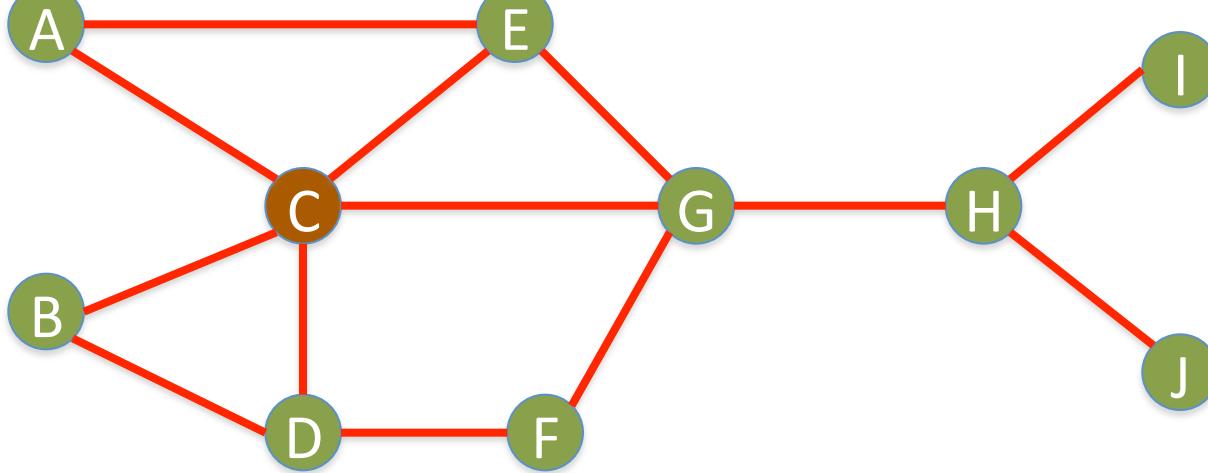
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Total: 0

A: Betweenness Centrality = 0

Closeness Centrality

Social Network Analysis: Closeness Centrality

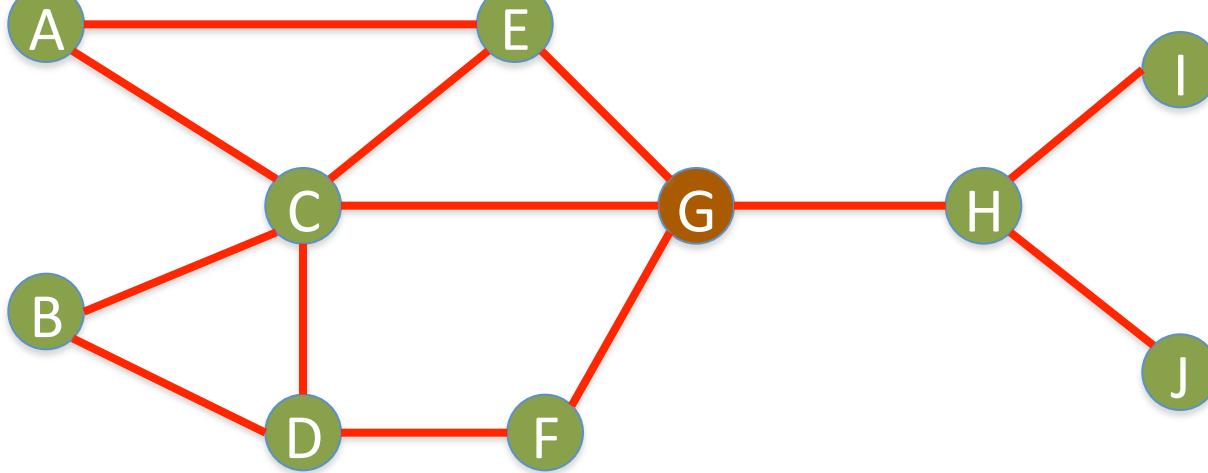


C→A:	1
C→B:	1
C→D:	1
C→E:	1
C→F:	2
C→G:	1
C→H:	2
C→I:	3
C→J:	3

Total=15

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

Social Network Analysis: Closeness Centrality

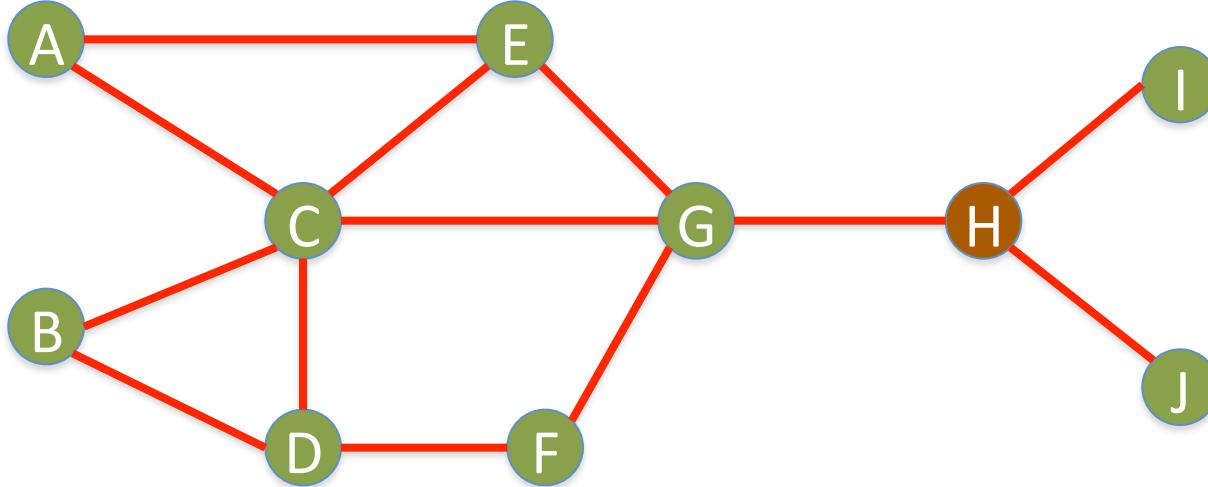


G→A:	2
G→B:	2
G→C:	1
G→D:	2
G→E:	1
G→F:	1
G→H:	1
G→I:	2
G→J:	2

Total=14

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

Social Network Analysis: Closeness Centrality

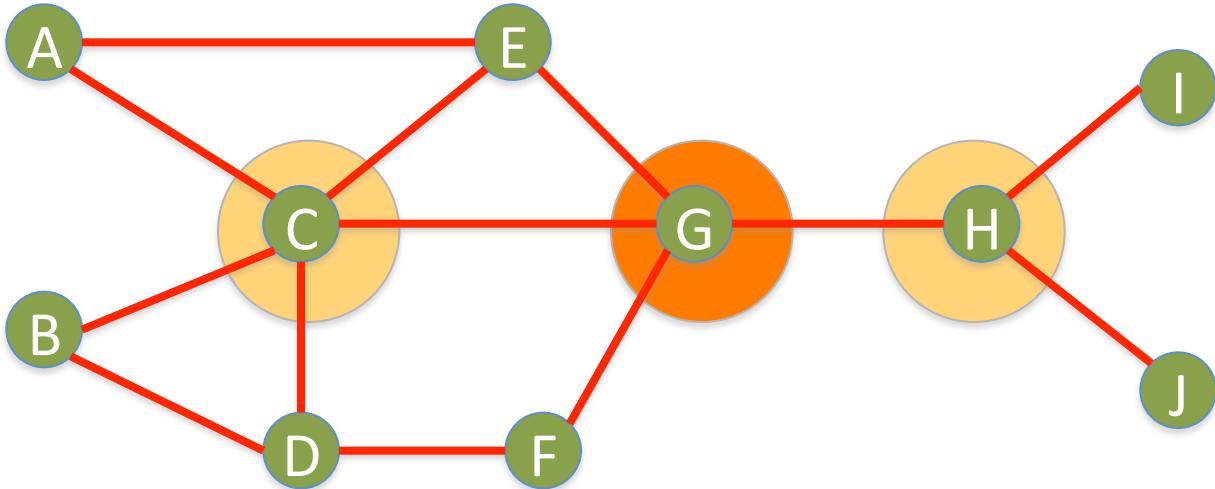


H→A:	3
H→B:	3
H→C:	2
H→D:	2
H→E:	2
H→F:	2
H→G:	1
H→I:	1
H→J:	1

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

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 Networks, 1 (1978/79) 215–239
©Elsevier Sequoia S.A., Lausanne – Printed in the Netherlands

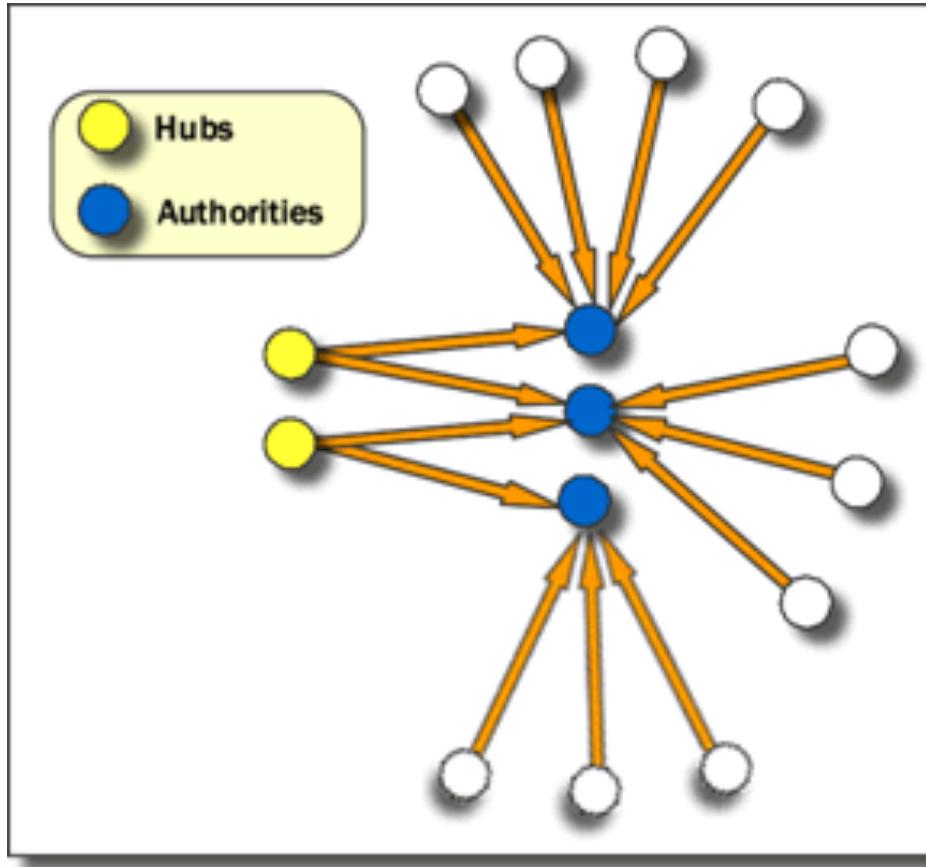
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Centrality in Social Networks Conceptual Clarification

Linton C. Freeman

Lehigh University *

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.

Tools of Social Network Analysis

Social Network Analysis (SNA) Tools

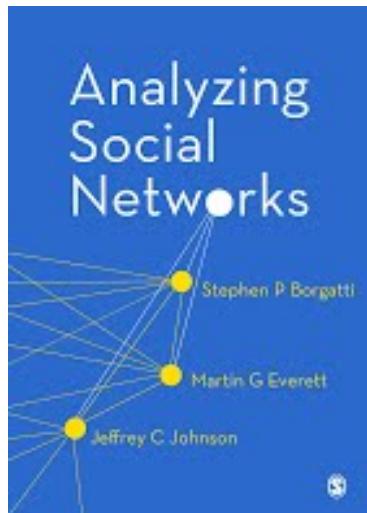
- **NetworkX**

- **igraph**

- **Gephi**

- **UCINet**

- **Pajek**



Tools of Social Network Analysis

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

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.

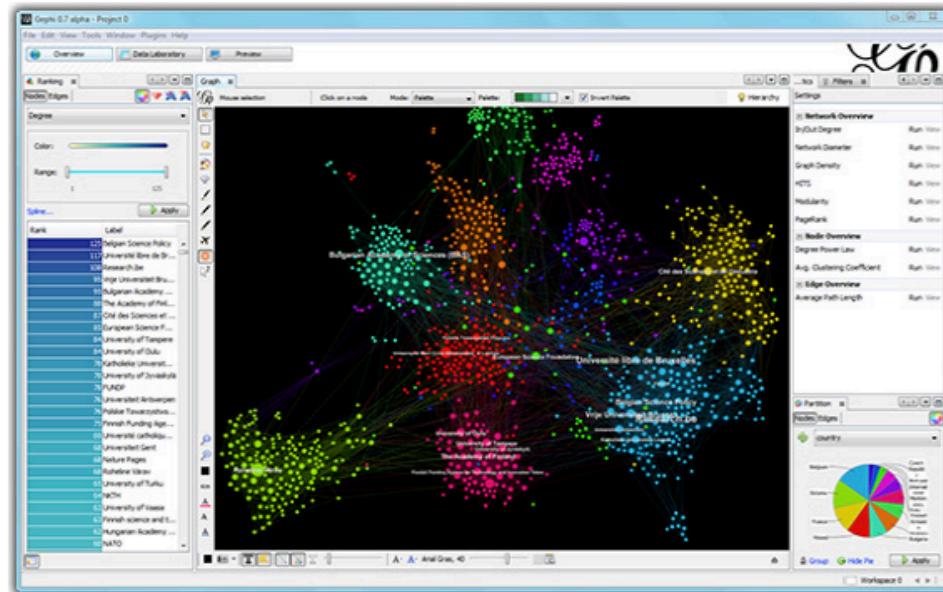
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APPLICATIONS

- ✓ **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



UCINET



UCINET Software

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Links

- [Analytic Technologies](#)
 - [NetDraw](#)
 - [E-Net](#)
- [LINKS Center](#)
 - [Workshop](#)
- [Steve Borgatti](#)

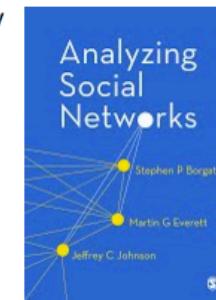
New! UCINET-oriented book on social network analysis now available! See [details](#).

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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- 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 valuesChanged 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](#)).

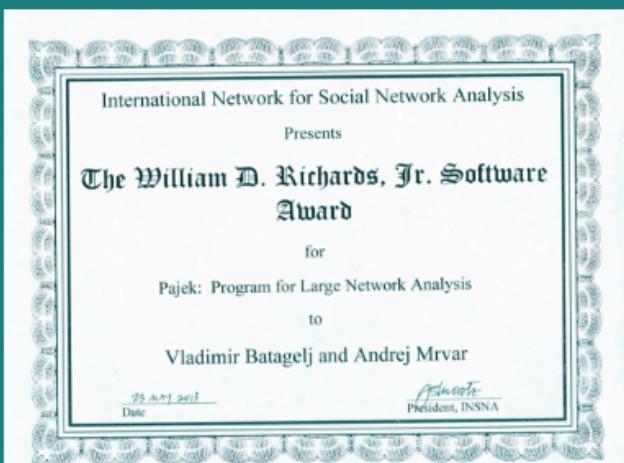
Our layouts for **Graph-Drawing Competitions**: [GD95](#), [GD96](#), [GD97](#), [GD98](#), [GD99](#), [GD00](#), [GD01](#) and [GD05](#).

<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	Web Start  Install Shield Install-Zip Portable	Web Start  Install Shield Install-Zip Portable
March 1, 2016	4.09	Install Shield Install-Zip Portable	Install Shield Install-Zip Portable
Sept. 25, 2011	2.05	zip	zip
Pajek mailing list		Datasets	





Pajek
and
Pajek-XXL

Programs for Analysis
and Visualization
of Very Large Networks

STRUCTURAL ANALYSIS IN THE SOCIAL SCIENCES

Exploratory Social Network Analysis with Pajek

REVISED AND EXPANDED



Wouter de Nooy, Andrej Mrvar,
Vladimir Batagelj

Exploratory
Social Network
Analysis with Pajek

Pajekを活用した
社会ネットワーク
分析

著者: Wouter De Nooy, Andrej Mrvar, Vladimir Batagelj
翻訳: 安田 雪里

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実践的・社会ネットワーク分析の決定版

PAJEK
蜘蛛:
社会网络分析技术

Exploratory Social Network Analysis with Pajek (Second Edition)
REVISED AND EXPANDED
Wouter De Nooy, Andrej Mrvar, Vladimir Batagelj
林國津・李荷忠・申江
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NodeXL: Network Overview, Discovery and Exploration for Excel

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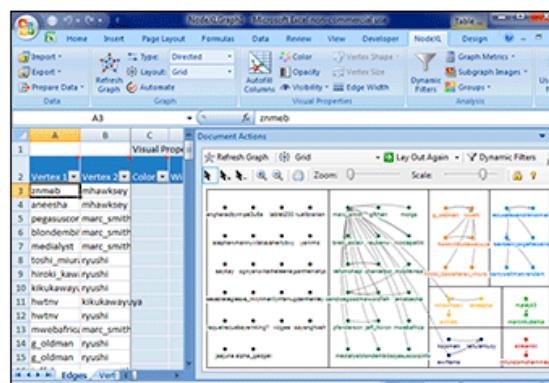
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OPEN TOOLS, OPEN DATA, OPEN SCHOLARSHIP FOR SOCIAL MEDIA

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://nodelx.codeplex.com/>

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NodeXL Basic Excel Template 2014

DATE

Thu Jan 23, 2014 at 7:00 AM

STATUS

Beta

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17 ratings

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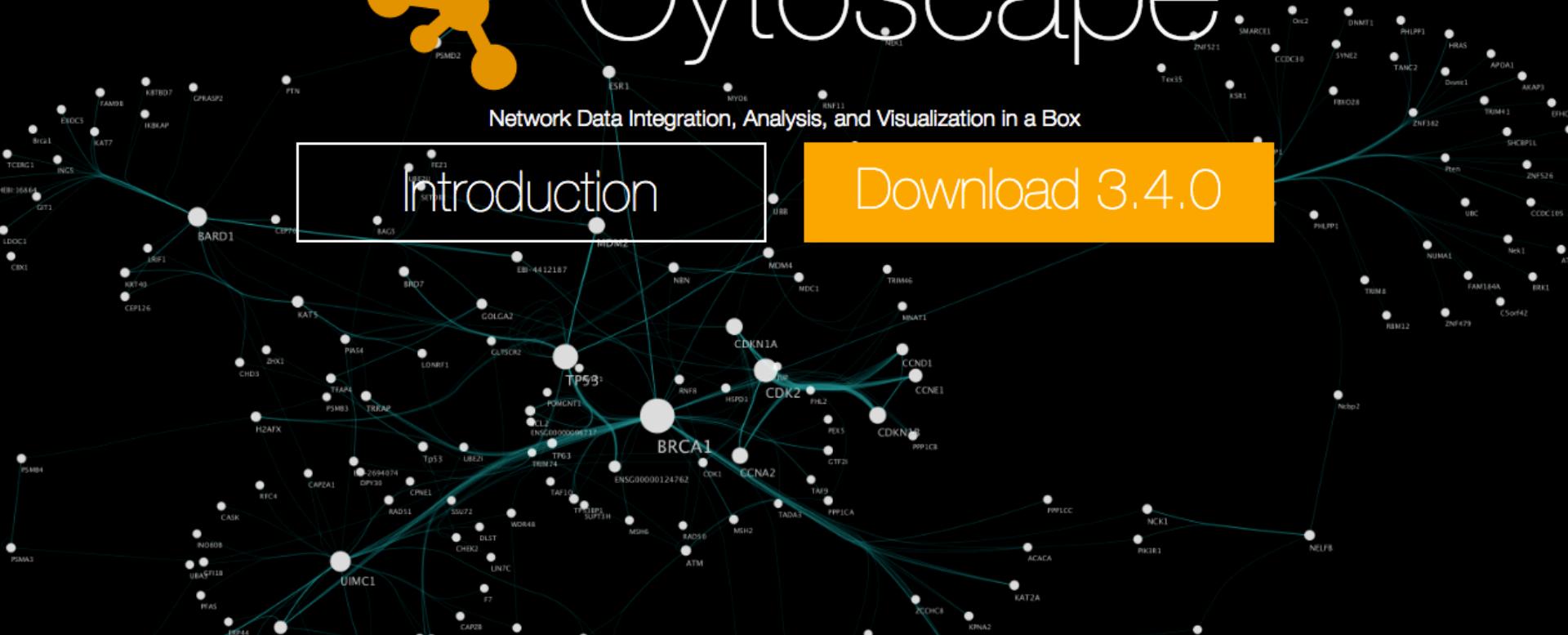
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Cytoscape

Network Data Integration, Analysis, and Visualization in a Box

[Introduction](#)[Download 3.4.0](#)

<http://www.cytoscape.org/>

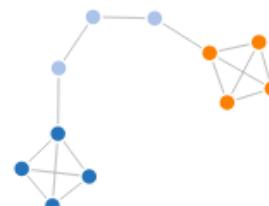
NetworkX

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%

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

igraph



Products ▾ News On github

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

By Jure Leskovec

STANFORD
UNIVERSITY



Stanford Network Analysis Project

- SNAP for C++ ▶
- SNAP for Python ▶
- SNAP Datasets ▶
- What's new
- People
- Papers
- Citing SNAP
- Links
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Open positions

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

• **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.

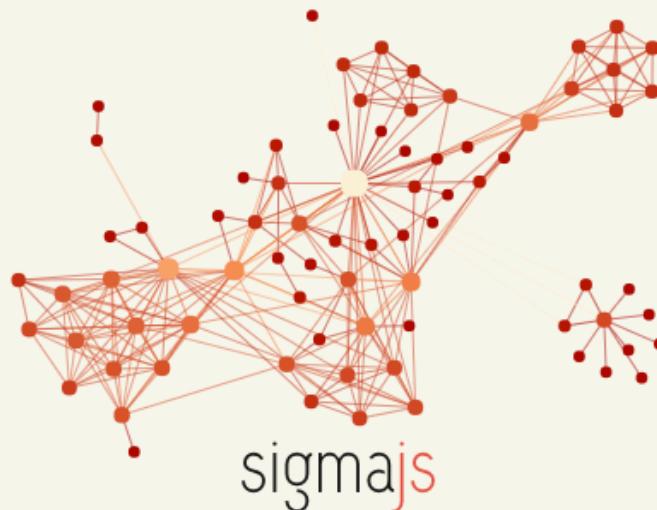
- Tutorial on [Large Scale Network Analytics with SNAP](#) will be held at [WWW-15](#) conference, Florence, Italy, May 18, 2015. [More info](#).

<http://snap.stanford.edu/>

sigma.js

 sigma.js

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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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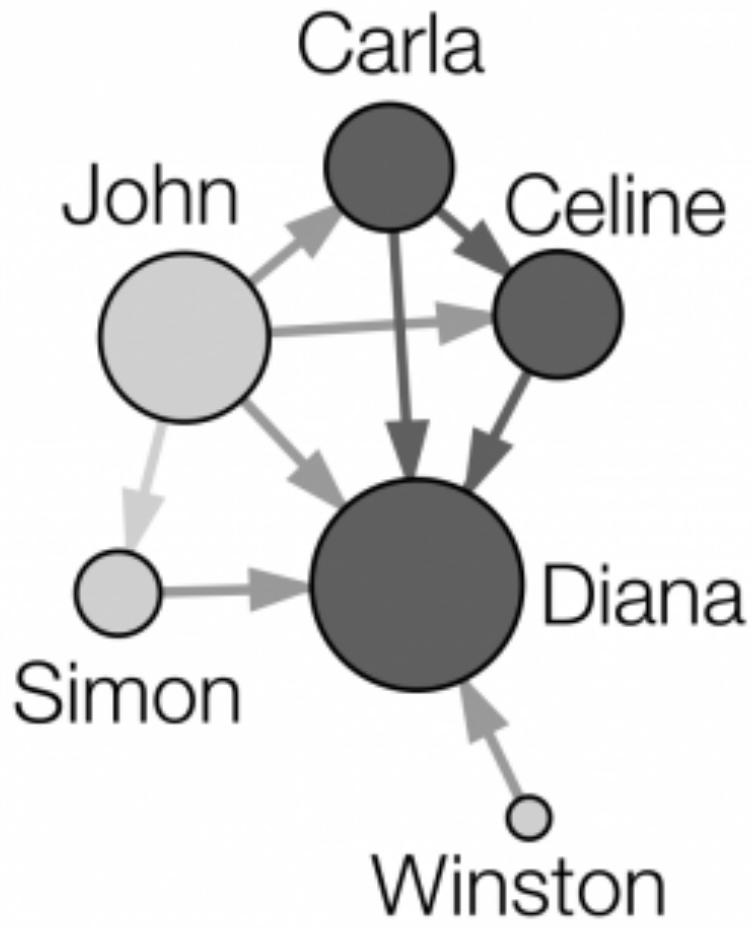
DOWNLOAD V1.1.0 

SCIENCESPO - MÉDIALAB

<http://sigmajs.org/>

Gephi: Social Network Analysis and Visualization

Network Analysis and Visualization with Gephi



Nodes	Edges
Id,Label,Attribute	Source,Target
1,John,1	1,2
2,Carla,2	1,3
3,Simon,1	1,4
4,Celine,2	1,6
5,Winston,1	2,4
6,Diana,2	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

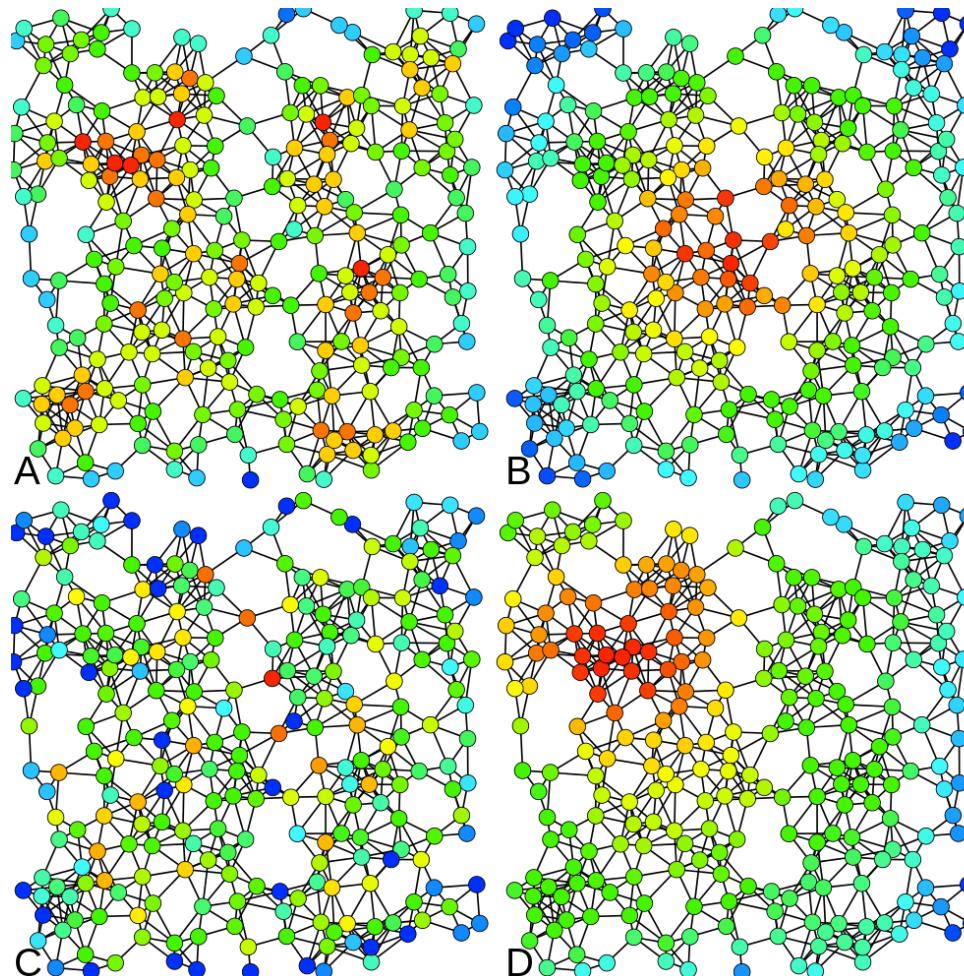
Nodes1.csv

Edges1.csv

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

A = Degree centrality
number of connexions

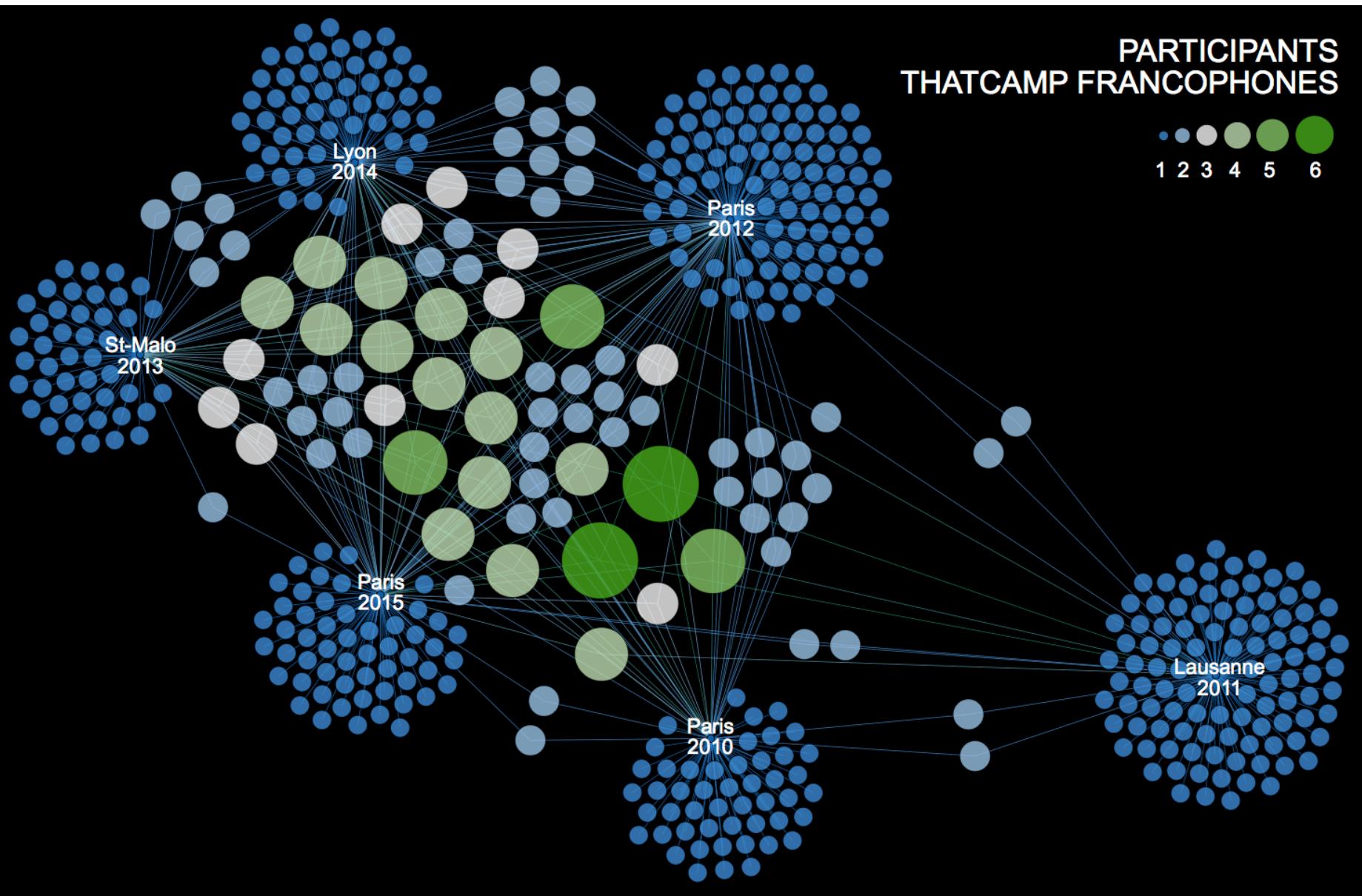
B = Closeness centrality
closeness to the entire network



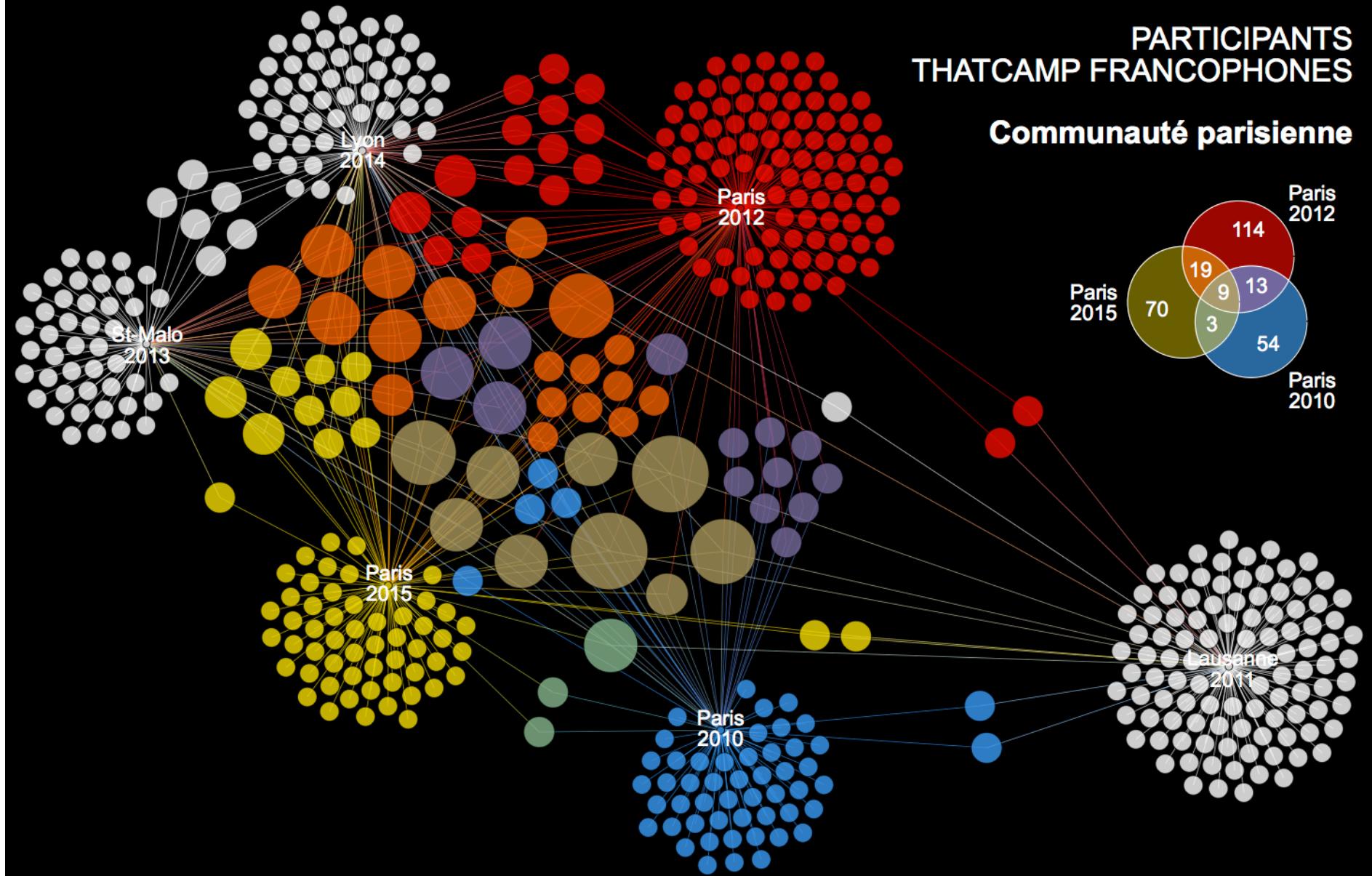
C = Betweenness centrality
bridges nodes

D = Eigenvector centrality
connection to well-connected nodes

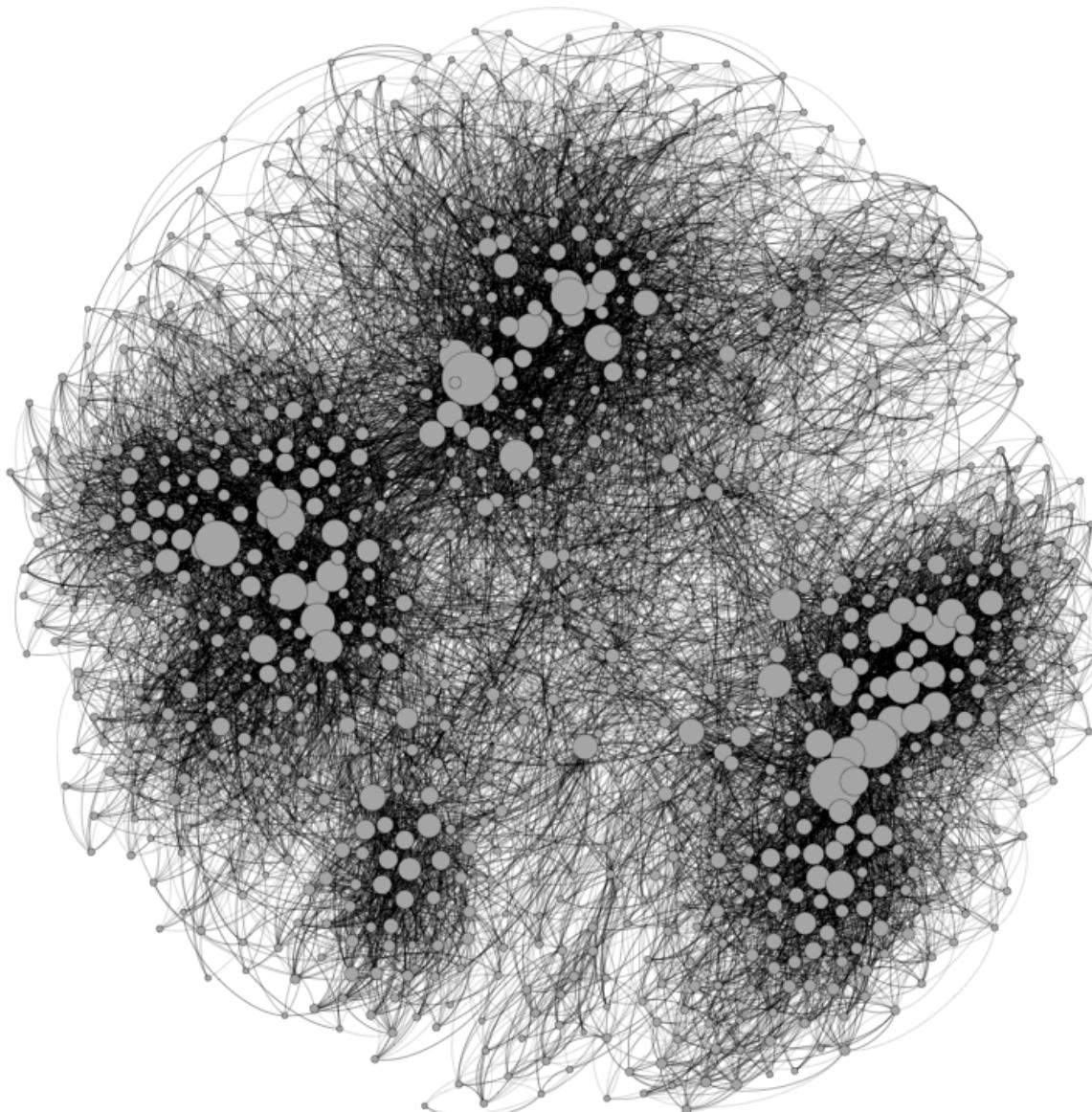
Conference Participants



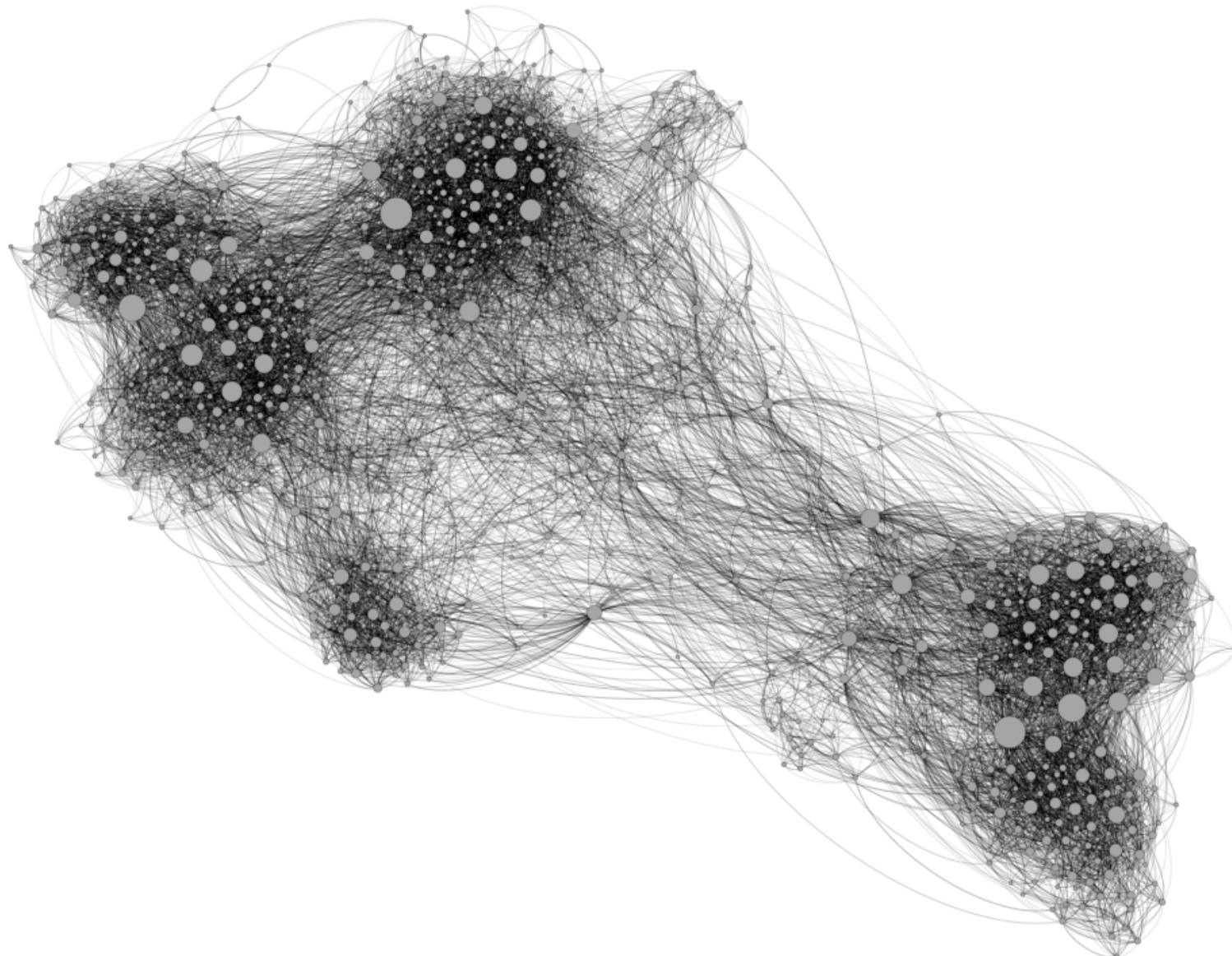
Conference Participants



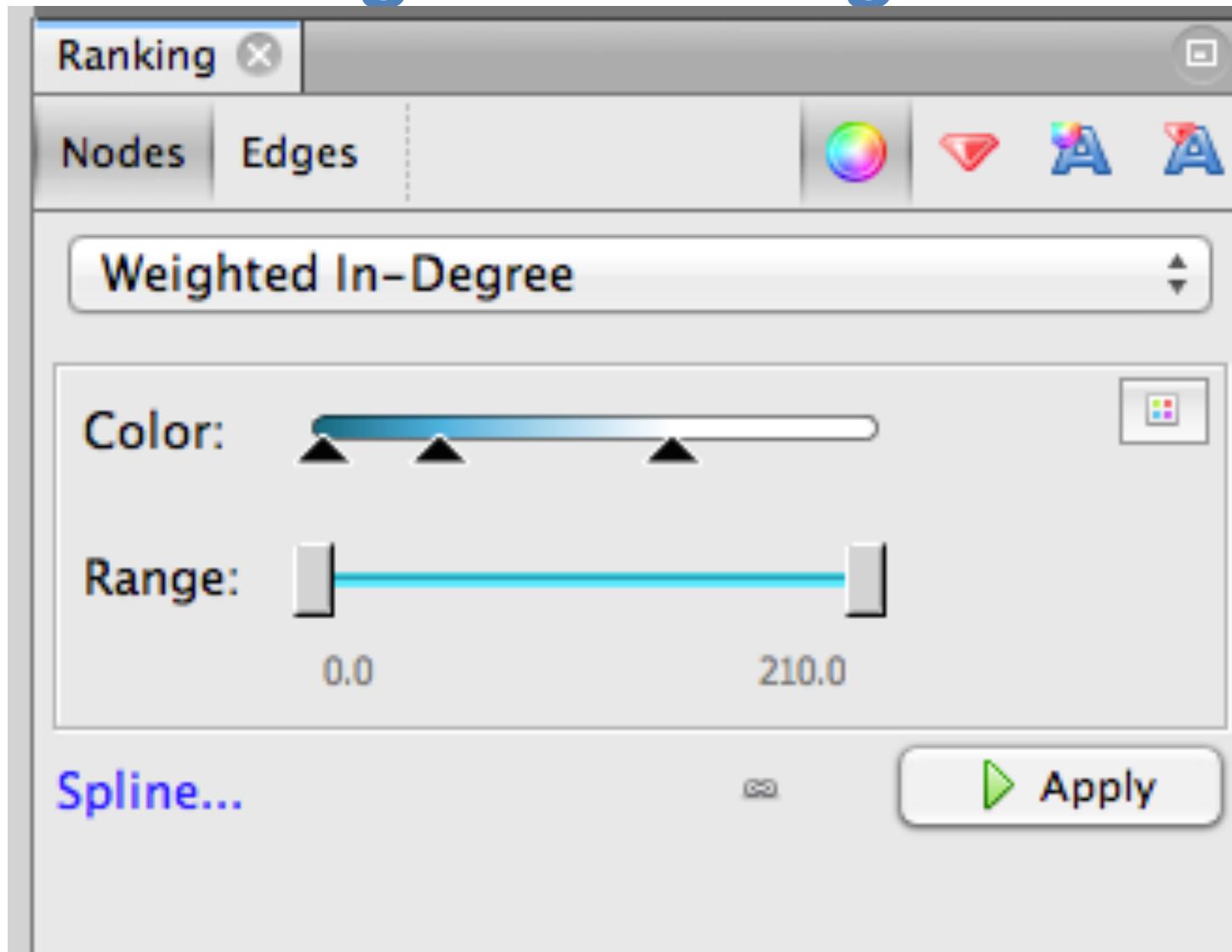
Fruchterman Reingold



Force Atlas 2



Nodes' color Weighted In-Degree



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 (1)

Avg. Weighted Degree 25.486 Run (1)

Network Diameter Run (1)

Graph Density Run (1)

HITS Run (1)

Modularity 0.57 Run (1)

PageRank Run (1)

Connected Components Run (1)

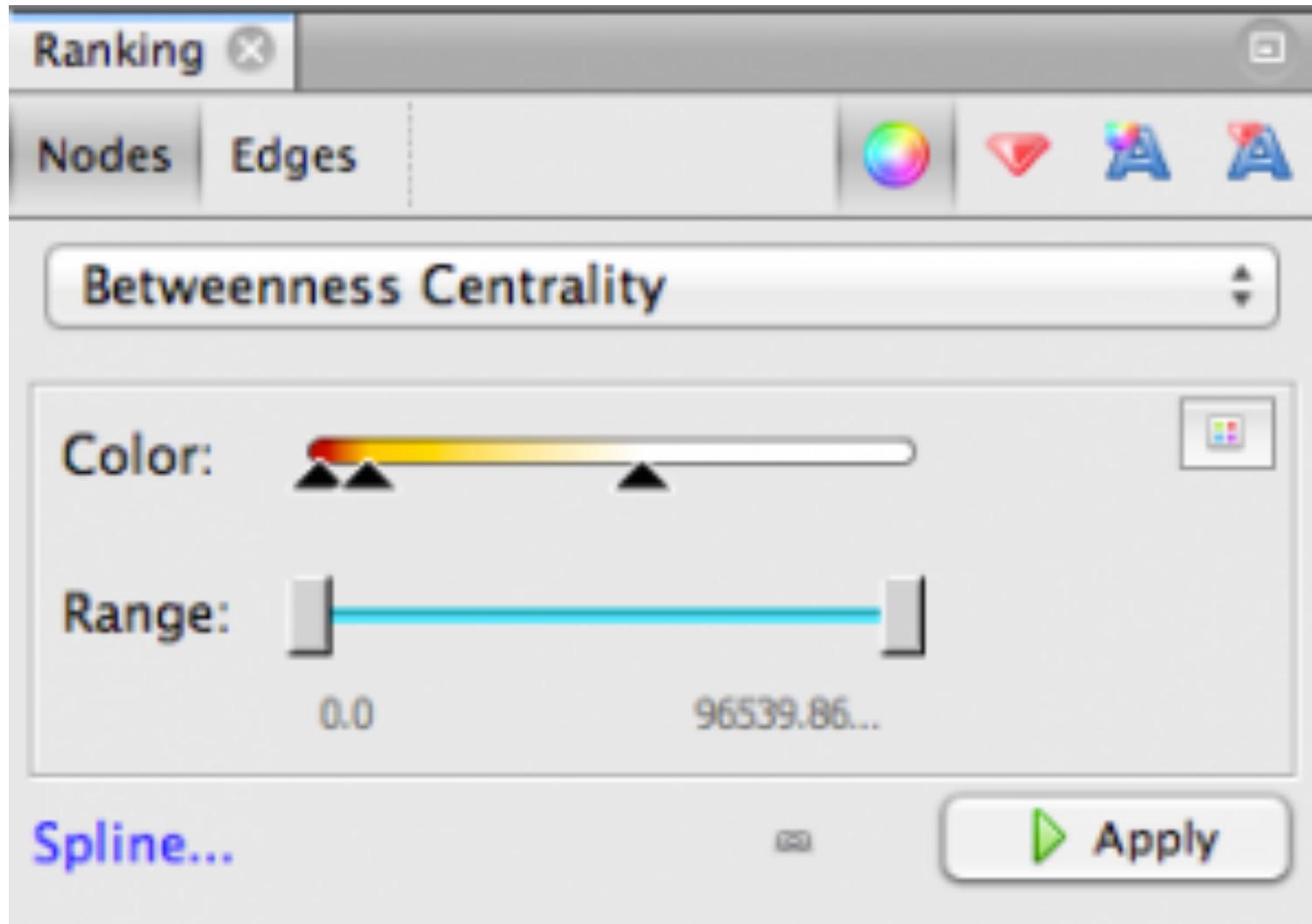
Node Overview

Avg. Clustering Coefficient Run (1)

Eigenvector Centrality Run (1)

Edge Overview

Nodes' color Betweenness Centrality

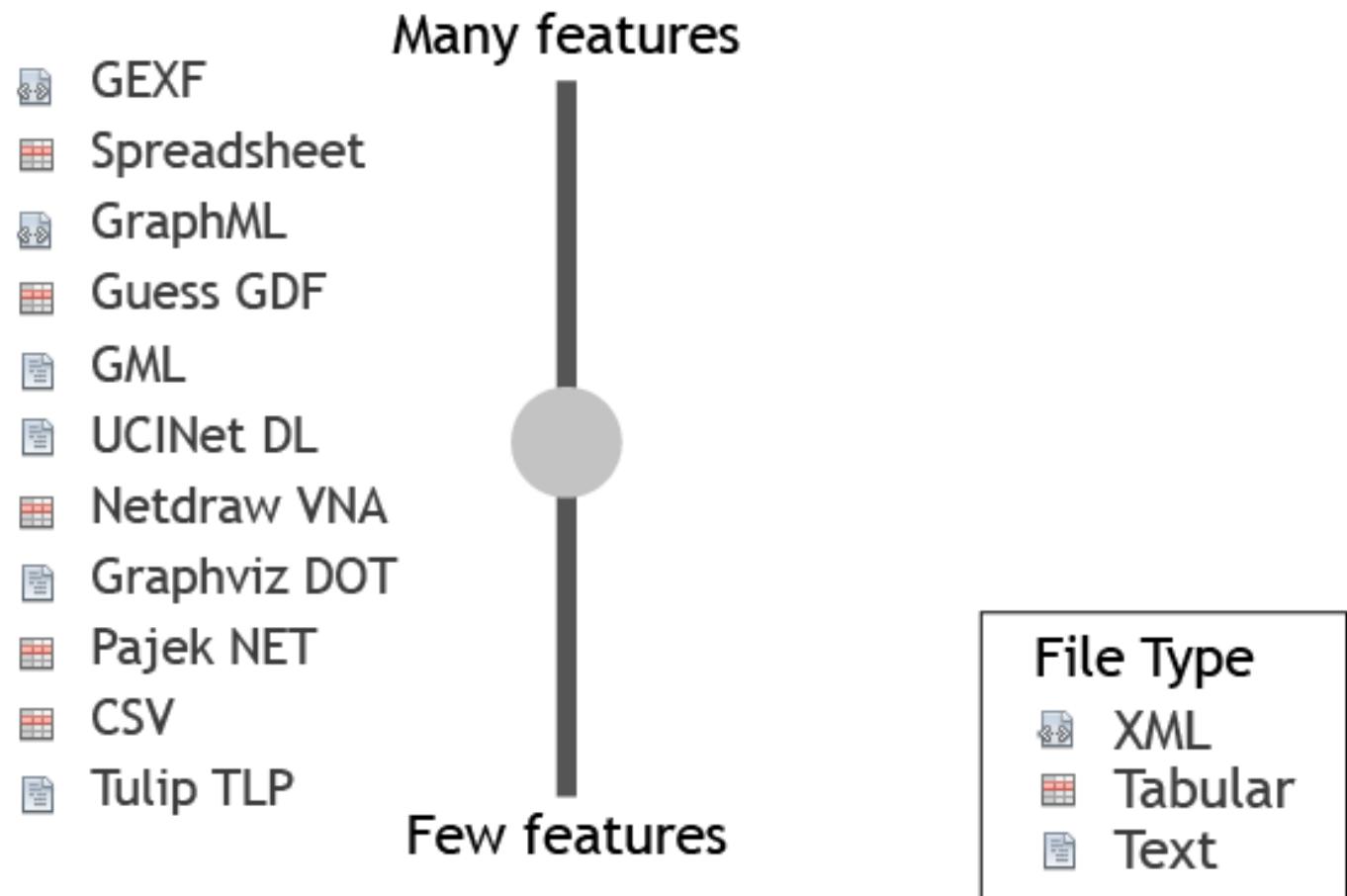


Gephi Supported Graph Formats

	Edge List/Matrix Structure	XML Structure	Edge Weight	Attributes	Visualization Attributes	Attribute Default Value	Hierarchical Graphs	Dynamics
CSV	Yes	No	No	No	No	No	No	No
DL Ucinet	Yes	No	No	No	No	No	No	No
DOT Graphviz	No	Yes	No	Yes	No	No	No	No
GDF	No	Yes	Yes	Yes	Yes	No	No	No
GEXF	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GML	No	Yes	Yes	Yes	Yes	No	No	No
GraphML	No	Yes	Yes	Yes	Yes	Yes	No	No
NET Pajek	Yes	No	No	Yes	No	No	No	No
TLP Tulip	No	No	No	No	No	No	No	No
VNA Netdraw	No	Yes	Yes	No	No	No	No	No
Spreadsheet*	No	No	No	No	No	Yes	No	No

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.

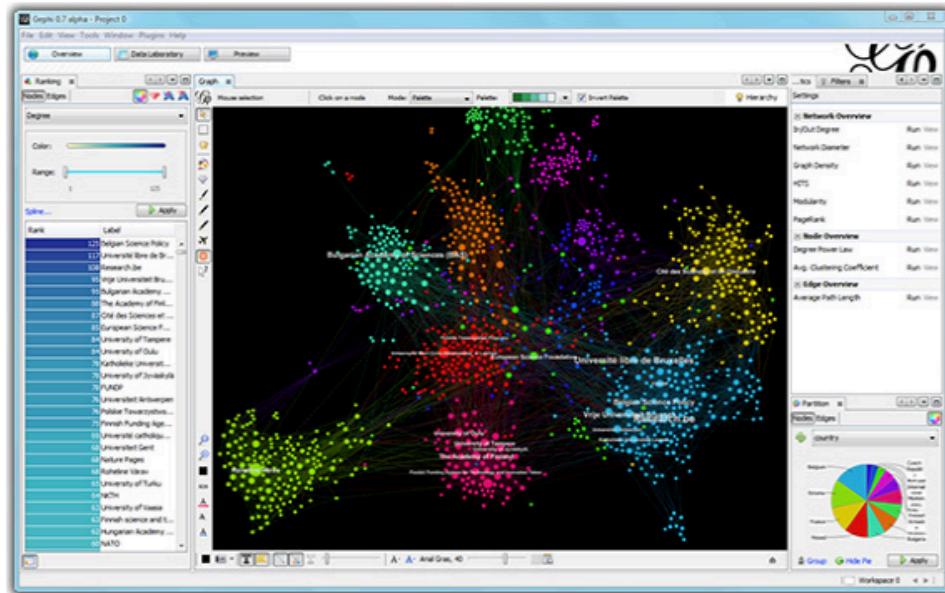
[Learn More on Gephi Platform »](#)



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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

Gephi: An Open Source Software for Exploring and Manipulating Networks
Mathieu Latapy and Sébastien Heymann
Media-Educa, Institut National de Recherche en Informatique et en Automatique (INRIA), Sophia Antipolis, France
Full paper: [http://gephi.org/paper/gephi.pdf](#)

Abstract:
Gephi is an open source software for exploring and manipulating networks. It has a WYSIWYG editor for defining topological structures and a set of visualizations for displaying them. It also provides a set of tools for analyzing and manipulating networks. It is built on top of Java and can be used as a Java application or as a web-based application. It is available for Windows, Mac OS X, and Linux. Gephi is a powerful tool for exploring and manipulating networks.

Download Gephi



Gephi
makes graphs handy

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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?

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

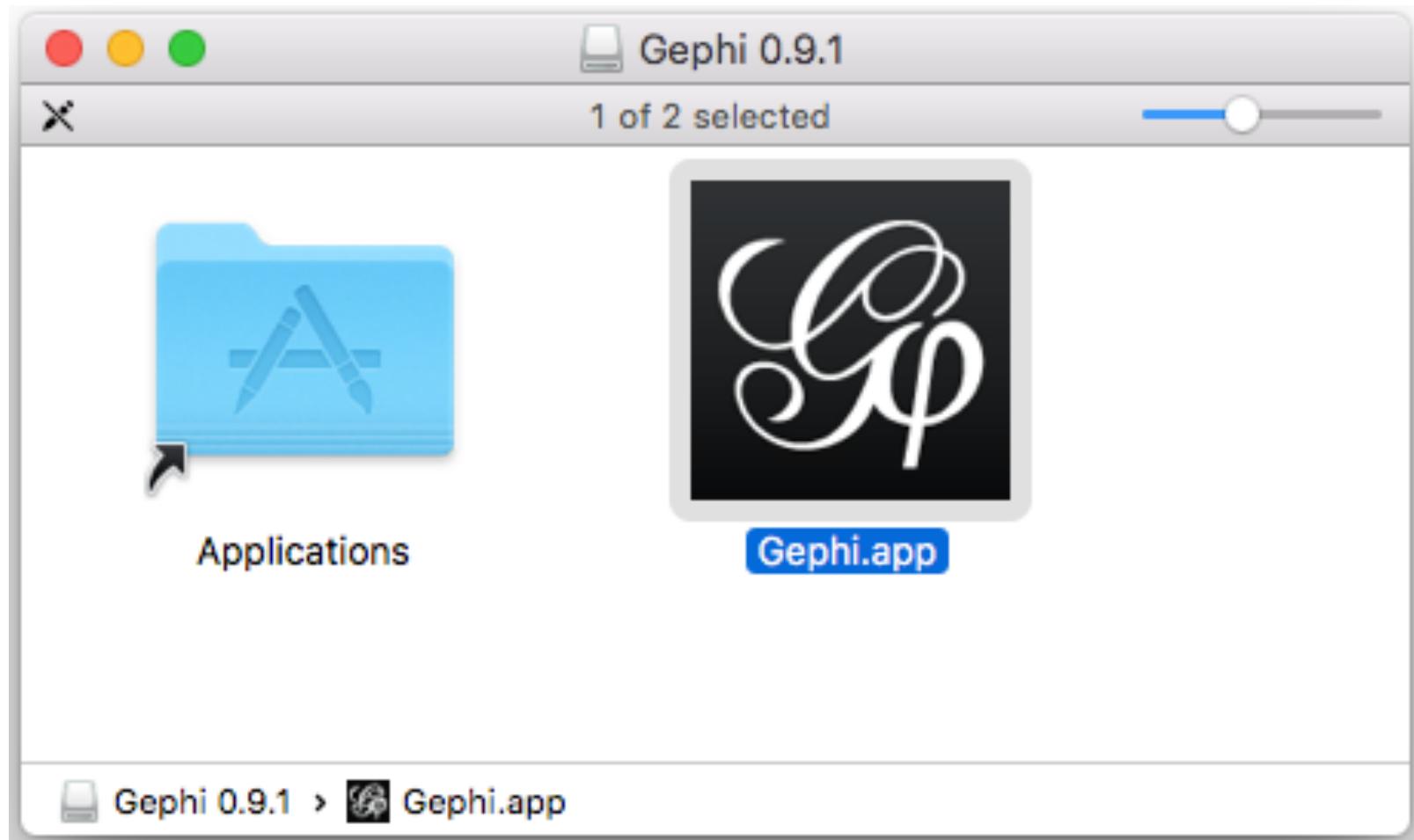
Download Gephi



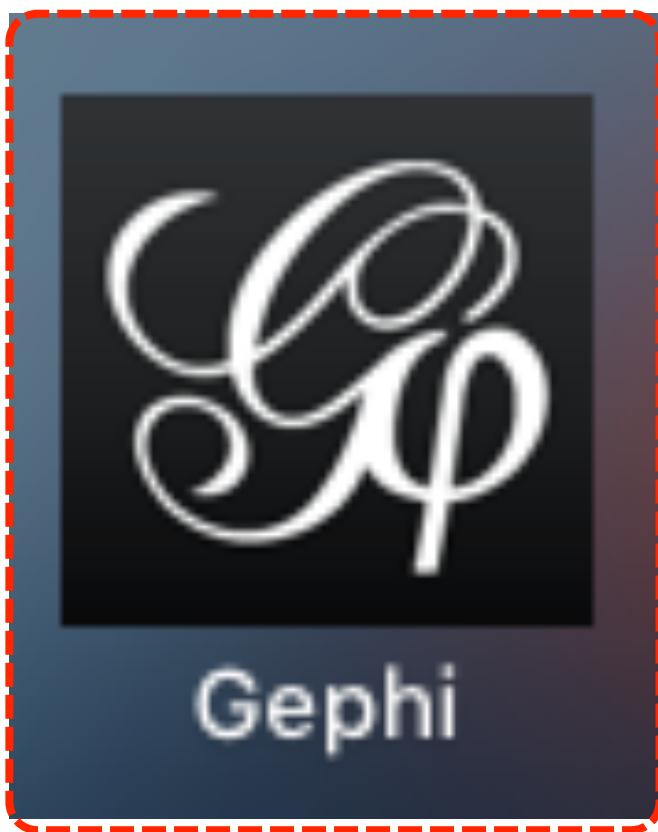
[**gephi-0.9.1-macos.dmg**](#)

Disk Image - 121.1 MB

Gephi 0.9.1



Gephi



Gephi



Gephi.app

Gephi: New Project

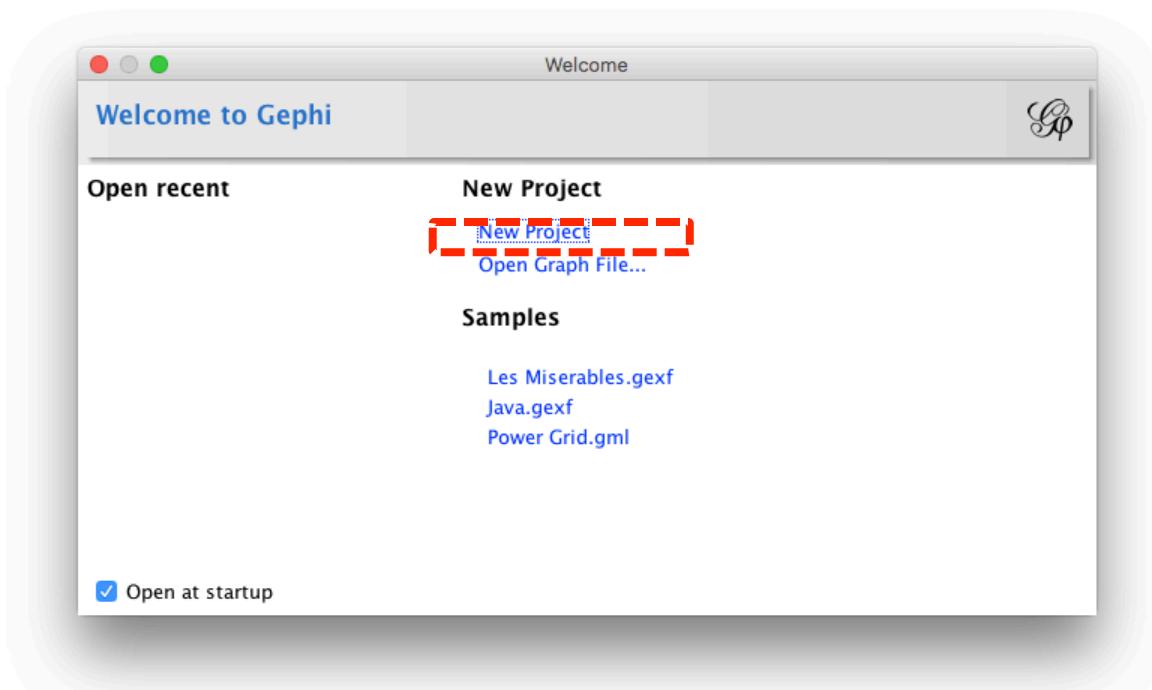
Import

Nodes1.csv and

Edges1.csv

to Gephi

Gephi New Project



Gephi Overview

The screenshot shows the Gephi interface with the following panels:

- Appearance**: Shows node and edge styling options. A red box highlights the "Nodes" and "Edges" sections.
- Layout**: Shows a layout configuration panel with a dropdown menu and a "Run" button. A red box highlights the "Layout" tab.
- Graph**: The main workspace where graphs are visualized. A red box highlights the central workspace area.
- Context**: Shows network statistics and analysis tools. A red box highlights the "Statistics" tab.

Large red numbers 1 through 5 are overlaid on the interface to identify specific features:

1. Appearance
2. Layout
3. Graph
4. Context
5. Statistics

Filters

Gephi Data Laboratory: Import Spreadsheet

The screenshot shows the Gephi Data Laboratory interface. At the top, there are three tabs: 'Overview', 'Data Laboratory' (which is selected and highlighted with a red dashed border), and 'Preview'. Below the tabs is a toolbar with several icons: 'Nodes', 'Edges', 'Configuration' (selected), 'Add node', 'Add edge', 'Search/Replace', 'Import Spreadsheet' (highlighted with a red dashed border), 'Export table', 'More actions', and a 'Filter' field. The main area is titled 'Workspace 1' and contains a 'Data Table' tab. The table has columns labeled 'Id' and 'Label'. At the bottom of the interface, there is a toolbar with various data manipulation tools, each with an icon and a dropdown menu:

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: Import Spreadsheet

The screenshot shows the Gephi interface with the 'Data Laboratory' tab selected (indicated by a red dashed box). The main window displays the 'Import Spreadsheet' dialog box, also highlighted with a red dashed box. The dialog box has two tabs: 'Steps' (selected) and 'General options'. The 'General options' tab contains fields for 'Choose a CSV file to import:' (with a browse button), 'Separator:' (set to 'Comma'), 'As table:' (set to 'Edges table'), and 'Charset:' (set to 'UTF-8'). A 'Preview:' section shows a large empty area with a red warning message: 'Invalid CSV file'. At the bottom are buttons for 'Help', '< Back', 'Next >', 'Finish', and 'Cancel'.

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 Interval

Id Label

Import spreadsheet

Steps

1. General options
2. Import settings

General options

Choose a CSV file to import:

Separator: As table: Charset:

Co... Edges table UTF-8

Preview:

Invalid CSV file

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

The screenshot shows the Gephi interface with the 'Data Laboratory' tab selected (highlighted by a red dashed box). A file browser window is open, showing a folder named 'SNA_Data' containing two files: 'Edges1.csv' and 'Nodes1.csv'. The 'Nodes1.csv' file is highlighted with a red dashed box and selected. The 'Import Spreadsheet' button in the toolbar is also highlighted with a red dashed box. The 'Import spreadsheet' dialog box is open, showing the 'General options' section with the file path set to '/imyday/Documents/SCDBA/SNA_Data/Nodes1.csv'. The 'Open' button in the file browser is also highlighted with a red dashed box.

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

Screenshot of the Gephi Data Laboratory interface showing the process of importing a CSV file.

The main window shows the following tabs:

- Overview
- Data Laboratory (selected)
- Preview

The Data Laboratory tab has the following sub-tabs:

- Nodes (selected)
- Edges
- Configuration
- Add node
- Add edge
- Search/Replace
- Import Spreadsheet
- Export table
- More actions

The "Filter:" field contains "Id".

A modal dialog titled "Import spreadsheet" is open, showing the following steps:

- General options
- Import settings

The "General options" section includes:

- Choose a CSV file to import: /imyday/Documents/SCDBA/SNA_Data/Nodes1.csv
- Separator: Co... (dropdown)
- As table: Nodes ta... (dropdown)
- Charset: UTF-8 (dropdown)

The "Preview:" section displays the following table:

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

At the bottom of the dialog are buttons: Help, < Back, Next > (highlighted with a red dashed box), Finish, and Cancel.

The bottom toolbar contains the following icons:

- 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

The screenshot shows the Gephi interface with the 'Data Laboratory' tab selected. A 'Data Table' workspace is open, displaying a table with columns 'Id' and 'Label'. A modal dialog titled 'Import spreadsheet' is centered over the workspace. The dialog has two tabs: 'Steps' (selected) and 'Import settings'. The 'Steps' tab shows 'General options' and 'Import settings'. The 'Import settings' tab contains the following information:

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

At the bottom of the dialog are buttons: 'Help', '< Back', 'Next >', 'Finish' (which is highlighted with a red dashed box), and 'Cancel'.

Below the dialog, a toolbar provides various data manipulation functions:

- 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

The screenshot shows the Gephi Data Laboratory interface with a red dashed box highlighting the 'Data Table' tab. The table displays six nodes with columns for Id, Label, Interval, and Attribute.

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

Below the table are various data manipulation tools:

- 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' (selected), and 'Preview'. Below the tabs is a toolbar with various icons and buttons. The 'Data Table' tab is active. The toolbar includes buttons for 'Add node', 'Add edge', 'Search/Replace', 'Import Spreadsheet' (highlighted with a red box), 'Export table', 'More actions', 'Filter', 'Source', and a magnifying glass icon. Below the toolbar is a header row with columns labeled 'Source', 'Target', 'Type', 'Id', 'Label', 'Interval', and 'Weight'. The main area is currently empty. At the bottom, there is a toolbar with icons for '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

Edges1.csv

Source,Target

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

The screenshot shows the Gephi Data Laboratory interface. At the top, there are tabs for Overview, Data Laboratory, and Preview. Below that is a workspace titled 'Workspace 1' containing a 'Data Table' panel. The Data Table panel has tabs for Nodes, Edges, Configuration, Add node, Add edge, Search/Replace, Import Spreadsheet (which is highlighted with a red box), Export table, More actions, Filter, Source, and a dropdown menu. The configuration tab is selected. The Data Table panel displays columns for Source, Target, Type, Id, Label, Interval, and Weight. A yellow box highlights the 'Edges1.csv' file path: '/Documents/SCDBA/SNA_Data/Edges1.csv'. A red box highlights the '...' button in the file path input field. A blue box highlights the 'Open' button in the file selection dialog. The file selection dialog shows a list of files: 'Edges1.csv' (selected) and 'Nodes1.csv'. The 'File Format' dropdown is set to 'All Files'. The bottom of the screen shows a toolbar with various data manipulation tools: 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

Screenshot of the Gephi Data Laboratory interface showing the import of 'Edges1.csv'.

The 'Data Table' tab is selected. The 'Configuration' tab is active, showing the 'Import spreadsheet' dialog.

Import spreadsheet dialog:

- 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: UTF-8
 - Co... dropdown: Nodes table (highlighted with a red box) and Edges table (selected and highlighted with a red box).
- Preview:** Shows the edge data:

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

A large red box highlights the 'Edges table' option in the 'Co...' dropdown.

Red text overlay: Edges table

Toolbar icons (bottom):

- 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

Screenshot of the Gephi Data Laboratory interface showing the import process for 'Edges1.csv'.

The main window shows a 'Data Table' with columns: Source, Target, Type, Id, Label, Interval, and Weight. A 'Configuration' tab is selected.

An 'Import spreadsheet' dialog is open:

- Steps:** 1. General options, 2. Import settings.
- General options:**
 - Choose a CSV file to import: /Documents/SCDBA/SNA_Data/Edges1.csv
 - Separator: Comma (Co...)
 - As table: Edges table (highlighted with a red dashed box)
 - Charset: UTF-8
- Preview:** Shows the edge data:

Source	Target
1	2
1	3
1	4
1	6
2	4
2	6
3	6
4	6
- Buttons at the bottom:** Help, < Back, Next > (highlighted with a red dashed box), Finish, Cancel.

A large red text annotation 'Edges table' is overlaid on the 'As table:' dropdown.

Bottom toolbar icons (from left to right): 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 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

Screenshot of the Gephi software interface showing a network graph and various analysis tools.

The top menu bar includes:

- Overview
- Data Laboratory
- Preview

The workspace contains:

- Appearance** panel: Nodes, Edges, Unique, Attribute, color code (#c0c0c0), Apply button.
- Layout** panel: Choose a layout (e.g., ForceAtlas2), Run button.
- Graph** panel: Dragging (Configure) mode, selection tools (lasso, rectangle, freehand, diamond).
- Context** panel: Nodes: 6, Edges: 9, Directed Graph, Filters, Statistics, Settings.
- Network Overview** section: Average Degree, Avg. Weighted Degree, Network Diameter, Graph Density, Modularity, PageRank, Connected Components, Node Overview, Edge Overview, Dynamic metrics (Run buttons).
- Dynamic** section: # Nodes, # Edges, Degree, Clustering Coefficient (Run buttons).

The central area displays a network graph with 6 nodes and 9 edges, showing a complex web of connections.

Gephi Overview: Graph

The screenshot shows the Gephi software interface with a graph visualization. The graph consists of 6 nodes and 9 edges, forming a complex network structure. The nodes are black dots, and the edges are thin grey lines. The interface includes various panels: Overview, Data Laboratory, Preview, Appearance (Nodes, Edges, Unique, Attribute), Workspace 1, Layout (Choose a layout, Run), Graph (Dragging, Configure), Context (Nodes: 6, Edges: 9, Directed Graph, Filters, Statistics, Settings), and a right-hand panel with Network Overview, Node Overview, Edge Overview, and Dynamic metrics, each with a Run button.

Graph

Dragging (Configure)

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 Overview: Layout

Screenshot of the Gephi software interface showing the Layout panel highlighted with a red dashed border.

The Layout panel (left side) displays a list of available layouts:

- Choose a layout
- Fruchterman Reingold
- Label Adjust
- NoOverlap
- OpenOrd
- Random Layout
- Rotate
- Yifan Hu
- Yifan Hu Proportional** (selected)

The main workspace shows a network graph with 6 nodes and 9 edges. The nodes are arranged in a triangular pattern with some internal connections.

The top navigation bar includes tabs: Overview, Data Laboratory, Preview, and a workspace tab labeled "Workspace 1".

The right sidebar contains various analysis and visualization tools:

- 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.

The bottom toolbar includes icons for Presets..., Reset, and various layout and selection tools.

Gephi Overview: 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
- Convergence Thresl 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level 10
- Theta 1.2

Yifan Hu Proportional Presets... Reset

Dragging (Configure)

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

```
graph TD; A(( )) --> B(( )); A --> C(( )); A --> D(( )); A --> E(( )); A --> F(( )); B --> C; B --> D; C --> E; D --> F
```

Gephi Overview: Layout

Yifan Hu

The screenshot shows the Gephi software interface with a directed graph visualization. The graph consists of six nodes arranged in a cluster, with edges pointing from the top-left node to the others. The layout panel on the left is highlighted with a red dashed border, showing settings for the 'Yifan Hu' layout algorithm. The 'Run' button in this panel is also highlighted with a red box. The right side of the interface displays various network statistics and metrics, each with a 'Run' button.

Graph View: Dragging (Configure)

Layout Panel (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:
 - Convergence Thresh: 1.0E-4
- Barnes-Hut's properties:
 - Quadtree Max Level: 10
 - Theta: 1.2

Right Panel Metrics:

- 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

Appearance: Nodes Color

Overview Data Laboratory Preview

Workspace 1

Appearance

Nodes Edges Unique Attribute Color #c0c0c0

Graph Dragging (Configure)

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

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
- Convergence Thresh 1.0E-4

Barnes-Hut's properties

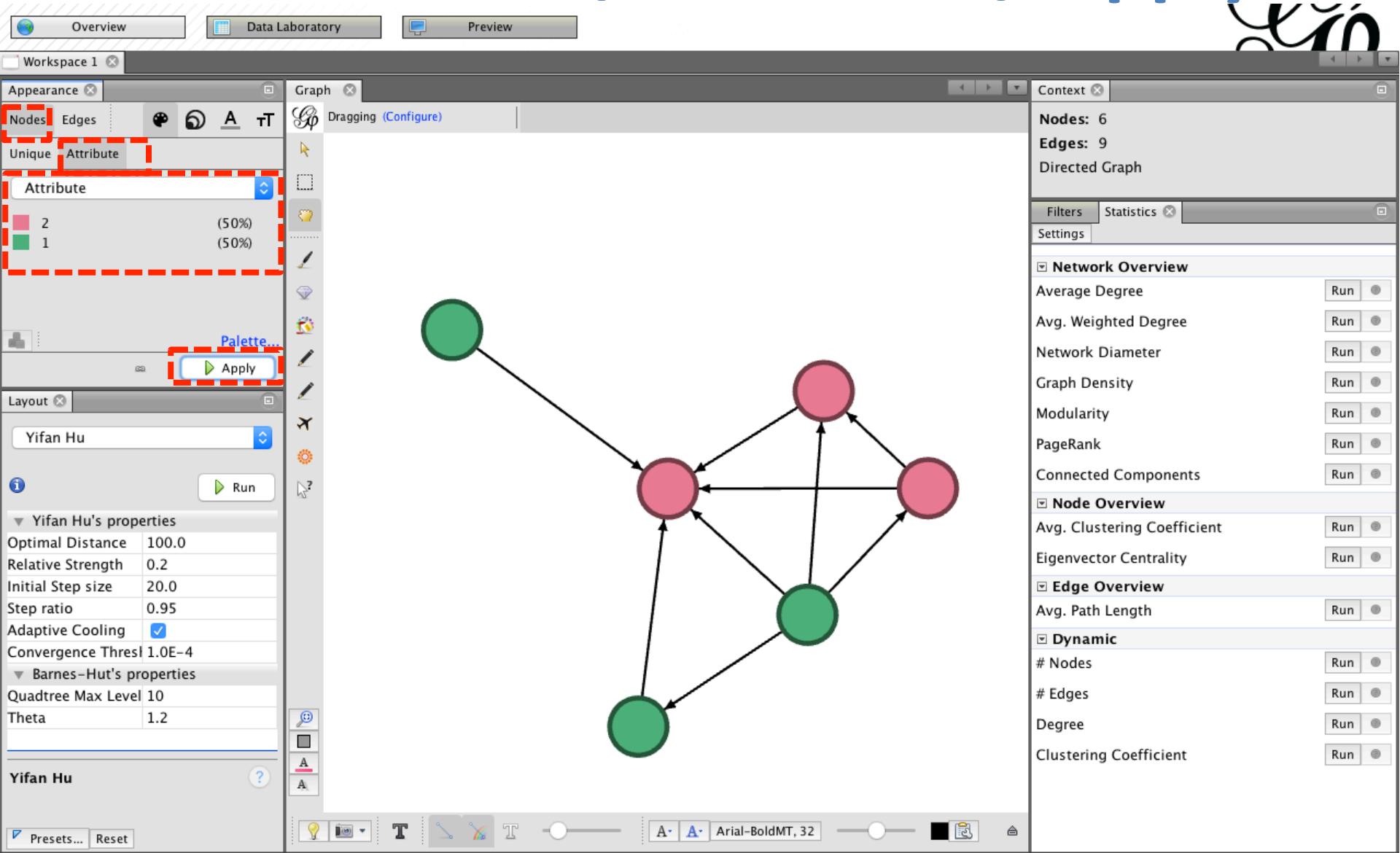
- Quadtree Max Level 10
- Theta 1.2

Yifan Hu

Presets... Reset

T Arial-BoldMT, 32

Nodes Color / Attribute / Apply



Show Node Labels

Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Unique Attribute

Attribute

2 (50%)
1 (50%)

Palette... 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
- 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
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

100% 100% Arial-BoldMT, 32

Show Node Labels

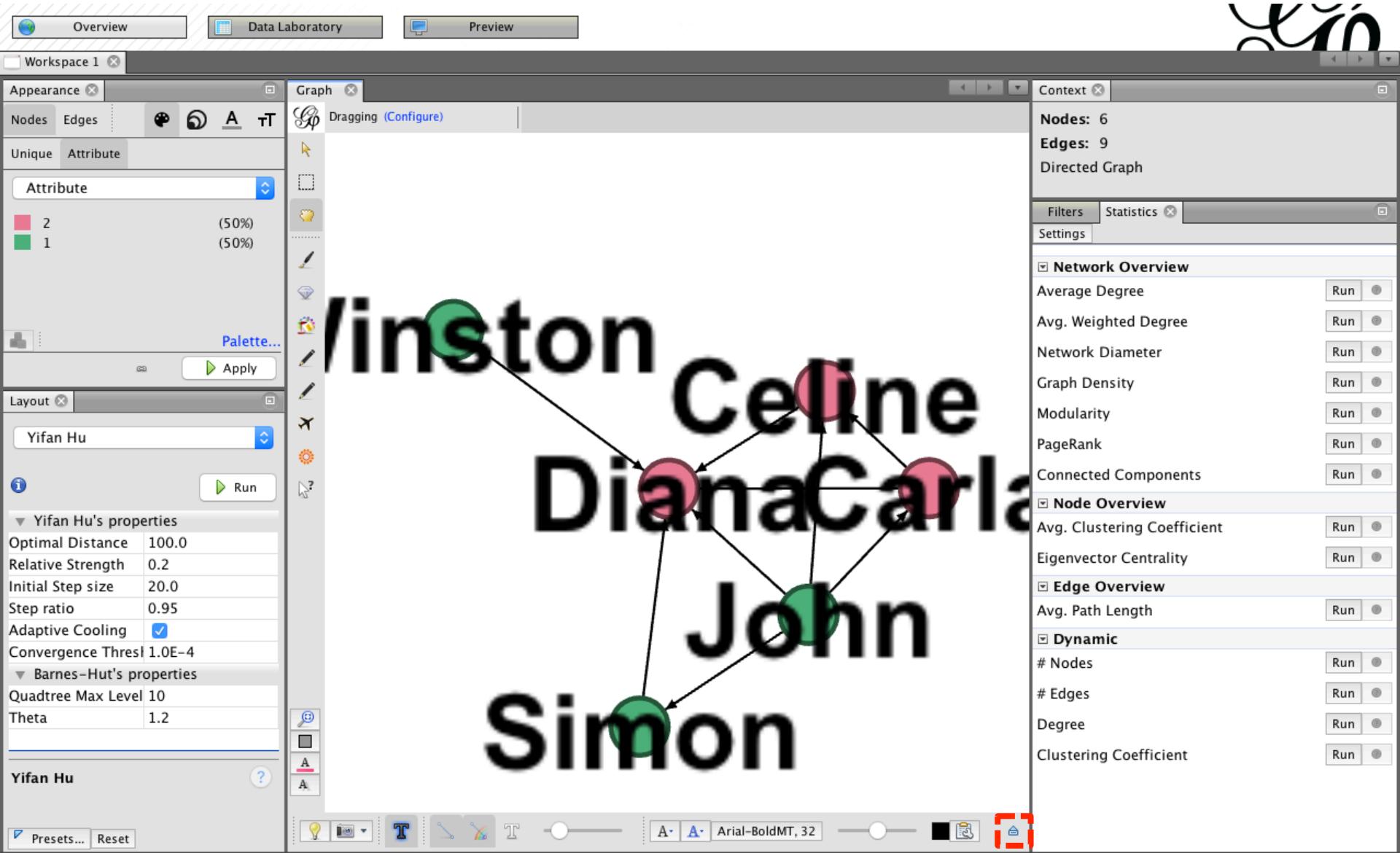
```
graph TD; N1(( )) --> N2(( )); N1(( )) --> N3(( )); N1(( )) --> N4(( )); N1(( )) --> N5(( )); N1(( )) --> N6(( )); N2(( )) --> N7(( )); N3(( )) --> N7(( )); N4(( )) --> N7(( )); N5(( )) --> N7(( )); N6(( )) --> N7(( )); N7(( )) --> N8(( )); N7(( )) --> N9(( )); N7(( )) --> N10(( ));
```

Show Node Labels

The screenshot shows a network analysis software interface with the following components:

- Top Bar:** Overview, Data Laboratory, Preview.
- Left Sidebar (Appearance):**
 - Nodes:** Nodes (2), Edges (1).
 - Unique:** Attribute (50% pink, 50% green).
 - Attribute:** 2 (pink), 1 (green).
 - Layout:** Yifan Hu.
 - Properties:** 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); Barnes-Hut's properties (Quadtree Max Level: 10, Theta: 1.2).
 - Presets:** Presets..., Reset.
- Graph View:** A directed graph with nodes labeled "winston", "Celine", "Diana", "Carla", "John", and "Simon". Some nodes have pink circles, others green. Arrows indicate directed edges between them.
- Right Sidebar (Context):**
 - Nodes:** 6, **Edges:** 9, **Directed Graph**.
 - Filters:** 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).
 - Statistics:** Run buttons for each metric.
- Bottom Tools:** A toolbar with various icons, including a red-highlighted text icon (T) and a red-highlighted selection icon (square).

Show Labels



Global Edges Labels

The screenshot shows a network analysis software interface with the following components:

- Top Bar:** Overview, Data Laboratory, Preview.
- Left Sidebar:** Appearance (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 checked, Convergence Thresh: 1.0E-4), Barnes-Hut's properties (Quadtree Max Level: 10, Theta: 1.2).
- Graph Area:** Graph (Dragging (Configure)) window showing a directed graph with nodes Winston, Celine, Diana, Carla, John, and Simon. Some nodes have green circular highlights. Edges connect Winston to Celine, Celine to Diana, Diana to John, and John to Simon.
- Bottom Navigation:** Global (highlighted with a red dashed box), Edges, Labels.
- Right Sidebar:** Context (Nodes: 6, Edges: 9, Directed Graph), Filters, Statistics, Settings, Network Overview (Run), Node Overview (Run), Edge Overview (Run), Dynamic (Run). The Dynamic section lists: # Nodes, # Edges, Degree, Clustering Coefficient.
- Top Right:** A small decorative logo.

Labels

The screenshot shows a network visualization interface with various tools and metrics.

Appearance Panel:

- Nodes:** 2 (Red), 1 (Green) (50% each)
- Attribute:** (50% Red, 50% Green)
- Layout:** Yifan Hu
- 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
- Barnes-Hut's properties:**
 - Quadtree Max Level: 10
 - Theta: 1.2

Graph Panel: Dragging (Configure)

Context Panel:

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

Metrics:

- 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

Toolbars and Buttons:

- Overview, Data Laboratory, Preview buttons
- Workspace 1 button
- Appearance, Graph, Context tabs
- Attribute dropdown: Attribute, Nodes, Edges, Unique, Attribute
- Attribute values: 2 (Red), 1 (Green) (50% each)
- Layout dropdown: Yifan Hu
- Run buttons for various metrics
- Apply button
- Palette... button
- Font toolbar: Font: Arial-BoldMT, 32, Color: black, Size: 100px
- Label toolbar: Global, Edges, Labels (highlighted)
- Node and Edge styling options: Font, Color, Size
- Presets..., Reset buttons

Network Structure: Nodes include Winston, Celine, Diana, Carla, John, and Simon. Winston, Celine, Diana, and Carla are red nodes. John and Simon are green nodes. They are interconnected by edges.

Labels Node Size

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges Attribute

Attribute
2 (50%)
1 (50%)

Palette... 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
Convergence Thresh 1.0E-4

Barnes-Hut's properties
Quadtree Max Level 10
Theta 1.2

Yifan Hu ?

Presets... Reset

Graph Dragging (Configure)

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

Node Font: Arial-BoldMT, 32 Color: █ Size: 10

Edge Font: Arial-BoldMT, 32 Color: █ Size: 10

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

Labels Node Font Size

The screenshot shows a network graph interface with various tools and settings for labeling nodes.

Graph View: A network graph with nodes labeled Winston, Diana, Celine, John, and Simon. Some nodes are green (Winston, John, Simon) and some are pink (Diana, Celine, Carla).

Appearance Panel: Shows node and edge counts: Nodes: 6, Edges: 9.

Attribute Panel: Shows node categories: 2 (50%) and 1 (50%).

Layout Panel: Set to "Yifan Hu".

Context Panel: Shows global statistics: Nodes: 6, Edges: 9.

Font Dialog (highlighted with a red dashed box):

- Family:** Arial (selected)
- Style:** Bold (selected)
- Size:** 24 (selected)

Preview: Shows the preview of the selected font and style.

Node Labeling Options:

- Font:** Arial-BoldMT, 24 (highlighted with a red dashed box)
- Color:** Black
- Size:** 24 (sliders for node and edge sizes)

Global, Edges, Labels Buttons: Labels is selected.

Dynamic Buttons: # Nodes, # Edges, Degree, Clustering Coefficient.

Labels Node Size

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges Unique Attribute

Attribute
2 (50%)
1 (50%)

Palette...

Layout 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
Convergence Thresh 1.0E-4

Barnes-Hut's properties
Quadtree Max Level 10
Theta 1.2

Yifan Hu

Graph Dragging (Configure)

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

Labels

Node Edge

Font: Arial-BoldMT, 24 Color: Size:

Font: Arial-BoldMT, 32 Color: Size:

Labels Scaled

Overview Data Laboratory Preview

Workspace 1

Appearance

Nodes Edges Unique Attribute

Attribute

2 (50%) 1 (50%)

Palette... 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 ✓

Convergence Thresh 1.0E-4

Barnes-Hut's properties

Quadtree Max Level 10

Theta 1.2

Yifan Hu

Presets... Reset

Graph Dragging (Configure)

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

Font: Arial-BoldMT, 24 Color: Size: 100%

Font: Arial-BoldMT, 32 Color: Size: 100%

Scaled ✓

Labels

Labels Color

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges Unique Attribute

Attribute
2 (50%)
1 (50%)

Palette...

Graph Dragging (Configure)

Layout 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
Convergence Thresh 1.0E-4

Barnes-Hut's properties
Quadtree Max Level 10
Theta 1.2

Yifan Hu

Choose a Color

Hue: 2 Sat: 96 Bri: 99 Red: 252 Green: 17 Blue: 9 Hex: FC1109 Alpha: 128

Cancel OK

Dynamic
Nodes
Edges
Degree
Clustering Coefficient

Global Edges Labels

Show
Edge default color: Scale
Selection color
In: Both:
Out:

```
graph TD; Winston --> Diana; Ce --> Diana; Jo --> Diana; Simon --> Diana;
```

Labels Color

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges Unique Attribute

Attribute
2 (50%)
1 (50%)

Palette...

Graph Dragging (Configure)

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

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
Convergence Thresh 1.0E-4

Barnes-Hut's properties
Quadtree Max Level 10
Theta 1.2

Yifan Hu

Layout Yifan Hu

?

Winston → Diana → Celine → Carla
Winston → John → Simon → Diana
John → Diana
John → Celine
John → Carla
Celine → Diana
Carla → Diana
Carla → Celine
Simon → Diana
Simon → Celine
Simon → Carla

Font: Arial-BoldMT, 24 Color: Red Size: 100px

Font: Arial-BoldMT, 32 Color: Black Size: 100px

Global Edges Labels

Node Edge

Font: Arial-BoldMT, 24 Color: Red Size: 100px

Font: Arial-BoldMT, 32 Color: Black Size: 100px

129

Gephi Statistics: Average Degree

Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Unique Attribute

Attribute

2 (50%) 1 (50%)

Palett 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
- Convergence Thresh 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level 10
- Theta 1.2

Yifan Hu Presets... Reset

Dragging (Configure)

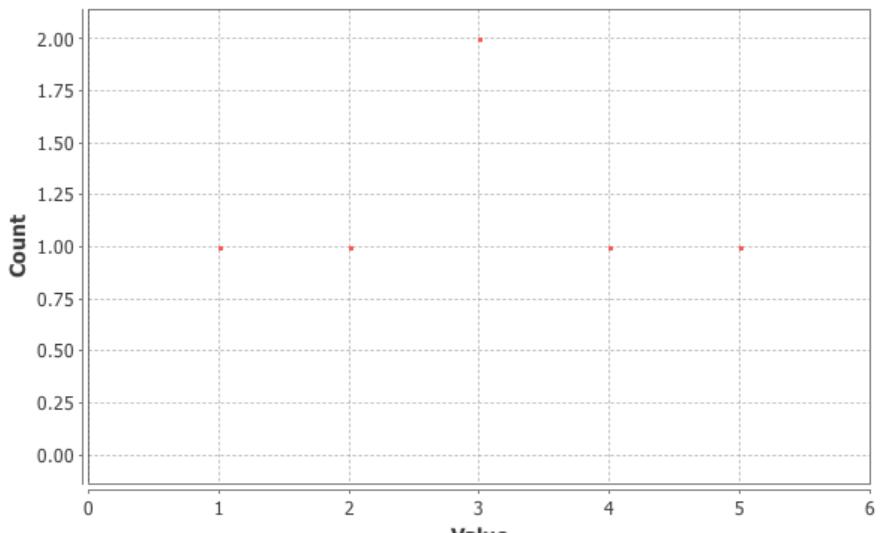
HTML Report

Degree Report

Results:

Average Degree: 3.000

Degree Distribution



Value	Count
1	1.0
2	1.0
3	2.0
4	1.0
5	1.0

Print Copy Save Close

Filters Statistics Settings

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

Gephi Statistics: Average Degree

Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Unique Attribute

Attribute

2 (50%) 1 (50%)

Palett 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
- Convergence Thresh 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level 10
- Theta 1.2

Yifan Hu Presets... Reset

HTML Report

In-Degree Distribution

A scatter plot titled "In-Degree Distribution" with "Value" on the x-axis (ranging from 0 to 6) and "Count" on the y-axis (ranging from 0.00 to 2.00). Four data points are plotted: (0, 2.0), (1, 2.0), (2, 1.0), and (5, 1.0).

Value	Count
0	2.0
1	2.0
2	1.0
5	1.0

Out-Degree Distribution

A scatter plot titled "Out-Degree Distribution" with "Value" on the x-axis (ranging from 0 to 6) and "Count" on the y-axis (ranging from 1.75 to 2.00). Two data points are plotted: (0, 2.0) and (0, 1.75).

Value	Count
0	2.0
0	1.75

Print Copy Save Close

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 Statistics: Avg. Weighted Degree



Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Unique Attribute

Attribute

2 (50%) 1 (50%)

Palett 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
- Convergence Thresh 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level 10
- Theta 1.2

Yifan Hu

Presets... Reset

Dragging (Configure)

HTML Report

Weighted Degree Report

Results:

Average Weighted Degree: 1.500

Degree Distribution

A scatter plot titled "Degree Distribution". The x-axis is labeled "Value" and ranges from 0 to 6. The y-axis is labeled "Count" and ranges from 0.00 to 2.00. The plot shows five data points at integer values from 1 to 5, with a count of 1.00 for each value except 3, where the count is 2.00.

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

Print Copy Save Close

Nodes: 6
Edges: 9
Directed Graph

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

Gephi Statistics: Network Diameter

The screenshot shows the Gephi software interface with a focus on network statistics. The top menu bar includes 'Overview', 'Data Laboratory', and 'Preview' tabs. Below the menu is a 'Workspace 1' tab. The left sidebar contains 'Appearance' and 'Layout' panels, with 'Yifan Hu' selected as the layout. The main workspace shows a graph with nodes and edges, and a 'Graph Distance settings' dialog is open. This dialog includes a 'Distance' section with a detailed description of the average graph distance and diameter, and options for 'Directed' or 'Undirected' graphs and 'Normalize Centralities in [0,1]'. Below the dialog, there are definitions for 'Betweenness Centrality', 'Closeness Centrality', and 'Eccentricity'. The right side of the interface features a 'Context' panel showing 'Nodes: 6', 'Edges: 9', and 'Directed Graph'. A 'Statistics' panel is also visible, with a red dashed box highlighting the 'Network Diameter' entry under the 'Network Overview' section. The bottom of the screen shows the Gephi toolbar with various icons and a font/color/size selector.

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges Unique Attribute

Attribute

2 (50%)
1 (50%)

Graph Dragging (Configure)

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

Context Nodes: 6
Edges: 9
Directed Graph

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

Global Edges Labels

Node
Font: Arial-BoldMT, 24 Color: #000000
Size: 100

Edge
Font: Arial-BoldMT, 32 Color: #FFFFFF
Size: 100

Presets... Reset

Gephi Statistics: Network Diameter



Overview Data Laboratory Preview

Workspace 1

Appearance

Nodes Edges Unique Attribute

Attribute

2 (50%) 1 (50%)

Palett 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:
Convergence Thresh: 1.0E-4

Barnes-Hut's properties

Quadtree Max Level: 10
Theta: 1.2

Yifan Hu Presets... Reset

Graph

Dragging (Configure)

HTML Report

Graph Distance Report

Parameters:

Network Interpretation: directed

Results:

Diameter: 1
Radius: 0
Average Path length: 1.0

Betweenness Centrality Distribution

Count

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 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 shows the Gephi software interface with a focus on a 'Graph Density Report' dialog box.

Toolbar: Overview, Data Laboratory, Preview.

Appearance Panel: Nodes, Edges, Unique, Attribute. Attribute panel shows 2 (50%) and 1 (50%).

Graph Panel: Dragging (Configure).

Context Panel: Nodes: 6, Edges: 9, Directed Graph.

Statistics Panel: Filters, Statistics. Statistics section is highlighted with a red dashed border.

Report Content:

- HTML Report:** Graph Density Report
- Parameters:** Network Interpretation: directed
- Results:** Density: 0.300

Layout Panel: Yifan Hu, Run button.

Properties Panel: Yifan Hu's properties, Barnes-Hut's properties.

- 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.
- Barnes-Hut's properties:** Quadtree Max Level: 10, Theta: 1.2.

Bottom Buttons: Print, Copy, Save, Close, Presets..., Reset.

Gephi Statistics: Modularity

The screenshot shows the Gephi software interface with the following details:

- Top Bar:** Overview, Data Laboratory, Preview.
- Left Sidebar:** Appearance (Nodes, Edges, Unique, Attribute), Layout (Yifan Hu, Run), Properties (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; Barnes-Hut's properties: Quadtree Max Level 10, Theta 1.2).
- Center:** Graph pane showing "Dragging (Configure)" and a "Modularity settings" dialog box. The dialog contains:
 - Randomize: Produce a better decomposition but increases computation time.
 - Use weights: Use edge weight.
 - Resolution: 1.0
- Right Sidebar:** Context (Nodes: 6, Edges: 9, Directed Graph), Statistics (Filters, Statistics, Settings). The Statistics panel lists various metrics with "Run" buttons:
 - Network Overview: Average Degree (Run), Avg. Weighted Degree (Run), Network Diameter (Run), Graph Density (Run, value 0.3).
 - Modularity (Run).
 - PageRank (Run).
 - Connected Components (Run).
 - Node Overview: Avg. Clustering Coefficient (Run), Eigenvector Centrality (Run).
 - Edge Overview: Avg. Path Length (Run, value 1).
 - Dynamic: # Nodes (Run), # Edges (Run), Degree (Run), Clustering Coefficient (Run).

Gephi Statistics: Modularity

Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Unique Attribute

Attribute

2 (50%)
1 (50%)

Dragging (Configure)

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

Yifei Hu

Yifei Hu's properties

- Optimal Distance: 100.0
- Relative Strength: 0.2
- Initial Step size: 20.0
- Step ratio: 0.95
- Adaptive Cooling:
- Convergence Thresh: 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level: 10
- Theta: 1.2

Yifei Hu

Presets... Reset

Filters Statistics

Nodes: 6
Edges: 9
Directed Graph

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

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Gephi Statistics: Connected Components

The screenshot shows the Gephi interface with the following components:

- Top Bar:** Overview, Data Laboratory, Preview.
- Left Sidebar:** Workspace 1, Appearance (Nodes, Edges, Unique, Attribute), Layout (Yifan Hu), Properties (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), Barnes-Hut's properties (Quadtree Max Level 10, Theta 1.2).
- Center:** Graph panel showing a network with nodes colored by attribute (2 pink, 1 green). A "Dragging (Configure)" tool is selected.
- Bottom:** Global, Edges, Labels tabs for node and edge styling.
- Right Panel:** Context (Nodes: 6, Edges: 9, Directed Graph), Filters, Statistics (Network Overview, Node Overview, Edge Overview, Dynamic metrics like # Nodes, # Edges, Degree, Clustering Coefficient).
- Modal Dialog:** "Connected Components settings" dialog with "Connected Components" description. It has two radio buttons:
 - Directed**: Detects strongly & weakly connected components
 - Undirected**: Detects only weakly connected componentsOK and Cancel buttons.

Gephi Statistics: Connected Components

Overview Data Laboratory Preview

Workspace 1

Appearance Graph Context

Nodes Edges Unique Attribute

Attribute

2 (50%)
1 (50%)

Palett 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
- Convergence Thresl 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

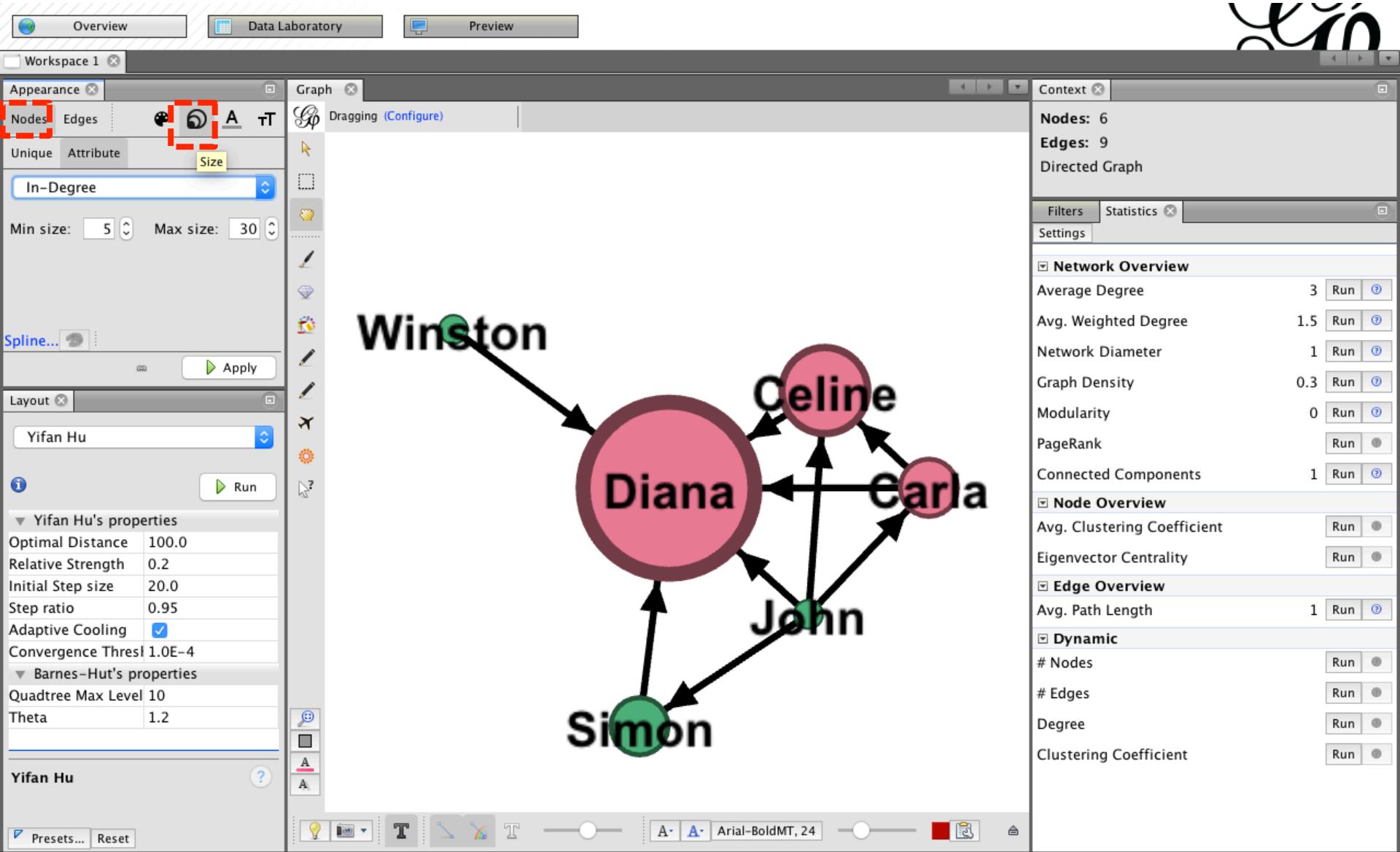
Average Degree 3 Run (?)
Avg. Weighted Degree 1.5 Run (?)
Network Diameter 1 Run (?)
Graph Density 0.3 Run (?)
Modularity 0 Run (?)
PageRank Run
Connected Components 1 Run (?)

Network Overview
 Node Overview
 Edge Overview
 Dynamic

Avg. Clustering Coefficient Run
Eigenvector Centrality Run
Avg. Path Length 1 Run (?)
Nodes Run
Edges Run
Degree Run
Clustering Coefficient Run

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Appearance Nodes Size



Appearance Nodes Size

Attribute / In-Degree

Overview Data Laboratory Preview

Workspace 1

Appearance X

Nodes Edges A T

Unique Attribute

In-Degree

- Choose an attribute
- Degree
- In-Degree
- Out-Degree
- Out-Degree
- Weighted Out-Degree
- In-Degree
- Closeness Centrality

Apply

Graph X Dragging (Configure)

Context X

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

Winston

Diana

Celine

Carla

John

Simon

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
- Convergence Thresl 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level 10
- Theta 1.2

Yifan Hu

Presets... Reset

T Arial-BoldMT, 24

Appearance Nodes Size

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

Overview Data Laboratory Preview

Workspace 1

Appearance X

Nodes Edges Unique Attribute

In-Degree

Min size: 5 Max size: 30

Spline... 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

Convergence Thresl 1.0E-4

Barnes-Hut's properties

Quadtree Max Level 10

Theta 1.2

Yifan Hu Presets... Reset

Graph X Dragging (Configure)

Context X

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

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

Appearance Edges

Attribute / Weight / Color

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges A

Unique Attribute

Weight

Color: Default ▶ Invert Recent ▶

Spline... Layout X

Yifan Hu

i Run

Yifan Hu's properties

- Optimal Distance 100.0
- Relative Strength 0.2
- Initial Step size 20.0
- Step ratio 0.95
- Adaptive Cooling
- Convergence Thresl 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level 10
- Theta 1.2

Yifan Hu Presets... Reset

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 ⓘ

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

Appearance Edges

Attribute / Weight / Color / Apply

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges A T

Unique Attribute

Weight

Color: 

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
- Convergence Thresl 1.0E-4

Barnes-Hut's properties

- Quadtree Max Level 10
- Theta 1.2

Yifan Hu

Presets... Reset

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

Winston → Diana → Celine → Carla → John → Simon

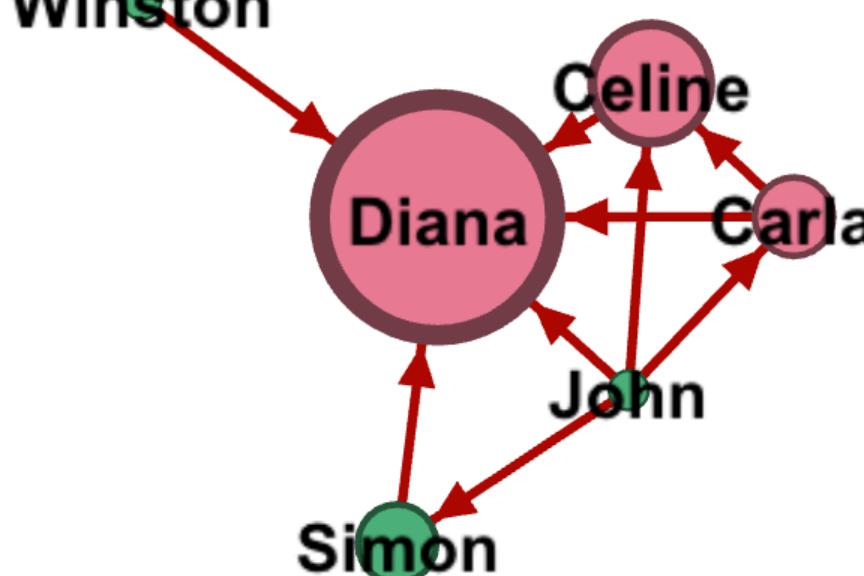


Diagram illustrating the application of appearance settings for edges in a network visualization. The 'Edges' tab in the Appearance panel is selected, and the 'Weight' setting is applied. The resulting graph shows directed edges between nodes, where the thickness of the edges represents their weight. The nodes are labeled with names: Winston, Diana, Celine, Carla, John, and Simon. The edges are red arrows pointing from one node to another, with varying thicknesses indicating edge weights.

Gephi Data Laboratory

The screenshot shows the Gephi Data Laboratory interface. The top navigation bar includes tabs for "Overview", "Data Laboratory" (which is selected and highlighted with a red dashed border), and "Preview". Below the tabs is a workspace titled "Workspace 1" containing a "Data Table". The table has columns for "Nodes" and "Edges", and a "Configuration" tab is active. The "Configuration" tab includes buttons for "Add node", "Add edge", "Search/Replace", "Import Spreadsheet", "Export table", and "More actions". A "Filter:" input field and an "Id" column header are also present. The data table itself contains the following data:

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	0.0	4.0	4.0	4.0	1.0	1.0	1.0	0.0	0	0	4
2	Carla	2	1	2	3	1.0	2.0	3.0	1.0	1.0	1.0	1.0	0.0	0	0	3
3	Simon	1	1	1	2	1.0	1.0	2.0	1.0	1.0	1.0	1.0	0.0	0	0	2
4	Celine	2	2	1	3	2.0	1.0	3.0	1.0	1.0	1.0	1.0	0.0	0	0	1
5	Winston	1	0	1	1	0.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0	0	5
6	Diana	2	5	0	5	5.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0	0	0

At the bottom of the interface, there is a toolbar with various icons and dropdown menus for column operations:

- 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 Presets Default

Settings Manage renderers

Nodes

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

Node Labels

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

Background Reset zoom - +

Export: SVG/PDF/PNG Refresh



Gephi Preview: Show Labels

Screenshot of the Gephi software interface showing the Preview tab selected. The left panel displays the Preview Settings, specifically the Nodes section, which has a red dashed border around its entire content area. The Nodes settings include:

- 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:

The Preview window shows a network graph with several nodes. The largest node is labeled "Diana" in a large, bold black font, with a pink background and a thick black outline. Other nodes include "Celine" (pink), "Carla" (pink), "John" (green), "Winston" (green), and "Simon" (green). Edges connect Diana to Celine, Diana to John, Diana to Simon, and Winston to John. The "Preview" tab is highlighted with a red dashed border.

Gephi Preview: Default Straight



Screenshot of the Gephi software interface showing the Preview tab. The left sidebar displays the workspace settings, specifically the Preview Settings panel where the 'Presets' dropdown is set to 'Default Straight'. The main preview area shows a network graph with nodes labeled 'Winston', 'Diana', 'Celine', 'Carla', 'John', and 'Simon'. The node 'Diana' is the largest and has its name displayed in a large, bold black font. Edges connect 'Winston' to 'Diana', 'Diana' to 'Celine', 'Diana' to 'Carla', 'Diana' to 'John', and 'John' to 'Simon'. The edges are straight lines, illustrating the 'Default Straight' preset. The bottom right corner of the screenshot includes the page number '148'.

Gephi Preview: Default Straight

Screenshot of the Gephi software interface showing the Preview tab. The left panel displays the Preview Settings dialog with a red dashed border around the Presets, Node Labels, and Edges sections. The Presets dropdown shows "Default Straight". The Node Labels section includes settings for opacity (100.0), font (Arial 12 Plain), and color (custom [0,0,0]). The Edges section includes settings for thickness (1.0), color (mixed), and edge arrows (size 3.0). The right panel shows a network graph with nodes: Winston (green), Diana (large pink), Celine (pink), Carla (pink), John (green), and Simon (green). Edges connect Winston to Diana, Celine to Diana, Carla to Diana, John to Diana, John to Celine, and Simon to Diana. The edges between John and Celine, and between John and Carla are curved, while the edge from Winston to Diana is straight.

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

Gephi Preview: Export SVG/PDF/PNG

The screenshot shows the Gephi Preview interface with a network graph and an export dialog.

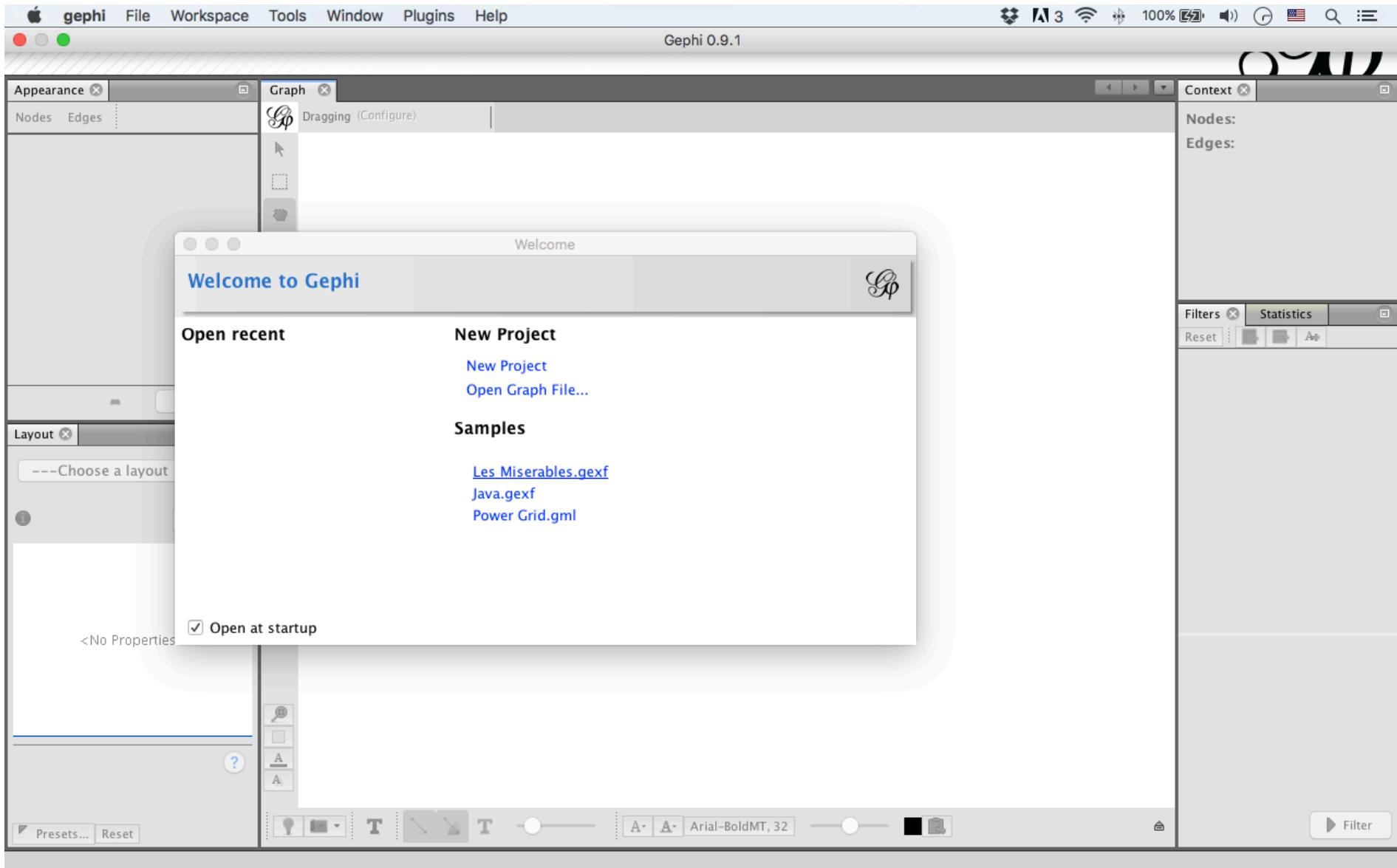
Network Graph: The graph consists of four nodes: "Winston" (green), "Diana" (large pink), "Celine" (pink), and "Simon" (green). "Winston" has a directed edge pointing to "Diana". "Diana" has a directed edge pointing to "Celine". "Diana" also has a directed edge pointing to "Simon".

Preview Settings Panel: On the left, there is a panel titled "Preview Settings" with tabs for "Presets" and "Settings". The "Settings" tab is active, showing configuration for "Node Labels" and "Edges".

Export Dialog: A modal dialog titled "Export" is open. It contains a "Save As:" field with the value "SNA_Gephi_1" (highlighted with a red dashed box). Below it is a dropdown menu set to "SNA_Data". The "Name" section lists files "Edges1.csv" and "Nodes1.csv". At the bottom, the "File Format:" dropdown is set to "PNG Files (*.png)". The "Save" button is highlighted with a red dashed box.

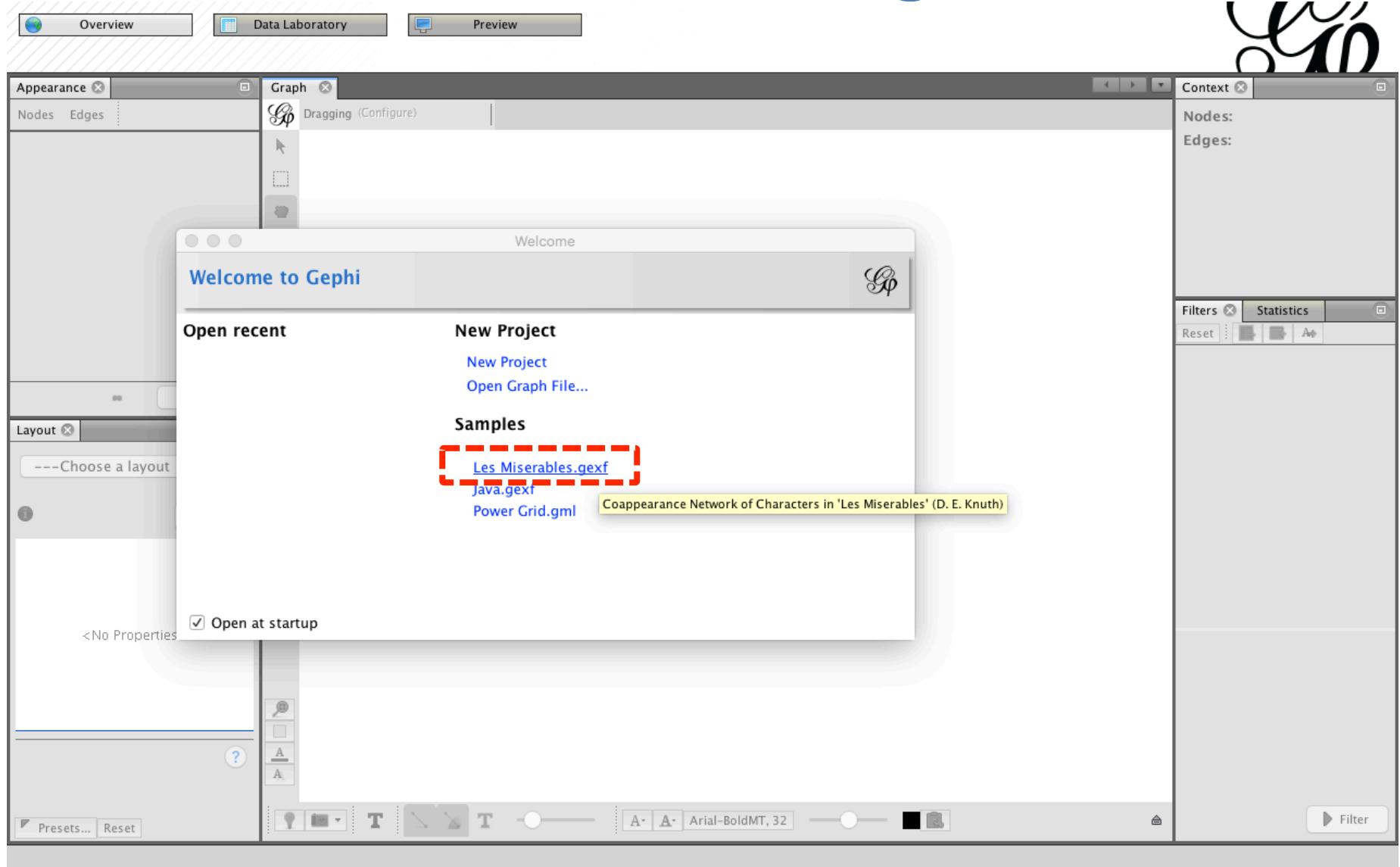
Open Gephi Samples

Gephi Samples

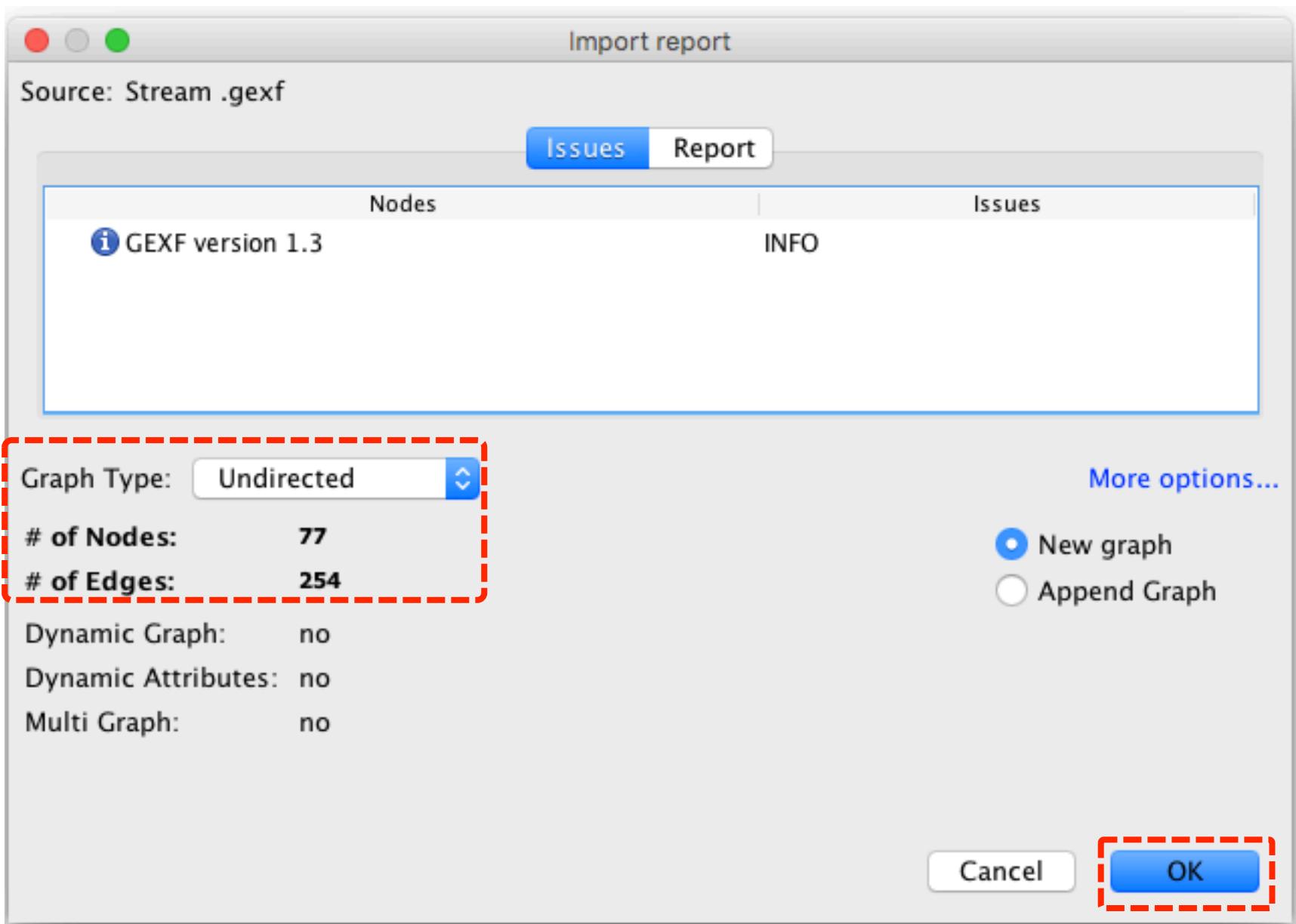


Gephi Samples

Les Miserables.gexf



Gephi Import Report



Gephi Overview

The screenshot shows the Gephi interface with a network graph displayed in the center. The graph consists of several clusters of nodes, with a prominent red central node and other nodes in various colors (blue, green, purple, yellow). Edges connect the nodes between clusters.

Top Bar:

- Overview (selected)
- Data Laboratory
- Preview

Left Sidebar (Appearance):

- Nodes (selected)
- Edges
- Color palette (hex code: #c0c0c0)
- Unique Attribute
- Layout (Choose a layout: ---Choose a layout---, Run button)
- <No Properties>
- Presets... Reset

Right Sidebar (Context):

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

Bottom Tools:

- Lightbulb icon
- Text input field
- Line tool
- Color palette
- Text input field (Arial-BoldMT, 32)
- Size slider
- Color palette
- Save icon

Gephi Layout

The screenshot shows the Gephi software interface with the following components:

- Top Bar:** Overview, Data Laboratory, Preview.
- Left Sidebar (Appearance):** Nodes, Edges, Unique, Attribute, color palette (#c0c0c0).
- Central Graph Area:** A network graph with a large red central node connected to many smaller nodes of various colors (blue, green, purple, yellow). Edges are dashed and colored.
- Layout Panel (Left):** A dropdown menu titled "Choose a layout" listing:
 - Contraction
 - Expansion
 - Force Atlas
 - ForceAtlas 2
 - Fruchterman Reingold
 - Label Adjust
 - Nooverlap
 - OpenOrd
- Toolbars and Buttons:** Presets..., Reset, various icons for selection, zoom, and styling.
- Right Sidebar (Context):** Nodes: 77, Edges: 254, Undirected Graph.
- Right Sidebar (Filters):** Library (Attributes, Dynamic, Edges, Operator, Topology, Saved queries).
- Bottom Right Sidebar (Queries):** Drag filter here.
- Bottom Bar:** Font style and size (Arial-BoldMT, 32), color palette.

Gephi Layout: Force Atlas

Overview Data Laboratory Preview

Workspace 1

Appearance Nodes Edges Unique Attribute #c0c0c0

Graph Dragging (Configure)

Context Nodes: 77 Edges: 254 Undirected Graph

Filters Reset Library Attributes Dynamic Edges Operator Topology Saved queries

Queries Drag filter here

Layout Force Atlas Run

Force Atlas

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

Force Atlas Presets... Reset

Arial-BoldMT, 32

Gephi Layout: Contraction

Screenshot of the Gephi software interface showing the Contraction layout.

The main window displays a network graph with a large red central node and several clusters of smaller nodes in blue, green, purple, and yellow. The edges connecting the nodes are dashed and colored.

Toolbar (Top): Overview, Data Laboratory, Preview.

Appearance Panel (Left): Nodes, Edges, Unique, Attribute, Color selector (#c0c0c0), Apply button.

Layout Panel (Left): Contraction, Run button (highlighted with a red box).

Graph Panel (Center): Dragging (Configure) button.

Context Panel (Right): Nodes: 77, Edges: 254, Undirected Graph, Filters, Statistics, Library (Attributes, Dynamic, Edges, Operator, Topology, Saved queries), Queries (Drag filter here).

Bottom Panel: Presets..., Reset, Font settings (T, Arial-BoldMT, 32), Color selection.

Gephi Layout: Expansion

The screenshot shows the Gephi software interface with the following components:

- Top Bar:** Overview, Data Laboratory, Preview.
- Left Sidebar:** Appearance (Nodes, Edges, Unique, Attribute), a color palette (#c0c0c0), and a Layout panel.
- Layout Panel (highlighted with a red dashed border):**
 - Expansion:** A dropdown menu currently set to "Expansion".
 - Run:** A button with a play icon.
 - properties:** A section containing "Scale factor" with a value of "0.8".
- Graph Area:** Displays a network graph with nodes colored in various shades of blue, green, purple, and red, connected by edges.
- Right Sidebar:**
 - Context:** Shows "Nodes: 77", "Edges: 254", and "Undirected Graph".
 - Filters:** Buttons for Library, Statistics, and Reset.
 - Library:** A tree view with categories: Library, Attributes, Dynamic, Edges, Operator, Topology, and Saved queries.
 - Queries:** A section with a placeholder "Drag filter here".
- Bottom Bar:** Presets..., Reset, and a toolbar with various icons.

Gephi Layout: ForceAtlas 2

Screenshot of the Gephi software interface showing the ForceAtlas 2 layout configuration and visualization.

The main window displays a network graph with nodes colored by community (green, cyan, purple, red, blue, yellow, orange) and edges connecting them. A large green cluster is prominent in the center-left, while other clusters are scattered across the right side.

Layout Panel (Left):

- Selected layout: ForceAtlas 2
- Buttons: Stop (highlighted with a red box)
- Threads:
 - Threads number: 3
- Performance:
 - Tolerance (speed): 1.0
 - Approximate Repu (checkbox)
 - Approximation: 1.2
- Tuning:
 - Scaling: 10.0
 - Stronger Gravity (checkbox)
 - Gravity: 1.0

Graph Panel (Top Center):

- Dragging (Configure) button
- Tool icons: Selection, Zoom, Pan, Edge Selection, Edge Creation, Edge Removal, Node Selection, Node Creation, Node Removal, Text Selection, Text Creation, Text Removal, Font Size, Font Style, Font Color, Font Weight, Font Family, Filter.

Context Panel (Right):

- Nodes: 77
- Edges: 254
- Undirected Graph
- Filters, Statistics, Reset buttons
- Library:
 - Attributes
 - Dynamic
 - Edges
 - Operator
 - Topology
 - Saved queries
- Queries: Drag filter here

Toolbar (Bottom):

- Presets..., Reset buttons
- Font icons: Lightbulb, Text, Text with icon, Text with arrow, Text with double arrow, Text with double arrow and icon.
- Font Size: 32, Font Style: Arial-BoldMT, Font Weight: bold, Font Color: black, Font Background: white.
- Filter button

Gephi Layout: Fruchterman Reingold

Screenshot of the Gephi software interface showing the Fruchterman Reingold layout algorithm applied to a network graph.

The layout parameters in the "Layout" panel are:

- Fruchterman Reingold
- Area: 10000.0
- Gravity: 10.0
- Speed: 1.0

The graph consists of several clusters of nodes, primarily colored red, green, blue, and purple. A large red node is at the center, connected to a cluster of green nodes on the right. Other clusters include a blue cluster at the top left, a purple cluster in the middle, and a red cluster at the bottom left. Edges connect nodes both within and between these clusters.

Contextual information on the right side of the interface includes:

- Nodes: 77
- Edges: 254
- Undirected Graph

Other panels and features visible include:

- Appearance: Nodes, Edges, Unique, Attribute, Color palette (#c0c0c0).
- Graph: Dragging (Configure) tool.
- Preview: Preview tab.
- Context: Library (Attributes, Dynamic, Edges, Operator, Topology, Saved queries), Queries (Drag filter here).
- Tools: Selection, Zoom, Drawing, Text, Style, Filter.
- Presets: Presets... Reset.

Gephi Layout: OpenOrd

Screenshot of the Gephi interface showing the OpenOrd layout results.

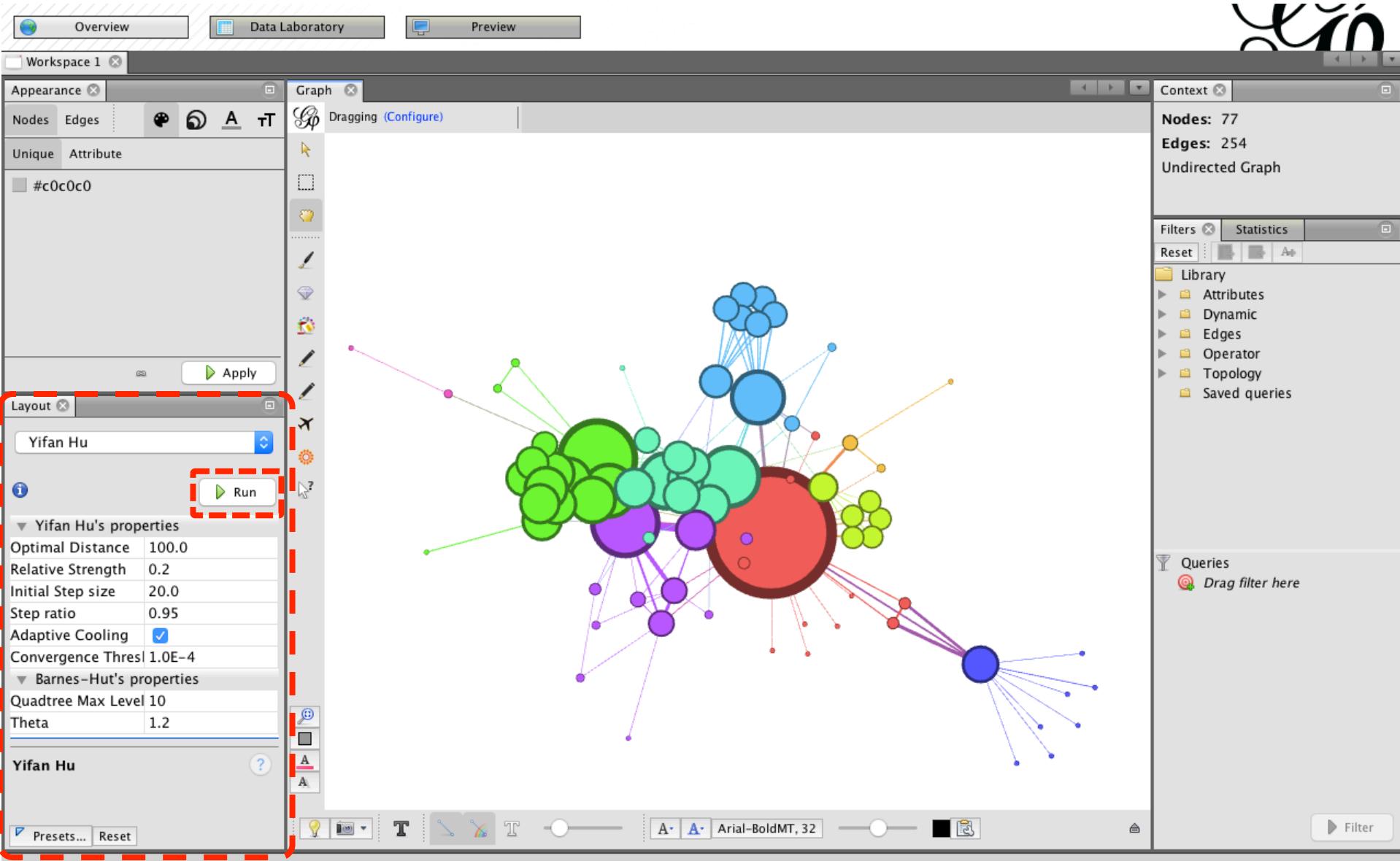
The main graph area displays a complex network structure with nodes of various sizes and colors (red, green, blue, purple, yellow) connected by a dense web of edges. A large red node is at the center, surrounded by several green and purple clusters.

The left sidebar contains the **Layout** panel, which is currently set to **OpenOrd**. The **Run** button in this panel is highlighted with a red box. Below it, the **Stages** section shows the following configuration:

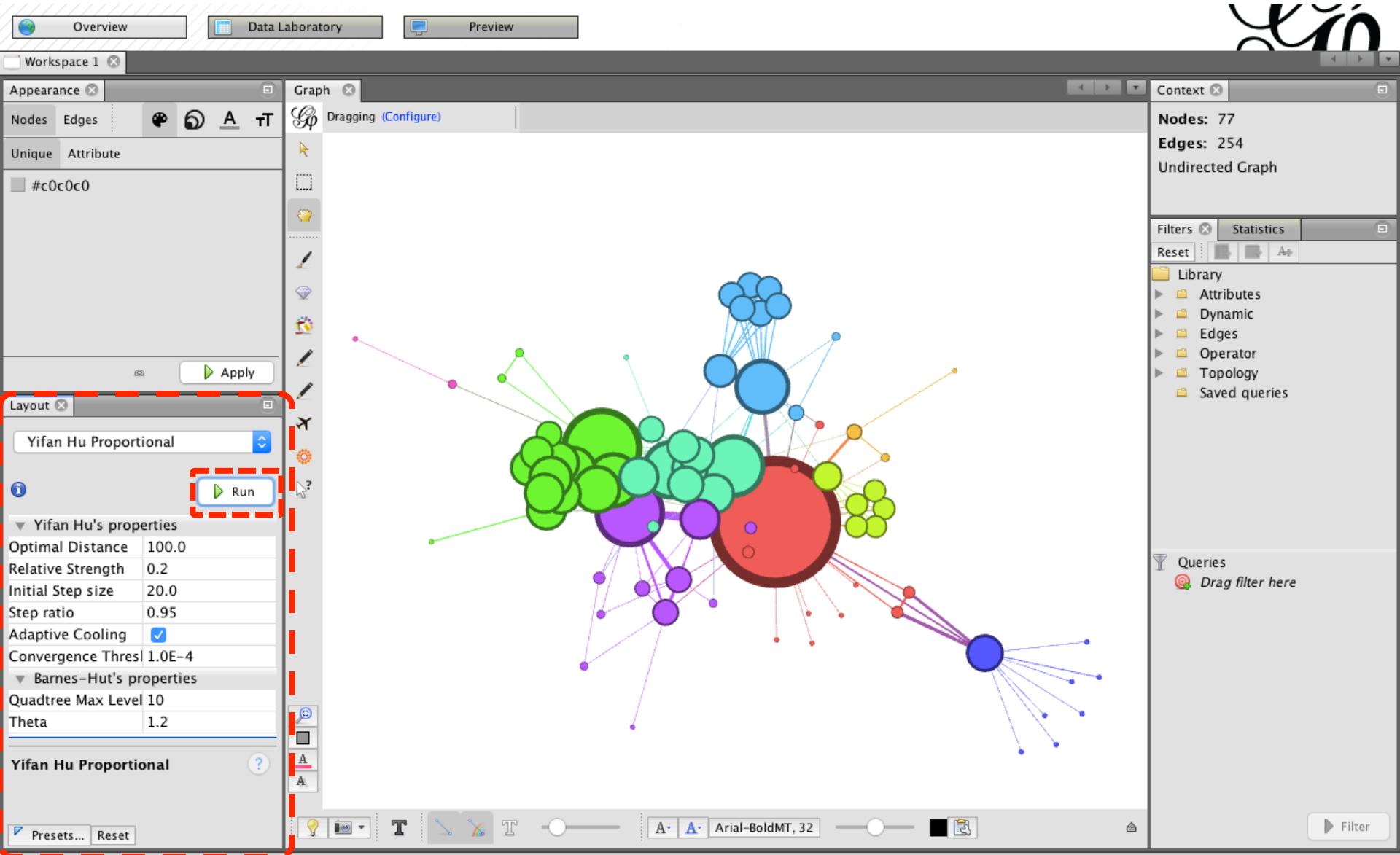
Liquid (%)	25
Expansion (%)	25
Cooldown (%)	25
Crunch (%)	10
Simmer (%)	15
OpenOrd	
Edge Cut	0.8
Num Threads	3
Num Iterations	750

The top navigation bar includes tabs for **Overview**, **Data Laboratory**, and **Preview**. The right sidebar provides summary statistics: **Nodes: 77**, **Edges: 254**, and **Undirected Graph**. It also features a **Library** section with categories like **Attributes**, **Dynamic**, **Edges**, **Operator**, **Topology**, and **Saved queries**.

Gephi Layout: Yifan Hu



Gephi Layout: Yifan Hu Proportional



Gephi Data Laboratory: Nodes

Screenshot of the Gephi Data Laboratory interface showing the 'Nodes' tab in the 'Data Table' panel.

The 'Data Laboratory' tab is highlighted with a red dashed box.

The 'Nodes' tab is selected in the top navigation bar.

The Data Table shows the following data:

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	Fauchelevent		4
29	Bamatabois		3
3	MmeMagloire		1
30	Perpetue		2
31	Simplice		2
32	Scaufflaire		1
33	Woman1		1
34	Judge		3
35	Champmathieu		3

Below the table are various data manipulation tools:

- 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

Screenshot of the Gephi Data Laboratory interface showing the Edges tab selected. The Data Laboratory tab is highlighted with a red dashed box.

The Data Table shows the following edge data:

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

Bottom navigation bar:

- 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

Screenshot of the Gephi Data Laboratory interface showing the "Data Laboratory" tab selected (highlighted with a red dashed box). The "Export table" button in the toolbar is also highlighted with a red dashed box.

The main area displays a data table with columns: Id, Label, Interval, and Modularity Class. A context menu is open over the table, with its contents also highlighted by a red dashed box. The menu includes options for Separator (set to Comma), Charset (set to UTF-8), and a list of columns to export: Id, Label, Interval, and Modularity Class. The "OK" button at the bottom right of the menu is also highlighted.

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	Fauchelevent		4
29	Bamatabois		3
3	MmeMagloire		1
30	Perpetue		2
31	Simplice		2
32	Scaufflaire		1
33	Woman1		1
34	Judge		3
35	Champmathieu		3

Below the table are several buttons for column management:

- 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



Screenshot of the Gephi software interface showing a network graph preview.

The top navigation bar includes tabs: Overview, Data Laboratory, and Preview (which is highlighted with a red dashed box).

The left sidebar contains the Preview Settings panel:

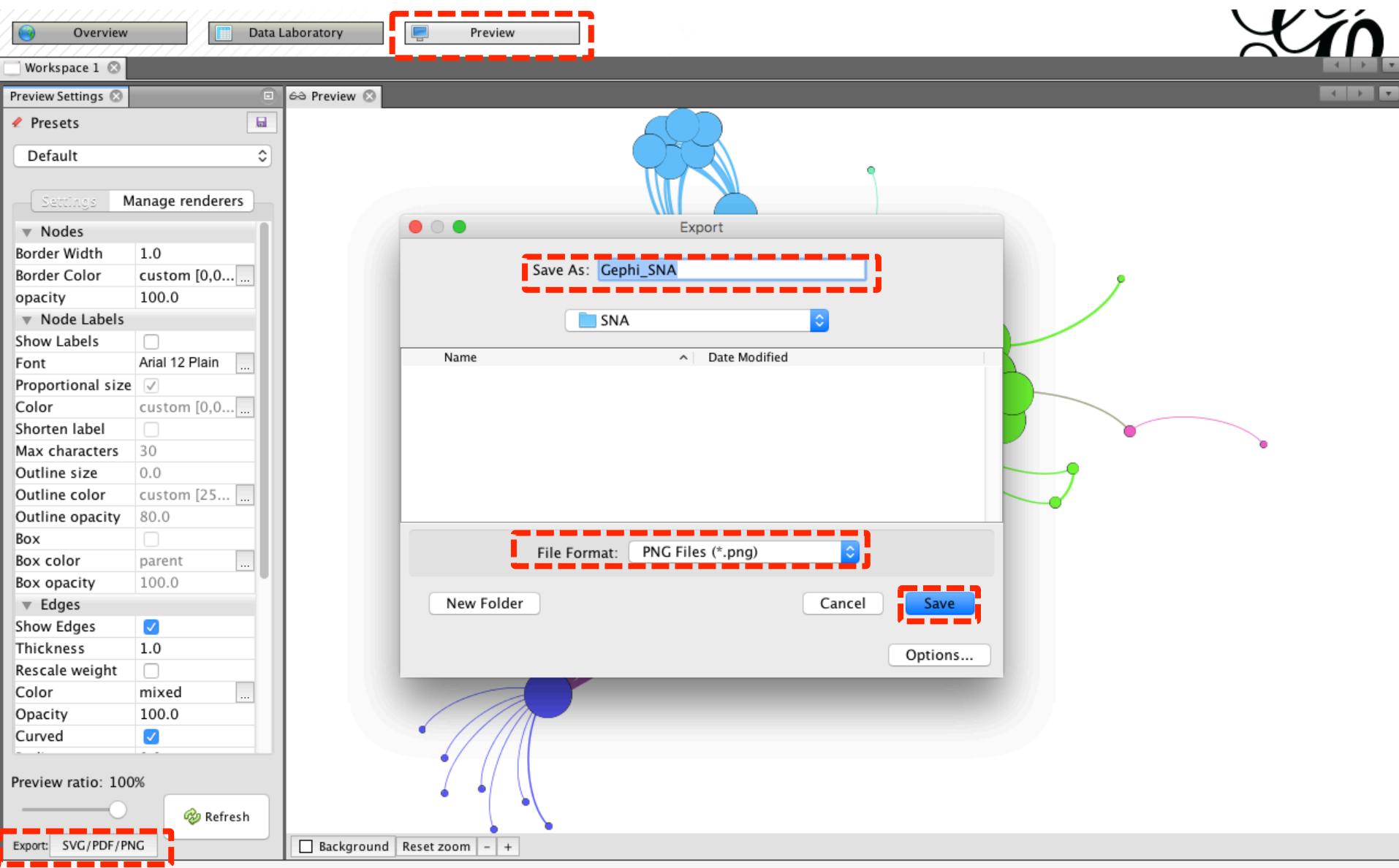
- Presets: Default
- Settings tab (selected)
- Manage renderers
- Nodes settings:
 - Border Width: 1.0
 - Border Color: custom [0,0,...]
 - opacity: 100.0
- Node Labels settings:
 - Show Labels:
 - Font: Arial 12 Plain
 - Proportional size:
 - Color: custom [0,0,...]
 - Shorten label:
 - Max characters: 30
 - Outline size: 0.0
 - Outline color: custom [25...
 - Outline opacity: 80.0
 - Box:
 - Box color: parent
 - Box opacity: 100.0
- Edges settings:
 - Show Edges:
 - Thickness: 1.0
 - Rescale weight:
 - Color: mixed
 - Opacity: 100.0
 - Curved:

Preview ratio: 100%

Export: SVG/PDF/PNG (highlighted with a red dashed box)

The main canvas displays a network graph with nodes of various sizes and colors (red, blue, green, purple, yellow) and edges connecting them. A large red node is at the center, connected to several smaller nodes of different colors.

Gephi Preview: Export SVG/PDF/PNG



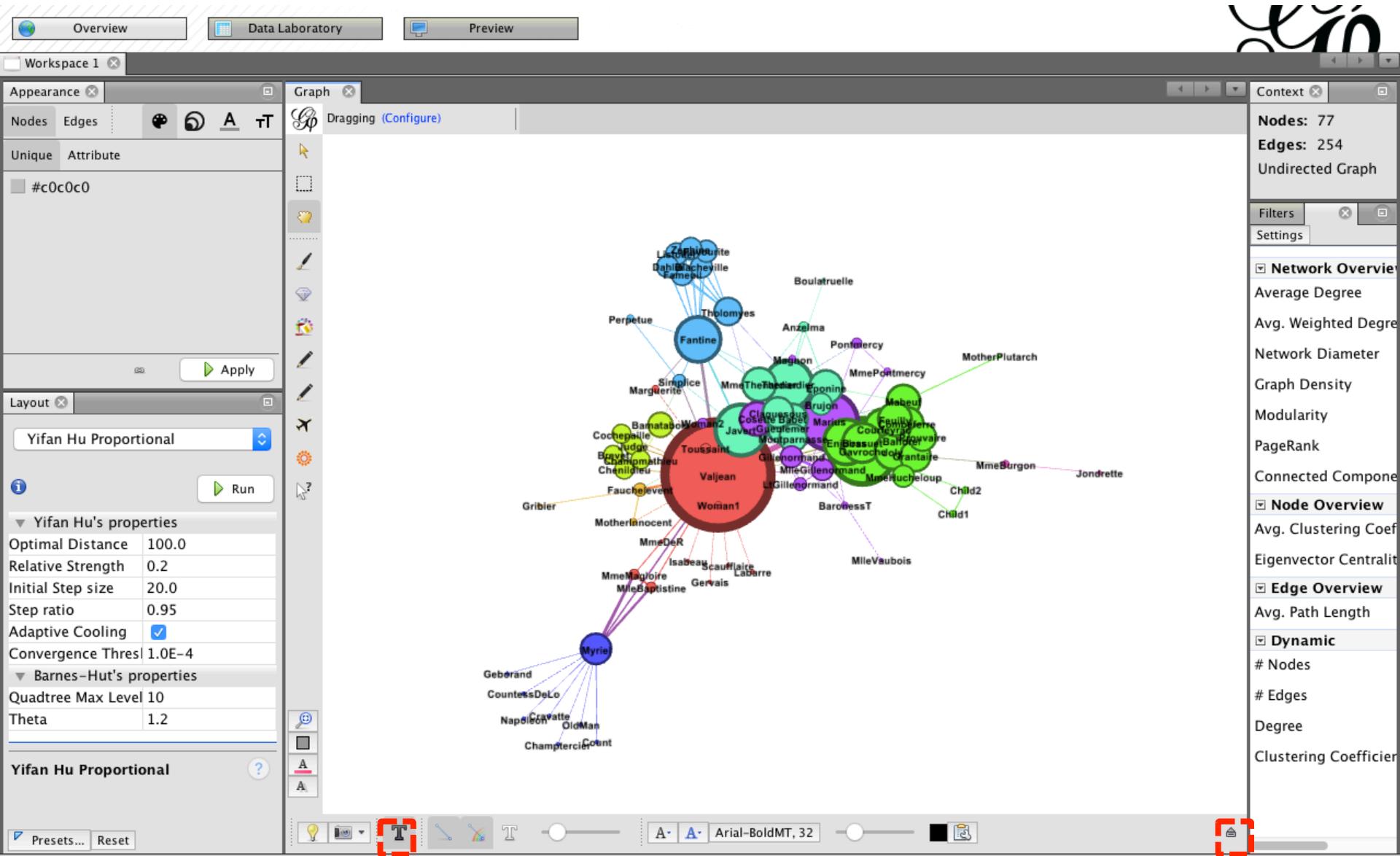
Gephi Overview: Text Labels

Screenshot of the Gephi interface showing a network graph of characters from Les Misérables. The graph consists of nodes representing characters and edges representing relationships. Nodes are colored according to their community structure, with a large red cluster at the center.

The interface includes the following components:

- Top Bar:** Overview, Data Laboratory, Preview.
- Left Panel (Appearance):** Nodes, Edges, Unique, Attribute, Color selector (#c0c0c0), Apply button.
- Left Panel (Layout):** Yifan Hu Proportional, Run button, Yifan Hu's properties (Optimal Distance: 100.0, Relative Strength: 0.2, Initial Step size: 20.0, Step ratio: 0.95, Adaptive Cooling checked), Barnes-Hut's properties (Quadtree Max Level: 10, Theta: 1.2).
- Graph Area:** The main workspace displaying the network graph.
- Bottom Panel (Text Labels):** Global, Edges, Labels (selected). Node settings: Font: Arial-BoldMT, 32, Size: Scaled, Color: Text. Edge settings: Font: Arial-BoldMT, 32, Size: Scaled, Color: Text. Hide non-selected checkbox.
- Right Panel (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 (Number of nodes, Number of edges, Degree, Clustering Coefficient).

Gephi Overview: Text Labels



Comparison of Social Network Analysis (SNA) Tools

General Comparison of SNA Tools

Software	NETWORKX	IGRAPH	GEPHI	PAJEK
TYPE	LIBRARY	LIBRARY	STAND ALONE	STAND ALONE
PLATFORM	PYTHON	PYTHON\R\C LIBRARY	WINDOWS	WINDOWS
COMPUTATIONAL TIME	FAST	FAST	FAST	MEDIUM
NO. OF NODES	1 MILLION	1 MILLION	0.15 MILLION	1 MILLION

Naheed Akhtar (2014)

Network Types Supported by SNA Tools

Graph type	Networkx	IGraph	Gephi	Pajek
1-Mode network	Yes	Yes	Yes	Yes
2-Mode network Graph	Yes	Yes	Yes	Yes
Multirelational network Graph	No	No	No	Yes
Temporarily network Graph	Yes	No	No	Yes

Naheed Akhtar (2014)

Graph Layout Supported by SNA Tools

Layout	Networkx	IGraph	Pajek	Gephi
Circular layout	Yes	Yes	Yes	Yes
Random layout	Yes	Yes	Yes	No
Spectral layout	Yes	No	No	No
Spring layout	Yes	Yes	Yes	Yes
Graphviz layout	Yes	No	No	No
Kamada kawai	No	Yes	Yes	No
Fruchterman reingold	No	Yes	Yes	No
Force Atlas layout	No	No	Yes	No

Naheed Akhtar (2014)

Execution Time for SNA Features

SNA Features	Networkx	IGraph	Gephi	Pajek
Load time	54.67 sec.	3.707 sec	29 sec	3 sec
Degree centrality	58.57 sec	6.199 sec	4 sec	2 sec
Graph degree	60.87 sec	6.22 sec	4 sec	2 sec
Page rank	120.78 sec	9.81 sec	10 sec	No
Hits	57.23 sec	15.43	8 sec	No
Cliques	66.98 sec	9.35 sec	Na	No
Density	58.94 sec	3.302 sec	4 sec	No
Modularity	81 .4 sec	9 sec	30 sec	6 sec
Network diameter	35 sec	3.51 sec	120 sec	No
Core	65.84 sec	6.532 sec	No	1 sec
Cohesion	No	8.943 sec	No	No
Clustering coefficient	3303.99 sec	1800 sec	1200 sec	108 sec
Hub	76.57	5.831 sec	3 sec	No
Authority	Array is to big	6.783 sec	3 sec	No

Naheed Akhtar (2014)

Comparative analysis of Social Networking Analysis tools

Software	Pajek	Gephi	Social Network Visualizer	Netlytic	Graphviz
Version	1.26	0.7 alpha	1.56 Beta	Tier 1,2,3	2.38.0
Type	Stand-alone software	Stand-alone software	Stand-alone software	Stand-alone software	Stand-alone software
Platform	Windows	Java	Windows	Windows	Windows
License	Free	GNU GPL	Free	Tier 1,2 (Free) Tier 3 (CS)	Free
Expectable Computing Time	Fast(C)	Medium(JAVA)	Fast(C)	Medium(JAVA)	Fast(C)
Tractable number of nodes	500000 nodes	150000 nodes	100000 nodes	300000 nodes	1400000 nodes
Time to load 10^5 nodes and 10^6 edges	24 seconds	40 seconds	46 seconds	50 seconds	34 seconds
File formats					
GML	No	Yes	Yes	Yes	No
Pajek(.net)	No	Important Only	No	No	No
GraphML	Export only	Yes	Yes	Yes	No
DL	Yes	Yes	Yes	Yes	No
GEXF	No	Yes	Yes	Yes	No
Graph types					
Two-mode graphs	Yes	No	No	No	Yes
Multi-relational graphs	Yes	No	No	Yes	Yes
Temporality	Yes	No	No	Yes	Yes
Visualization layouts					
FruchtermanReingold	Yes	Yes	Yes	Yes	No
Kamada Kawai	Yes	Yes	No	No	Yes
Other spring layouts	No	Yes	Yes	No	Yes
Indicators					
Degree centrality	Yes	Yes	Yes	Yes	Yes
Betweenness centrality	Yes	Yes	Yes	Yes	Yes
Closeness centrality	Yes	Yes	Yes	Yes	Yes
Dyad census	No	No	No	No	No
Triad census	Yes	No	No	No	No
HITS	No	Yes	Yes	No	No
Page Rank	No	Yes	Yes	Yes	No
Clustering Algorithms					
Edge Betweenness	No	No	No	Yes	No
Walktrap	No	No	No	Yes	No
Spinglass	No	No	No	Yes	No
Dendogram Display	Yes	Yes	Yes	Yes	Yes

Comparative analysis of Social Networking Analysis tools

Software	Pajek	Gephi
Version	1.26	0.7 alpha
Type	Stand-alone software	Stand-alone software
Platform	Windows	Java
License	Free	GNU GPL
Expectable Computing Time	Fast(C)	Medium(JAVA)
Tractable number of nodes	500000 nodes	150000 nodes
Time to load 10^5 nodes and 10^6 edges	24 seconds	40 seconds

File formats

GML	No	Yes
Pajek(.net)	No	Important Only
GraphML	Export only	Yes
DL	Yes	Yes
GEXF	No	Yes

Graph types

Two-mode graphs	Yes	No
Multi-relational graphs	Yes	No
Temporality	Yes	No

Comparative analysis of Social Networking Analysis tools

Software	Pajek	Gephi
Visualization layouts		
FruchtermanReingold	Yes	Yes
Kamada Kawai	Yes	Yes
Other spring layouts	No	Yes
Indicators		
Degree centrality	Yes	Yes
Betweenness centrality	Yes	Yes
Closeness centrality	Yes	Yes
Dyad census	No	No
Triad census	Yes	No
HITS	No	Yes
Page Rank	No	Yes
Clustering Algorithms		
Edge Betweenness	No	No
Walktrap	No	No
Spinglass	No	No
Dendogram Display	Yes	Yes

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